

*Naval Forces Under the Sea
The Rest of the Story*

Individual Interviews

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UNDERSEA & HYPERBARIC MEDICAL SOCIETY

INTERVIEW OF
COMMANDER ANTHONY RODGERS

Kensington, Maryland
Friday, September 5, 2003

PROCEEDINGS

INTERVIEWER: I'm at the Naval Special Clearance Team (NSCT) One in Coronado, California with the commanding officer, Commander Anthony Rodgers. Could you start out by giving me a short summary of your career as a Navy diver?

COMMANDER RODGERS: Sure. I graduated from the Naval Academy in 1983. I went to SWAS and then to dive school. I graduated from dive school in September of 1984. Then I went to the USS *Kansas City*. I was on the *Kansas City* until 1986, at which time I went to Underwater Demolition (UD) School. I graduated from UD school in September of 1987. I then went to Explosive Ordnance Disposal (EOD) MOB Unit 2 at Fort Storey, Virginia.

I had an area search detachment, which was initially in the Mine Countermeasures (MCM) department. Then I took a team of battle group divers and EOD on the USS *Theodore Roosevelt* on her maiden voyage in 1989. Then I had an MCM detachment in 1989. 1988 was spent on the *Theodore Roosevelt*. I did most of my diving as an MCM detachment as an officer in charge. I extended a year. I was there for three years so that I could get Rota and have an MCM detachment. Being in mine work there had great appeal to me to. I've been lucky enough to actually trail through in and out of mine warfare throughout my career. I think it helped, in addition to the timing of the commissioning of this unit, that I had sort of dabbled in mine warfare throughout my UD career.

From MOB Unit 2, I went the Detachment in Rota, which wasn't really an MCM unit at the time. I was there for two and a half years. Then I went to PG school. My thesis was related to mine warfare. I went from there to MOB Unit 6 as the executive officer. At the time, MOB Unit 6 was a dedicated MCM or UMCM command. That was our focus.

From there I went to 5th Fleet as the mine warfare EOD officer on the 5th Fleet staff. After the 5th Fleet, I went to VEO Mine Warfare, which was in the NAVSEA program office, which dealt mostly with surface MCM systems and C4I. It was at that time the decision was made to commission NSCT-1, which we did in September of 2002. That's my career. Since September 2002, I've been here at NSCT-1 getting us on our collective feet.

INTERVIEWER: Your whole career has basically involved mine issues?

COMMANDER RODGERS: Yes. I would say that since EOD school, I've had something to do with mine warfare. Even at the Detachment in Rota, even though we didn't have an MRCI or anything back Then all the short attachments had a limited mine warfare capability. We did some operations with the Royal Navy divers. They would come to Spain and do MCM exercises with us, as well as doing some stuff with the Spanish. It was sort of an introduction to coalition MCM and how the Royal Navy did their MCM diving.

INTERVIEWER: How does the mission of NSTC-1 differ from traditional EOD mine countermeasures?

COMMANDER RODGERS: Well, the notions behind commissioning NSCT-1 were free amphibious landing and mine and obstacle clearance. The command was a consolidation of what was before the VSW MCM detachment, that is, the very shallow water mine countermeasures detachment and the two other marine mammal systems, Mark 4 and Mark 7. The very shallow water mine countermeasures detachment started in 1996. It took a while after Desert Storm to digest that we did not have the capability to, in a clandestine manner, clear mines and obstacles in the very shallow water region, which is doctrinally defined as the depths from ten feet out to forty feet. In reality, it's from outside the surf zone, wherever that might be, to as deep as your rigs or your equipment will allow.

What we have really evolved into is from outside the surf zone to the horizon. That's our goal. That's our mission. Some of it is sort of self-defined because we certainly can't clear Q routes from the horizon as a single command, or routes from the horizon all the way up to the surf zone. We don't have the resources to do that in any amount of time. But we can provide a safe route for our own systems to get into where the boat lanes would begin for an amphibious landing. The reason we were commissioned was to consolidate some of the deeper water MCM systems, that is, the Mark 4 and Mark 7 marine mammal systems. Mark 4 is the system that finds moored mines in deep water. Mark 7 finds proud mines and buried mines in what is termed 'shallow water', but it's sort of between VSW and very deep water. The difference between an MCM detachment and us is that we are 150 strong and we specialize in the very shallow water area.

We have Navy EOD techs. We have Navy SEALs. We have reconnaissance Marines. We have special warfare combat craft crewmen. We have mammal handlers and first and second-class divers. I have a submariner who is sort of a calico of specialties that were selected to enable access for the amphibious force, given that mines and obstacles are likely.

INTERVIEWER: Tell me about your first real operational deployment, to Operation Iraqi Freedom.

COMMANDER RODGERS: It was a great opportunity to assess what it takes to get us from Coronado to the fight. I don't want to call it an exercise. It was an operation. It took three C-5s to get us over there. We did an exercise in January of this year to practice. After the exercise was when we could sort of tell how many boxes, how many cages and how many pallets it was going to take.

Before the exercise, we thought it might take as many as five C-5s to get us over there. We didn't want that to be true. So, we kind of pared ourselves down. I think we could probably get smaller for the next deployment. But it was a great opportunity to get up and move basically everything we have except for one of the marine mammal systems. We took nine dolphins. We took six Unmanned Underwater Vehicles (UUV). We took everything that gets in a boat and does operations with us with the exception of the Mark 4, because we didn't expect deep water mines. That wasn't going to be our operational environment.

It was significant because it wasn't very long prior to that that we were actually commissioned. We didn't start from zero. The SW MCM detachment existed before and so did the Mark 4 and Mark 7. But we hadn't integrated them and we certainly hadn't taken nine animals anywhere, in addition to all this. You know, the mission of harbor clearance was not something that we were terribly familiar with since 1996. We had been practicing diving against an opposed beach, which happened not to be this mission.

Anyway, the deployment was an eye opener for us, I think, in terms of the urgency to clear water. We expect that sort of urgency before an amphibious landing. We didn't expect it for clearing a harbor for humanitarian aid delivery. We thought that we'd have lots of time. We thought it would basically be a benign environment. Neither of those turned out to be the case. It was not the deployment designed for NSCT-1, or for what we were commissioned. But it was a great opportunity to pick up, get over there, operate and come home. Now we're just digesting all the lessons as to how to do it better next time.

INTERVIEWER: How hard was it to transition from the mission for which they had been training for years, you know, the mission of clearing amphibious assault lanes to attempting to clear a harbor instead?

COMMANDER RODGERS: In terms of difficulty, it was not difficult. I would consider harbor clearance a subset of our capabilities as we train to clear boat lanes. The normal training regimen is that you do everything at night. You do it under cover of darkness. You do it loaded with lots of weapons, expecting to encounter perhaps some kind of surface force out there. You come with an insertion craft from over the horizon, get put in, stand in water for three hours, at least from a diving perspective, come back up and go back out to the ship. It was not that at all.

It was basically setting up on the beach. As I said, there was a fair amount of urgency. There were heavy currents that we were subject to diving around. We had to wait for slack water periods to do that. Nobody was shooting at us when the whole command landed in Umm Qasr. We had a lead party that had a couple of little skirmishes, but nobody was in really serious firefights except for one guy for one day. Comparing to how we'd been training for those years, it was actually, operationally, I think, easier. What we weren't quite prepared to do was set ourselves up in a forward operating base on the beach.

We found a warehouse. Initially, we didn't have cots. We didn't have tents. We had done a little bit of practice as to how to work from a forward operating base. In terms of good solid communications and the infrastructure that you would have if you were used to going forward and then setting up on land, we've always practiced and had the ship as our home base.

When you are done with the mission you go back to the ship and that's where your planning spaces are. That's where your communications are. That's where everything is. It's a ship. We have been using ships for a couple hundred years and we know how to work from them. Working from the beach was one of our main lessons. We are now better prepared to go into a harbor, to be helicoptered in and work from there with the tents and the com sweeps and all that stuff that is really expeditionary.

INTERVIEWER: What about the mammals? The transit time was without stress for the animals, right?

COMMANDER RODGERS: It was. I think the mammals went really well. It's funny because when we were written into the planning order, right after we were commissioned, I made a visit to 5th Fleet. Its desire was for us to go over and be part of the plan, but they didn't want to bring the dolphins. They knew that the dolphins were going to be a pain in the neck, in terms of logistics. They are very logistically intensive.

However, the handlers at this command, the support from SPAWAR, the veterinarians, the tech reps and all the folks who thought about the logistical requirements nailed it. They covered everything. There was never a time when, you know, we were in a condition in which we thought an animal was in danger except for of a couple of times when they ran, and that does happen. But the 5th Fleet didn't want to have to deal with the dolphins. It knew we had dolphins. The 5th Fleet people knew we had UUVs and they were thinking, "Well, it's a much smaller package. It's a much easier package." They said, "We want you guys, but don't bring the dolphins."

During my visit, the point that I made was that we had been feeding these dolphins restaurant-grade mackerel for thirty years and we had never taken them to a mine campaign. We had never had them hunt mines in a real scenario and the environment was tailored for it. We thought we might be working in the river. Ultimately we didn't, as a command. But the plans showed the Port of Umm Qasr. The plans showed the river. We thought, "This is tailored for dolphins. If we don't bring them to this one, why do we have them? We should just let them go, sell them to Sea World or do something because this is really what they are there for." If they are

too much of a logistical pain to bring to a theater of war, it's just not worth all the effort that goes into them.

Whether it was that argument or the fact that dolphins are the only ones that can find buried mines, and the likelihood of buried mines during the planning stages was pretty high, or the combination of the two, the powers that be were convinced. They said, "Okay, bring your dolphins." The one issue with the dolphins that we advertised was that when they were to fly over there, at a distance like that, we wanted to have an acclimatization period. Seven to ten days was what we advertised. They get off the plane and go into what we call a 'Miller pen,' which is a pen that is set up in open water. The dolphin is worked every day out of that pen for a week or so, so he gets used to the water temperature, the salinity, and the environment in general. It's a new place for him. He can get all the vibrations of the plane out of him and all that other stuff. After that period, we can embark the ship and be ready to go to war.

Well, the tip bid was running about a week and a half behind. The theater commander wanted to say that he was ready to go but the dolphins were not there yet. Our flight kept getting pushed back because the normal tip bid delay was affecting us, as it was everybody else. When it came to the point at which it was about two weeks behind, he said, "Okay, look, when these dolphins come you're just going to get on the ship and you're going to the nag and waiting until you get called in." Against our objections, the thought was that we would go there and still have some time to acclimate them up there. We were to set our pools up in the well deck and then work them out of the stern gate. The thought was that they could be up close to where they were going to be working anyway.

Well, that posed to be sort of a problem because one stern gate and nine dolphins is not a reasonable way with which to work them. We did that. The dolphins flew over and they

embarked directly on the USS *Gunston Hall* and we got underway. It was basically a one or two-day operation. We were underway, trying to get them in shape. When they're in pools, which are these twenty-foot wide pools that are about five or six feet deep, they just aren't as content. It's harder to get them motivated. They're just kind of swimming in circles. You try to get them out every day to work. But with unrep schedules, a couple of bad weather days and just trying to work boats from a stern ramp and get nine dolphins out every day, it didn't happen.

When it was time to start, we had four dolphins that we thought were ready. In that period of work-ups, which was actually for about two weeks while we were up in the northern Gulf waiting to get the call, one of them ran for about five or six days. It was Heffy. At the time, it was considered a mine threat area. It wasn't a minefield. It wasn't a mine danger area because no mines had been found. But it was considered to be an area that might be mined and just a dangerous area. The possibility of suicide boats was in some of the intelligence reports. It wasn't an area in which you wanted to have to leave a boat in the water overnight with the pinger in the water, hoping for the dolphin to come back. It caused us a little bit of stress.

After five or six days, the dolphin did come back. We got him. He had lost a bunch of weight. But after that, there were a couple of dolphins that we didn't even want to put in the water, because we were afraid they were going to run. It took up man-hours to sit in the boat when in fact we had to get these dolphins ready. The same thing applies to acclimatization. We had four dolphins that were ready to go. When it was time to go into the port, we sent in by helo all the pools and stuff to set up before we could send the dolphins in.

Again, it was logistically covered without a hitch. The tech reps had taught our guys how to set a pool up, but they knew how to do that already. It is kind of like your swimming pool at home. You fill it up, shock it with a bunch of chlorine and then re-treat it after the chlorine has

worn off. You re-treat it to the salinity, the temperature and basically everything that is ideal for the dolphin. Then you call the dolphins in and they come in on the helo and you put them in the pools.

It worked fine, but it is a lot of baggage to use these systems. But we did use them successfully. I say successfully. We got them over there and they calibrated fine. We didn't find any mines in the water. To answer the question, it was stressful for the dolphins, but it worked out fine.

INTERVIEWER: You didn't find mines because there weren't any there. The dolphins were able to verify that the port was safe and that allowed the humanitarian material to flow through the port?

COMMANDER RODGERS: That's correct. They were not, certainly, the first sensors in the water. When we got the call to go in, the first sensor in the water was the UUVs. The system we used was the Remos. It looks like you talked to Staff Sergeant Durand. He probably gave you a pretty good overview of how that went. Had we not suspected that mines might have been buried, we wouldn't have used the dolphins, because the resolution on Remos gave us a good picture. We got a good picture from the side scan that is on the UUV.

We painted the bottom with the UUV. Anything that might have looked like mines on the screen we put divers on. The divers also went in on the piling of the piers and they did a jackstay about five yards out from it because we suspected that the dolphins wouldn't go right up to the pilings. Sometimes they get a little skittish about going right up to a seawall or a set of pilings if it's an area with which they are not familiar. We did a jackstay the length of the seawall and reacquired any of the contacts that the mine-like contacts that the UUVs came up with. We used the dolphins third in the areas where we thought the bottom was soft enough, based on the

divers' report. That was where a mine would be buried completely if it were thrown over the side, either from a truck driving up to the pier and backing up and dumping mines or a vessel that had floated up and dropped the mines there.

We did find patrol boats that had mines on them and boats with empty spaces where mines might have been before that. There were plenty of indications that there might be mines in the water. We did what we consider a thorough search to determine whether or not there were mines. As you know, exploratory hunting is what you do until you find one. Once you find one, you pull out the fine-toothed comb and you really look hard. Well, exploratory hunting has proven to be a method that tells you whether you have mines. That's what we did throughout both the ports of Umm Qasr and Az Zubayr, and we never found one. I would say the dolphins did their job. They didn't find any mines. We haven't heard a boom yet. It's been six months since they did their work, so I expect that there really aren't any mines there.

INTERVIEWER: That's good. Tell me about the UUV, sir.

COMMANDER RODGERS: The UUV is the thing that has gotten the most attention since the end of the war. Divers and dolphins do not give you the picture of the bottom that the UUV does. It's a really nice thing to have. The resolution, like I said, provides you with a high probability of detection and, under such conditions like that which we had at Umm Qasr, it gives you adequate coverage for exploratory hunting. For the NSCT 1 mission, we used the UUVs first. If we are approaching a beach for an amphibious landing, the optimal solution for mine countermeasures is to avoid where the mines are, not clear them. That process is slow, loud and hard. If you can paint me a picture of where I am and where I want to go and I can look at the picture and say, "Well, let's make our route over here where there aren't any mines," then that's what I want to do.

There is an idea and sort of a mantra coming out of the war effort with the UUVs. If we can have the capability to find buried mines with these things and we can make the capability to place charges when we do find mines, that's when we really start talking about getting the man out of the minefields. Divers and dolphins will be replaced when these UUVs can find mines reliably. They didn't find any mines either, so they are sort of unproven in that way. But when they can find them, lay charges on them, and have a couple of other capabilities like being able to find buried ones, we'll be able to use them exclusively. We do need an obstacle avoidance system and a couple of other things. But this was the first operational use of the UUVs and that very quickly became recognized by the commander of the 5th Fleet. He was aware that we had those and called us away to do another job, to search a lake for a pilot who had gone down in that lake. Like I said, it very quickly became recognized that this is a very small package and logistically at the opposite end of the spectrum from dolphins, or divers for that matter. Today, though, we still need both of those systems to do a search.

It's sort of like the side-scan sonar that you tow, but you don't need the boat. All you need is a little rubber boat or if you can run it from the shore, you don't need a boat. It is programmable and you run it and do your search. You know, we fit people, UUVs, processing equipment, food, and water in one 53 helo. We fit enough stuff to do a job for two weeks, and packed it up in a couple of hours. It was really nice.

INTERVIEWER: That's a new precedent.

COMMANDER RODGERS: Yes. Going a high clutter area, Hawaii, for example, and looking for mines among coral heads, is something we are not so sure we are ready to do yet. On an amphibious mission, we call it a 'bottom characterization tool.' So, we paint that picture of the bottom of the beach as wide as the tool can and then show that to Kadiff and Cliff. We say,

“Okay, it’s really smooth over here and it doesn’t look like there are any mines, but it’s really cluttered over here. It’s going to take us longer to clear in this area. Let’s pick our boat lanes where it’s nice and smooth and easily hutable and try to generate that discussion between Kadiff and Cliff. Get the word to them. Okay, let’s put the boat lanes here and then go about our business with dolphins and divers.” Hopefully, in five or ten years, or whatever it takes, we can put another UUV that, in and of itself, will find the mines and put charges on them. We’ll be good to go.

INTERVIEWER: Someday, Special Clearance Team 1 might be a lot of sonar techs and very few divers.

COMMANDER RODGERS: That’s correct. Yes.

INTERVIEWER: Do you think that's where the future will go?

COMMANDER RODGERS: You have the Expeditionary Strike Group, the first of which just deployed about a week and a half ago. I think battle groups and ARDS, if that is what they are called, maybe we stick with the Expeditionary Strike Group, but whatever it is, this group of ships goes forward as the fighting unit afloat. I think that ultimately, NSCT 1 will probably be out of a job. They won’t need to fly us away to do things.

When the reliable capabilities are completely contained in UUVs, that is, detection, classification, identification and neutralization, we’re going to put those UUVs on ships forward. They are going to be in the battle group through deep water. They are going to be able to go in laterals or whatever, and you will train your sonar techs that are already on those ships how to use these things. We should be out of a job. It’s kind of a matter of time. It might be twenty years, but I don't know.

INTERVIEWER: In the meantime, though, this is a pretty good place to be?

COMMANDER RODGERS: Oh, it's a great place to be. It's an unsolved mission. We think we have a pretty good set of tactics for how to do it. We're coming up on a year of a fair number of exercises, the main one of which will really allow us to pull out all the stops and have our coming out party in June of next year. Basically, we'll test all these lessons that we learned, both in Operation Iraqi Freedom and the logistics and tactics that we have been practicing in the water here in San Diego in the amphibious role, but not necessarily harbor clearance. Can we get across the beach and either avoid or clear everything that's in the way in a reasonable amount of time for the Marines to get ashore?

INTERVIEWER: That's going to be in June next year?

COMMANDER RODGERS: That's right. It will be in June at Camp LeJeune.

INTERVIEWER: Right now, your unit's made up of mostly EOD techs, SEALs and Marine reconnaissance divers?

COMMANDER RODGERS: I'd say we're about two-thirds second-class divers and fleet technicians one-third that type of person. I don't like to use the term 'support,' but SEALs, Marines, and EOD techs make up about a little over a third of our present manning. The rest of the people are going in the water so much, diving on mines. We have guys who are mammal handlers and guys who run UUVs. But the only way we have today to clear the mines is with a diver and a charge. Those other systems are search systems and a human does the neutralization. That makes up about a third of our guys.

INTERVIEWER: How does that mix of people work out for you?

COMMANDER RODGERS: It works surprisingly well. You know, it's a pretty congenial bunch. I think it is composed of fairly senior folks and so they are much more likely to bring

their strengths to the table and apply them as a team rather than carry around their individual backgrounds and try to preserve them. It's a pretty good environment here.

INTERVIEWER: It sounds like a synergy thing.

COMMANDER RODGERS: I would say that that's a good word.

INTERVIEWER: Are there any questions I haven't asked you, sir, or any topic we missed that comes to mind?

COMMANDER RODGERS: No, I don't think so.

INTERVIEWER: All right, sir. Thanks a lot.

COMMANDER RODGERS: You're welcome.

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UNDERSEA & HYPERBARIC MEDICAL SOCIETY

ORAL HISTORY INTERVIEW: ARTHUR J. BACHRACH, PH.D.

Taos, New Mexico

Monday, September 22, 2003

PROCEEDINGS

INTERVIEWER: It's September 22, 2003. I'm in the lovely adobe home of Dr. Art Bachrach and his interview will touch on a lot of the pieces of history that we do not have elsewhere. Art, let's get started and let's start at the beginning with where you were born, where you grew up, and where you went to school, even as far back as elementary school. We'll bring it all out and let's see what we can learn.

DR. BACHRACH: Well, I was born in New York, in New York City, and went to public schools in New York. I went to Columbia University, but the professor I wanted to work with moved over to City College, so I went there. I was 16 when I graduated from high school. I didn't really know what I wanted to do.

INTERVIEWER: That was young for high school. Tell us how you got through high school so quickly.

DR. BACHRACH: I skipped a couple of grades. In fact, I picked up one or two years in elementary school, so I got out early. It was 1939 and I went and got a job way downtown in New York City. I lived at the tip end of Manhattan, up near the area that what they called Spuyten Duyvil, or 'spitting devil,' in the Inwood area. It was country, or the suburbs, at that time. It isn't any more. I worked at an advertising agency as a runner and finally wound up in the art department. I started going to college at night, which was not easy. But I started taking psychology, was fascinated by psychology, so I quit my job and went to college full-time.

I was in the enlisted Reserve and got called up to the Army. We were supposed to be in some Air Corps program in Tennessee, a group of us who were psychology majors, but when we got off the troop train we wound up at Ft. McClellan, Alabama. Naïve as we were, we said there was a terrible mistake made, but we went through infantry basic training. I'd had the equivalent

of four years of college French, so somebody classified me as a French interpreter and I would have been in very difficult straits had I needed to perform as such. But that got me into the ASTP, the Army Specialized Training Program, so I was assigned to Amherst College to the language program, and we wound up in the Italian training program.

INTERVIEWER: Was that before or after World War II began?

DR. BACHRACH: It was after World War II began. I went into the Army in 1943 and was twenty years old at the time. To get into the program, you had to have a very high AGCT, the Army intelligence test, fluency in one language, and the equivalent of a college degree. The colonel who greeted us said, "You men are the cream of the United States Army." I looked around at the cream. I think I was a PFC at the time. There were sergeants and corporals and PFCs. I thought, "Well, Tom Lehrer," the Harvard University mathematician who was very funny, "once said that the Army never discriminated on the basis of race, creed, color, religion or ability." I looked at the cream of the crop, and the highest was a sergeant.

We went through the Italian training program which was an immersion program. We weren't permitted to speak English at any time in the barracks or the village or whatever, and in five months, we were fluent. Then, I spent two and one half years with the cobelligerenti program. We had 20,000 Italian prisoners in this camp who were being trained to take service jobs to free American soldiers for combat duty. Around the time of the Battle of the Bulge they cancelled the ASTP. They cancelled the Air Cadet Program and the 78th Division became almost entirely Air Cadets and ASTP. I went off into ordnance and then, finally, off again into infantry at Fort Benning, as an instructor.

INTERVIEWER: In what were you an instructor?

DR. BACHRACH: I was an instructor in rifles and marksmanship. I wasn't really that good but I could tell them what to do.

INTERVIEWER: What happened to the psychology track that you first started on?

DR. BACHRACH: Nothing happened. It was the typical Army, so absolutely nothing happened. But what did happen was that I wound up with the G.I. Bill of Rights so that when I got out of the Army, I went to Western Reserve University and got my master's degree. At the time, I couldn't take Cleveland's weather. Jones & Laughlin Steel Mill was operating and everybody had 'Cleveland Throat.' They've cleaned it up and it's really quite lovely now, though someone once said that Detroit is Cleveland without all the glitter. I got my master's and decided just to go to the University of Virginia and get my Ph.D. I had some friends in Virginia. I went there and had a job running the Behavioral Sciences Division in The Department of Neurology and Psychiatry at the University of Virginia. In 1952, I got my Ph.D.

INTERVIEWER: You were appointed to the position before you got your Ph.D.?

DR. BACHRACH: Yes, it was before I got my Ph.D. and when I got my Ph.D., I stayed on. I got my Ph.D. in 1952 and left in 1962. I was offered the job of professor and chairman of the Psychology Department at Arizona State University and it looked like an opportunity to build a whole new department. We had a good time. It was a very experimentally and physiologically oriented program. We applied for a THEMIS grant and our Program Manager was Jim Miller, who was head of the National Oceanic and Atmospheric Administration (NOAA) Diving Program. He was involved in Techtite. Our research was in a hyperbaric chamber

INTERVIEWER: It was an undersea program?

DR. BACHRACH: It was an undersea program that Jim Miller was heading. We put a THEMIS grant in. THEMIS was the idea that Lyndon Johnson had to give money to universities that did

not have defense contracts so they could support education. THEMIS was the Greek goddess of justice and equality. Of course, most of the contracts seemed to go to Texas for some reason or another. But we got one at Arizona State and it was embarrassing to the university that we had a contract to do undersea research. We had a hyperbaric chamber.

INTERVIEWER: What brought the hyperbaric chamber to the university?

DR. BACHRACH: A program on which we worked for the Office of Naval Research (ONR). Under THEMIS, we had a diving project.

INTERVIEWER: That was purchased under the THEMIS program?

DR. BACHRACH: It was purchased under the THEMIS program. We tried to put in a Sea Grant proposal and found out that you didn't have to be on the coast to have a Sea Grant. But the president of the university said he'd be the laughing stock of the western universities if we had a Sea Grant program in the middle of the desert. Well, Jim Miller had to explain a lot, too, as to why we had an undersea program in Tempe, Arizona.

I'd had a contract in Virginia with the Office of Naval Research. They called me one day and said, "Would you run over to San Diego and look at the SeaLab program?" I said, "Well, I don't know anything about the underwater world." They said, "You don't have to. Just go over and see if the experimental design is going to yield data." I spent the summer of 1968 on SeaLab III and became absolutely hooked on the people and the project. At the end of the summer, the Navy offered me a job to set up a whole new biomedical program in diving at the Naval Medical Research Institute (NMRI). I left the university and went to the NMRI. That was in 1969.

INTERVIEWER: Would you explain how that came about, how that offer came about to you? You were out at SeaLab. Who was the officer in charge (OIC) then?

DR. BACHRACH: Mazzone was the Officer In Charge.

INTERVIEWER: Walt Mazzone.

DR. BACHRACH: I had known John Rasmussen and Paul Nelson. I had known Paul and Bob Nelson for years because I used to go to the American Psychological Association conventions and John Rasmussen was a graduate student at Northwestern University at the time. We became good friends and John was at BUMED, and so was Paul. They were working with NMRI in the behavioral sciences program and they, I believe, were the ones who instigated this business of asking if I'd be interested. I went back to Washington, D.C. and talked to Tor Richter, Paul, and John.

INTERVIEWER: Was Tor Richter the commanding officer then?

DR. BACHRACH: No, he was still at BUMED. But he was scheduled. He was slated to be the commanding officer. I decided that I would do it. It sounded like a good opportunity.

INTERVIEWER: Let's go back to your appointment at NMRI. I don't mean to interrupt you so much here, but you were offered a senior executive service appointment (SES). Isn't that right?

DR. BACHRACH: It was a Public Law 313 appointment.

INTERVIEWER: That's right. That was before the SES.

DR. BACHRACH: When Carter was President, he offered the PL-313s a chance to become senior executives, but it wasn't really much of an offer because you didn't have any other alternative. The PL-313 program was a very good program. It brought us senior scientists to a very good salary level.

INTERVIEWER: Not to mention the authority level it brought, as well. PL-313s were pretty high on the totem pole, so to speak.

DR. BACHRACH: Well, I wound up as an SES-4, which was high up on the totem pole. We had a lot of responsibility but not much authority. There are walls of Jell-O in government that you know as well as anybody.

INTERVIEWER: Yes. I know about those walls of Jell-O.

DR. BACHRACH: I remember that at one point, we were trying to appoint a physiologist in the department and Civilian Personnel at NMRI said, "Why don't you go down yourself to 23rd and E Streets, or whatever, to civilian personnel downtown, and present this. You'll get it through a lot faster." Well, I went down and there was this receptionist sitting, reading a magazine, and I finally got her attention. I found that being a SES-4 didn't do a lot, in terms of getting things accomplished, but it was nice. But I also had an equivalent rank of rear admiral and that got me into quarters. I remember Ken Sell went to a meeting. I think it was at Wright-Patterson AFB and I was put into admiral's quarters and he wasn't.

INTERVIEWER: He was your boss and you got better quarters.

DR. BACHRACH: That's right. He was my boss. At NMRI, when I arrived the program there was mostly isolation research for the National Aeronautics and Space Administration (NASA). It was social psychology and that was not what BUMED had in mind. They at least felt that the isolation work had contributed to the ideas of undersea habitats and space, but they were interested in different aspects of it.

We started working on hiring people and had people like Mike Walsh , who had been there for a number of years and just readily jumped in with ideas for research. Mike, as you may remember, became the person who did so much of the drug research, which was some excellent work. We had a good staff there. We had John Thomas. Then, I hired John Shroat. They were

psychologists who really were excellent. We had a number of really good people. But one of the first hires I made was an editor, Peg Matzen.

Every time I was in a position in which I was heading up a program, one of the first people I looked for was an editor, because the product of any scientific department are lectures, presentations at scientific meetings or papers and books. There was a lot of resistance to having an editor come aboard, but once they found out what somebody like Peg could do to make their prose sing and really clarify it, [they thought she was great]. My rationale was that they were doing a product. Writing was your product and you needed an editor. If you have a computer program, you don't mind getting a computer expert in to fix it if it breaks. It worked out very well.

INTERVIEWER: But you also taught scientific writing there, did you not?

DR. BACHRACH: Yes. That actually came about at Arizona State, when I was the chairman there and a graduate student came in with a shy look and asked, "Would you help me? I need to write a curriculum vitae." My first response was, "What do you mean? Everybody knows how to write a curriculum vitae." Then, I thought, "Not necessarily." We started a volunteer program that met once a week on what we called 'Professional Issues' and it was completely voluntary. You could bring a sack lunch. One week we'd talk about how to go for a job interview. How do you present yourself? We suggested other things, like going out and having a beer with the graduate students and seeing what they thought about the department that you were looking to join. We talked about professional issues, like retirement benefits, insurance, what your teaching load was going to be, and what kind of a lab you were going to have.

The professional issues developed. People kept saying, "Well, I'm having trouble writing my research." I put up a course in scientific writing. It was a regular 16-week course. Then, I

took the idea to NMRI and taught scientific writing and editing to the editors and also for scientists, and it went over very well. I think people really seemed to like it. Peg Matzen was a big help in that, of course, as an editor. But I still feel that scientific writing is something in which scientists really need some help.

INTERVIEWER: I think you proved that at NMRI. They were good scientists but their writing was not always as it ought to be.

DR. BACHRACH: No. Their writing was not always the best. Maggie Meitzler was also one of the people who helped me. She's now an editor with the Oxford University Press and an editor for the National Cancer Institute. She was a NMRI editor and very helpful in working with us.

INTERVIEWER: I want to take this back to the isolation studies and see if you can verify a story that Gerald Duffner told. By the way, were you there while he was at NMRI?

DR. BACHRACH: No. I was there after Gerald Duffner.

INTERVIEWER: It was after Gerald Duffner. You may not remember this.

DR. BACHRACH: Sudduth was the commanding officer when I got there.

INTERVIEWER: You may have heard this story. It was during some isolation studies when they locked a group of people in the tunnel that ran from the officers' quarters to the hospital at the National Naval Medical Center in Bethesda, Maryland. They just locked both doors and kept them in there.

Well, that attracted a lot of attention and the television cameras were there, interviewing people and so forth. Gerald Duffner was the guy who was heading that particular isolation study. When they were about ready to open the doors and let the subjects out, a television newscaster asked him, during a live interview, "What was the one thing that could not be met in providing all the needs of the people who were isolated?" Duffner said that he couldn't think of anything.

His mind was blank, except that one of the subjects had an insatiable appetite for cottage cheese and they couldn't get him any because of the restrictive diet they were on. The next morning, there were trucks lined up in front of NMRI with cottage cheese to give all the guys as much cottage cheese as they wanted. Did you ever hear that story?

DR. BACHRACH: I never heard that story.

INTERVIEWER: Well, I wish you could have validated it because it has always been an interesting story to me, about something that happened in the early isolation studies. But I thought it was so funny.

DR. BACHRACH: Bill Hayward was the department chairman when that research was going on. He could validate it. I don't know where he is. He was in Germany, years ago, working for the Army.

INTERVIEWER: Go back to those isolation studies and bring it on from there. Tell me about your involvement.

DR. BACHRACH: Well, we were phasing out the isolation studies. It was in a contract with NASA and there were some realistic aspects of isolation. One of the things that I think we learned from the isolation studies was seen on SeaLab III. When you get into a limited stimulus situation, say, the fourteenth cough behind you in the movies is no louder than the first cough, but by the time the fourteenth cough comes, you're sitting there with your shoulders tensed. That is stimulus intensity in a low stimulus area. You get high in stimulus intensity from limited space. I'm sure it was also true on SeaLabs I and II.

We did see in isolation studies, and this has been reported generally, that there were mannerisms that would really get on people's nerves, like the way people ate or things like that, or repetitive phrases. People would keep using the same phrase. I don't entirely believe in

stimulation because they can get out and they *know* they can get out, but you still get some reality in there.

I remember talking to the divers in SeaLab II. Some of them didn't get along on the surface at all. But the phrase I heard several times from people, about when they were isolated in the habitat, down on the bottom, was that they were 'walking on eggs.' They were very careful not to do anything to annoy each other, although Bob Barth did bring chili down to the SeaLab and that was killed in a flash.

The isolation studies, I think, taught us something about what happens in a low stimulus situation. But I don't think that they, in my own opinion, contributed too much to the reality of the situation because of that one factor. They could get out. We're getting into sea stories, but there was a time they were doing a thousand-foot dive at the Experimental Diving Unit (EDU) in Washington, D.C., down at Anacostia. One diver's wife was allowed in to talk to him on the radio. The chief never should have let her in, but he did, and she announced over the phone that she was leaving him. Of course, he went berserk and they had to sedate him and keep him down, but what a wonderful "Dear John" letter that was. She knew that he couldn't get at her.

One important result of working with NASA was technology transfer. There was a researcher by the name of Chuck Kubokawa at AMES/NASA with whom we worked, and he gave us some thermal suits from the space program. We tried them out for divers and found them useful, a good transfer. Of course, NASA, the Navy and the military in general, I think, have contributed a great deal to what we know now as medical technology and scientific technology.

INTERVIEWER: At what point did the isolation studies evolve into all of the diving studies that you did there and all of the work that you did with divers? Now, I can see how that transfer

happened that you mentioned just a moment ago, but I think there was more involved than that, right?

DR. BACHRACH: Well, yes. There was some very good research in the isolation studies, but BUMED thought that we had gotten as much out of the studies as we could. They wanted to get into some of the aspects of diving and particularly, the performance and physiological costs. We phased out isolation and some staff left. Mike Walsh just took his experimental skills and applied them to the diving research. We started getting into diving research and one of the first areas that we got into was high-pressure nervous syndrome (HPNS).

We also had a memorandum of understanding (MOU) with the Royal Navy (RN). Peter Bennett was still in England at the Royal Naval Physiological Laboratory in Alverstoke. We had a MOU where the U.S. panel would meet with the RN panel. We had this project going on HPNS. We had a very fine instrumentation group with George Trensanski. His group built an intentional tremor device similar to one we built while I was doing some tremor research at Arizona State. We had a middle European machinist named Lazlo, who was a marvelous machinist and used to put jewelers rings on everything. I said to him one day, "This is going to be in a case. No one is ever going to see it." He said, "I'll know it's there." It was like the ship model builders of the 16th century on up who closed the hull. But if you look through fiber optics in Annapolis, as they did some years ago, inside a lot of the ship models they found fully carved figures, cannons, bunks, and everything. Well, Lazlo was like that. He would do jewelers rings. We had a model for a tremor device and the machinists and technicians at NMRI built an excellent one. That was some of our first research into diving. That was in cooperation with the RN.

INTERVIEWER: Explain just a bit about high-pressure nervous syndrome and what it does to divers.

DR. BACHRACH: With high-pressure nervous syndrome, generally, the first symptom is tremor. That was why we were interested in measuring tremors. It was so that we could see if we could pick it up early. Well, it could get as far as seizures, but it's generally a matter of imbalance and neurological symptoms that interfere with perception and work. It's usually a factor of depth and compression. Slow compression seems to be a lot healthier.

INTERVIEWER: Does it have the potential of endangering the person's life?

DR. BACHRACH: Oh, yes, indeed. I think that was what happened when we started getting into deep diving. At one time, people were talking about 2,000 to 3,000-foot limits. Well, I believe it was proven on the Lambertsen-University of Pennsylvania dives in the 75s and in Bennett's dives at Duke University. At depth, there were signs of HPNS, like tremor. It could be endangering. We still don't know the long-range effects of high-pressure nervous syndrome.

INTERVIEWER: Some have said helium plays a part in HPNS. Did you ever find that to be true? You said that it has more to do with the pressure and depth.

DR. BACHRACH: Well, I'd like to see the term 'inert' banished from the English language. Inert gas is not necessarily biologically inert and we did some studies with helium. I think Steve Gruneau was the one who did these studies at NMRI and recorded EEGs and found that there were definite changes on helium at depth.

'Inert' is not a biologically sound term and I think it has come true that human exposure to depth is not needed. Now, the human diver has been replaced with ROV's and submersibles, and submersibles have become more fuel efficient, so they are much more usable. But I see no point in exposing a human diver to the pressures of a really deep depth.

For example, when inspecting pipelines now, they don't use divers that much. They just run an ROV over the surface and sit up with bourbon in their hands and watch the screen and see what happens. This idea, actually, plus the HPNS and the exposure to physiological pressure and damage led me to think that there has got to be an alternative to deep diving. In 1975, I was in London at Oceans 2000 and saw JIM, the one atmosphere diving suit, for the first time. A little light went on in the attic and you could hear the steps coming down the stairs saying, "this might be an alternative."

It took me two years to convince the Navy to lease JIM from the British. Finally, we got permission to put the research proposal in to do a study of the one atmosphere diving system. There had been some tests on it before. The EDU tested it and they said that it was not mobile. Well, it turned out that they had him tethered in the pool. You didn't tether JIM. There was a line going to the surface, but that was primarily for getting him up and down and for communication. The one atmosphere diving system was, by definition, self-sufficient and self-contained. In 1977, we got JIM-4 and did a biomedical assessment of JIM and other research that was being studied up at New London. We did a very intensive study of JIM, as you know, over two years of research. We felt that one of the things we needed to do was a fleet-relevant study. We went down to Pax River and simulated one. JIM went down and released a pilot from the seat of a downed aircraft to bring up the body. We also tried to find the flight recorder with JIM.

In the report I did on JIM, I confess I stacked the decks. I had two columns. Suppose you had an accident at a thousand feet. It would take you ten minutes to get JIM to the bottom. We also did a fleet-relevant study in which we had the operator taking pictures through the glass window. You could document an accident using JIM and bring him up in ten minutes. If you

really wanted to do a trout fly fishing thing, you could bring him up in five minutes, but he might come up a little fast. But you could get him up with no decompression from a thousand feet.

On the other side, and I was again stacking the deck a little bit, I considered what would happen if you compressed a diver to a thousand feet and then brought him up. Well, he'd spend ten days in decompression. We thought that JIM had a lot of fleet relevance. It took 25 years before the fleet really started using JIM. At the symposium in 2001, they were reporting on the successful use of a one atmosphere diving system.

INTERVIEWER: Yes, they finally bought a couple.

DR. BACHRACH: Well, Ed Coil, Jim Vorosmarti and I went to the Pentagon because they were talking about starting a program for NOMADS, the Naval One Man Atmosphere Diving System, and we asked, "Well, why do you want to start all over again? JIM has been proven and there have been thousands of dives with him. Why don't you buy one, paint it blue and gold, but don't start all over again?"

Ed Coil was very supportive, as was Vorosmarti. He was the commanding officer at the time. I believe those were the happiest research years of my life. Working with divers is so rewarding in so many ways. On SeaLab III I became very close friends with Ken Conda and one of the first things I did when Ken got out of the Navy was to hire him at NMRI. I also hired Bill Armstrong. I got two SeaLab divers, as civilians, and my belief was that you couldn't train a scientist to be a diver very well but you might be able to train a diver to do research. We had Ken Conda on the bottom at Aegir, in Hawaii, and you couldn't fool him because he knew when a diver was fooling around. He was an excellent researcher.

INTERVIEWER: I'll never forget Ken Conda for the fact that he couldn't swim worth a lick on the surface. But he was one of the hardest working divers I've ever been with in the water. Ken is

quite a fellow. Speaking of people, that reminds me. In diving, your studies put you in touch with an awful lot of people. Pick out some of those people and talk about them, those who really stick out in your memory. You mentioned Ken Conda, of course, but there are others. There are scientists and people in the line, for example, in the Navy and people in universities and so forth.

DR. BACHRACH: Ken Conda and I got to be very, very close friends and on SeaLab III, I was put through a gauntlet. Here I was, a psychologist aboard SeaLab. For the first two weeks, they took me down to the Blue Fox in Tijuana. They took me to the Body Shop in San Diego and ran me through this test.

At the end of two weeks, Bob Barth said to me, "Well, you're okay for a ding-a-ling." I got to really respect and know the divers. Bob Barth is truly one of the people who has always stuck out in my mind as a leader, an individual who could do anything, and was a fine, respected person. I felt that George Bond was an incredible father figure, almost. 'Papa Topside.' George was maybe not the greatest scientist because we do know, and I was in on some of this, that he would interrupt some of the research on the bottom, at times, to give a sermon. He was religious and loved to quote scripture. In the middle of an experiment, his voice would come down and he would read to them. But George Bond was one of the people I really respected.

Scott Carpenter was another. I was at a Monday morning staff meeting in SeaLab and Scott proposed a checklist, which was very compulsive and very detailed. It came out of his space experience. We had the tragic death of Berry Cannon and they found out that the carbon dioxide canister was empty, the scrubber. That's the background on Scott's checklist, which was never adopted.

INTERVIEWER: It was never adopted, you said?

DR. BACHRACH: No. I also had the opportunity to meet Phillippe Cousteau. Phillippe was on SeaLab III and Navy divers were not very happy, because his being on SeaLab III meant that one Navy diver would not be assigned to SeaLab III. As you know, there were no rewards, in terms of promotions or special kinds of medals or anything, from SeaLab III. But they knew that every diver in the world knew they were down on SeaLab III and it was a very important thing for the Navy divers. Phillippe got one of the assignments.

They were grumbling about PR but within a week, he had worked so hard and was such a good diver and great guy that he was completely accepted and he was a very important figure. I was very lucky. I happened to be at the right spot at the right time. We had projects at NMRI with the RN in England and with Sweden, Japan, and France. I had the chance to meet people in England, people like David Elliott, who was an exchange officer. David, to me, was one of the great scientists and one of the finest people I have ever known.

I also met John Rawlins, who was at NMRI. I got to know John pretty well and we still keep in touch. I go over to the Historical Diving Society in England every year. I'm going next month to Portsmouth. Vorosmarti and I go together. He's a good traveling companion because we have the same priorities: museums, pubs, and naps, but not necessarily in that order.

In England, I also met people like Peter Barnard , who was excellent. He was very quiet but a superb researcher and a fine physician. He and David Elliott stand out as the people at Alverstoke. The group at DHL where JIM was developed and the people in Farnborough. Mike Borrow, who was one of the early people working on the JIM project, was an excellent person.

In Sweden, there were people like John Adolfsen , who came for a year in NMRI as a visiting scientist. He did some pretty basic work, some classic work, on performance measures. There was also the whole Japanese group. Kawashima and Mano were really fine people. Mano

and Kawashima were the two who translated the book that Glen Egstrom and I wrote on stress and performance in diving. They translated it into Japanese, which was very flattering. Of course, I don't know if they did a good job because I can't read it.

I was fortunate. I happened to be in England when they were working on the [HMS] *Mary Rose*. I would go over at Portsmouth to the conservatory to see what they were doing. It was the same thing with the Swedish ship *Wasa*. When I was in Stockholm, on at least three occasions I got on board the *Wasa* with a 'souwester' to protect us from the polyethylene glycol spray. I read in *Science* magazine just this week that they're having trouble because they're getting oxidation and sulfuric acid in the *Wasa* and it's in serious trouble.

INTERVIEWER: They have it housed now, don't they?

DR. BACHRACH: I'm not sure. The *Mary Rose* is under glass. I don't know whether they house the *Wasa*. But there were opportunities, like with the French in Toulon. There were pretty good people there, like at Aix-en-Provence, Maurice Hugon, who was head of the department, and Guy Imbert, who came up to NMRI for a while.

INTERVIEWER: How about Broussole? Did you know him?

DR. BACHRACH: Yes.

INTERVIEWER: Was he General Broussole?

DR. BACHRACH: He was Admiral Broussole. He organized a symposium in Toulon in 1977. They were just beginning to get over the Gaullist influence and were able to speak English to us. For a while there, when you were working with the French, they were not permitted to lecture or report in any other language but French. That DeGaulle influence eased.

In my own department, people like John Thomas, John Shroat and Mike Walsh were really just great people to work with. We had an opportunity to interact with so many different

laboratories all over the world, like those in Stockholm and Copenhagen, and I was very fortunate that I had these opportunities to meet these people. The people who stand out are people like Scott Carpenter, with whom I still keep in touch.

INTERVIEWER: Speaking of Scott Carpenter, in your opinion, if SeaLab had adopted Scott's checklist, do you think that might have prevented Berry Cannon's death?

DR. BACHRACH: Yes, although we never found out what actually killed Berry Cannon. There are several theories. Someone said that there were handprints on the habitat. They think that maybe he was electrocuted. The inquiry never gave out the report but it was definitely true that the carbon dioxide scrubber was empty.

I got along very, very well with the divers whom I liked and respected. Paul Linaweaver was the medical officer. I went back to Tempe after Berry Cannon's death. The depression that set in on everybody, who were just standing around, dazed, was just unbelievable and horrifying.

As an aside, I mentioned to Scott...I asked him why this incident killed the undersea program, but Gus Grissom's crew's death didn't kill the space program. Scott gave an answer that I think is probably valid. He said that the space program was a national program and the undersea program was not. There was national interest in the space program, but you could never engender that much interest for the undersea program. I think that may have contributed to it. But let's go back to Paul Linaweaver. He called me and asked, "Would you come back over to San Diego and talk to P.G. Wells? He's going to resign from the Navy because he feels culpable in Cannon's death. He said, 'I should have checked the equipment better.'" P.G. and I got along very well, so I flew over to San Diego and we had a very long, long session and he kept saying, "Well, it was my fault and I can't really handle being in the Navy anymore because I think I failed." There was no way that I could convince him that he should stay. He not only resigned,

but also, every time they have had a SeaLab reunion, and he still lives in Panama City, they've sent him notice and he never shows up. I think that is one of the real tragedies of SeaLab III. Berry's death was tragic. I think the Navy's loss of Wells, and his own feelings, were other really tragic consequences.

INTERVIEWER: As tragic as it was, some have hailed SeaLab III as being tremendously successful in many ways. Do you agree with that opinion?

DR. BACHRACH: Yes, I do.

INTERVIEWER: Can you list some of those successes? What came out of it?

DR. BACHRACH: I think the whole SeaLab program, I, II, and III, demonstrated that first of all, saturation diving was a practical, useful tool and commercial diving picked up saturation diving early and it was a useful tool for their purposes. When they tried to get the stuff from the *Andrea Doria*, they never could until they put a habitat down there. It was the same thing with the *Lusitania*. I was onboard the *Lusitania* for a while in 1968. There was only a one month window in June in which you could actually work, because they had 11-foot swells off Kinsale, which is the town, the old Head of Kinsale...eleven miles off Kinsale was where the *Lusitania* sank. Years later the ship was reached by habitat, again proving that saturation diving had a function.

We look back and think of the TWA 800 crash. We could have had saturation diving capability instead of having 150 divers going down and getting bent because, as I was told, they were being pushed to dive more because the press was standing there with their little cameras. Saturation diving also demonstrated, more than the isolation studies that have been done at the National Institute of Health and NMRI, that you could get people in isolation to work together and work effectively. Saturation diving had implications for space, as well the SeaLab habitat programs. We learned a lot about different kinds of equipment and about the gases. We also

learned that you could use a single compression and decompression function with a personnel transfer capsule to get work done. That became one of the main techniques in the North Sea, having diving bells with which you could lock out divers.

I believe the SeaLab programs, along with Ed Link and Cousteau and some of the other saturation divers were very important. I remember that Cousteau complained one time when they were down in ConShelf at 35 feet, or something like that. They had a real serious problem. The champagne had gone flat.

One of my friends was, as I recall, in the National Academy of Sciences with the marine division. Once a year, they had to do a report on what they had done with marine research. The Vice President of the United States always wrote the Foreward. Rather, someone wrote it for him and he signed it. I can't remember his name, but I had a friend who worked there and he told me one time that Hubert Humphrey, when he was Vice President, would come down to see them at least once a month. He'd sit there and say, "what can we get from the sea. Can we get food? Can we get drugs? What can we get from maritime research?" They said that they'd never had a Vice President who did that, and they believed that if Humphrey had been elected President, the ocean program would have been supported a lot more than it had been, because of his own interest. It's a little aside and a political thing, but he had a strong interest in what the sea could do for the world, not exploiting it as much as using it for humanitarian and commercial purposes.

INTERVIEWER: I didn't know that about Hubert Humphrey. That's interesting. You were also a qualified diver. You did some SCUBA diving?

DR. BACHRACH: Yes.

INTERVIEWER: Would you explain your first experience underwater and the SCUBA diving that you did?

DR. BACHRACH: Well, I got certified in 1967 and my checkout dives were down in Mexico. My first experience underwater was a combination of anxiety and awe, in that I felt graceful. I'm not very graceful on land, but underwater I felt graceful and the beauty was almost overwhelming. But there was also an anxiety, an apprehension, and I finally got over the apprehension and felt more comfortable with the equipment and the opportunity to get under and see things. When I was in good shape I could go down forty feet, snorkeling. At fifty feet, the color is going to change, anyway. I just had opportunities in some of the dive medicine courses I used to lecture at, to go on dives in the Caribbean and Bonaire and Hawaii. It was good.

I also had a better feeling for what problems could arise and I remember one hazing they did while I was in training. It was to sneak up and take off your mask. It was dumb, but it was an opportunity to teach you that you didn't really need the mask. It was nice to have. I got interested in what the mask meant to people and that got me interested in diver panic. I did a lot of studies about diver panic. Glen Egstrom, of UCLA, and I did the first paper on diver panic in the 1970s, in *Skin Diver* magazine. Even though people had been talking about panic, no one ever sat down and wrote up what to look for and how possibly to avert it.

The masks in anesthesia are very symbolic problems. In dive training it was one of the ways you screened people, as to whether they were going to make divers, because the mask can be a very significant feature of discomfort and ultimate panic. I found out that there were lots of studies that had been done on the mask. We did a study at NMRI that we never published because we didn't get enough data. But we had divers, sitting in a warm room, have them put the mask on and we had EEGs on each subject. We found out that just putting the mask on touched the trigeminal, and the trigeminal is linked up to the vagus and we could get a little bradycardia in a warm room, just by putting the mask on. We never really finished that study. We had some

pretty interesting results there. My SCUBA diving career was fun but it was also an opportunity to get a feeling for what divers were going through, not that I ever got into deep diving.

INTERVIEWER: You mentioned earlier that you did some things with Glen Egstrom from the University of California-Los Angeles (UCLA). Tell us something about that, about how you two got to know each other and what you did together.

DR. BACHRACH: Well, in 1968, the Office of Naval Research called a meeting of people who had been involved in doing research underwater. In 1968 it was in Arlington and Glen made a presentation, and I made a presentation. We were walking out of the room together and looked at each other and said, "You really made sense." or something to that effect. Then, we went out for a drink and then was when we really started our friendship and we've kept it up ever since. We've done a lot of papers together. We did the book together, *Stress and Performance in Diving*, and we still keep in touch. He is a fine friend.

Fred Bove called last year and asked if we'd do the human performance underwater chapter again for his diving medicine book. Well, Glen is retired and I am retired. We said to Fred, "Isn't there anybody out there who is actually *doing* the research?" He said, "Not really. You guys still keep up with what's happening." We said, "Sure." But it's ironic. I think Glen retired in 1990, and I retired in 1987, and we are` still asked to do a chapter like that. I think there is something lacking out in the field somehow.

INTERVIEWER: Yes, there is. He was a professor of kinesiology. Isn't that right?

DR. BACHRACH: Yes, he was a professor at UCLA.

INTERVIEWER: You mentioned earlier about going to the Historical Diving Society meeting. You're very well known in the field as being an expert on the history of diving. How did that all come about?

DR. BACHRACH: Well, I've often thought that there are three periods in a scientist's life. In the first period, he is at the bench doing experimental science. Then, as he gets on in years, he becomes a reviewer of other people's work, reviewing for journals or grants, proposals, and so on. In the third period, I think, he could get interested in the field and just how it came about.

I started getting really interested in the history of diving because they talked about it. Here, I've got the paperweight from the British celebration of fifty years of diving. Well, I gave a paper at one of the dive meetings, at Our World Underwater in Chicago, which was something like 216 years of diving because I found that in 1719, a Frenchman named Mandeville had invented a SCUBA, which didn't entirely work, but the concept was there. The concept has been around since the 1600s.

I just got very interested in it and I went to meetings of the Historical Diving Society in England with Reg Vallintine, John Bevan, and Nick Baker and people like that. Peter Dick, who is now the editor of the *Historical Diving Times* for the British, was another. These people were just really unbelievably knowledgeable in diving. John Bevan has his book on the Deane's, *The Infernal Diver*, John Deane. There was also Daniel David, a French historian who spent a lot of time in patent offices, and he came up with inventions and superb information..

In the first book, *Naval Forces Under the Sea*, there is an illustration of a diving system from 1828 that D' Augerville, who was a French dentist, invented and it was adopted by the French navy. The whole idea that SCUBA diving started with Cousteau in 1946 is just wrong because there is a history. In 1865, Rouquayrol and Denayrouze patented what was essentially one of the earliest, if not the first, demand regulators.

I just got interested in where all of this came from and corresponded with people like Daniel David, Bevan and Reg Vallintine and became more and more interested. I started doing

some research. I was in France at the Archives Nationales and I found an 1826 engraving of a diver with a leather bellows on his head, which would fill with air as he was working under the Pont Neuf on the hydraulic system. There is an engraving from 1826 of this diver with an air reserve. It is in my history of diving section in the 2001 symposium.

I became interested in the history of the diving bell, which I published. I got really interested in from the bucket onward. A helmet is essentially an individual's diving bell. So, there was all this development through the years in France and Britain, in particular. All of a sudden, I became more knowledgeable.

INTERVIEWER: Well, I think you certainly became one of the world's experts on the history of diving.

DR. BACHRACH: Oh, I wouldn't say that. Far from it! I look at John Bevan, Reg Vallintine, and Peter Dick from the UK and Daniel David of France as the true experts.

INTERVIEWER: I'd say that because what you bring out in your lectures on the history of diving is marvelous.

DR. BACHRACH: Well, I thought that in *Naval Forces Under the Sea*, the graphics people did an incredible job in organizing it because it was a hodge-podge of slides and they did a beautiful job just leading you through it.

INTERVIEWER: Actually, Lou Nuckols did most of that.

DR. BACHRACH: Did he?

INTERVIEWER: Yes. He had some help, I suppose, because he had access to all of the graphics and video people, but he placed most of the graphics.

DR. BACHRACH: That's great.

INTERVIEWER: He did a great job. This next question is a rather lengthy one, so I'll read it all and see where we go with it. Ocean floor habitat diving was moving along at a remarkable pace during the early part of the last half of the twentieth century, until we lost Berry Cannon during the operation of Navy SeaLab III, which we talked about just a moment ago. From then onward, habitat diving lost its luster. What is your opinion as to why? Was it Berry Cannon's unfortunate death or something else? Also, if Berry Cannon had not died, what is your opinion as to what the Navy would have developed from the SeaLab III experiments?

DR. BACHRACH: Well, I think I mentioned before, that Scott Carpenter said that space had this national interest and the ocean did not. I think that Berry's death was probably the reason for canceling the program, but I believe that the Navy deep submergence people had probably gotten as much as they wanted out of the habitats in the three experiments.

I think that it was hard to find a military application for habitats. That was part of it. Would you need a habitat, for example, to lay SOSUS lines? You would probably not. What would it be used for, in terms of things other than rescues? I still think that saturation diving for the TWA 800 could have done it.

In fact, it could have been used with the USS *Squalus*, if we had had saturation diving with *Squalus* instead of doing over 600 and some odd dives with a ten minute time because of decompression. It took over a month to do *Squalus*. With a saturation habitat, had there been one, like on the TWA crash, you could have done it a lot faster and more safely.

INTERVIEWER: In that case, though, there would have been a surface chamber with a PTC, correct? Is that what you're thinking of, rather than an ocean floor habitat, or is your opinion that it wouldn't matter?

DR. BACHRACH: Well, I don't think it would matter because the Aegir in Hawaii, which was Tap Pryor's concept, where we did some Navy research, was an excellent concept. The Aegir was a compression chamber. They compressed on the surface dockside, lowered the habitat to the bottom, and it became a habitat. They locked out at 540 feet, did the work, and then brought it to the surface and decompressed in the habitat. The habitat became a personnel transfer capsule and a decompression chamber and a workstation all in one unit. I thought that was an excellent concept.

INTERVIEWER: I agree with that. It was an excellent concept. That was after SeaLab III and yet the Navy determined they would not do any more habitat dives.

DR. BACHRACH: Well, they were Navy dives.

INTERVIEWER: Do you think it was because they looked upon what they needed and the mission was complete?

DR. BACHRACH: Yes, I believe that's the case. I think Berry Cannon's death was just one other reason to say, "Well, we don't need the program any more."

INTERVIEWER: The DSRVs, the Deep Submergence Rescue Vessels, are going out of service and are being replaced by other types of submarine rescue systems. What's your opinion as to the utility of the DSRVs, during their lifetimes, and what is your opinion about new submarine rescue systems like the Submarine Rescue and Diving Recompression System that is soon to be launched?

DR. BACHRACH: Well, I think the DSRVs have a mixed history. There was not great success with them. I believe the concept is still an important one because submarine rescue is still a very emotional factor in the service. There is drama and pathos and all sorts of emotions with a stranded submarine, but the DSRVs were never that successful. This is not an area I feel I have

any authority in, but I think that my understanding of what the new systems will be is that they are a lot more practical and the application of these systems probably will bring more success than the early DSRVs did. But, as I said, I'm not really expert in this area, but I know that there were always, it seemed to me, some problem with the DSRVs.

INTERVIEWER: Yes, well, the one that's still operating still has its problems. But I'm curious, too, if maybe anything in your studies you might have done, or that Glen Egstrom might have done, had an impact on how they designed the DSRV. Do you know of any studies that were used for that in kinesiology, for example?

DR. BACHRACH: No.

INTERVIEWER: Who did the human performance on that?

DR. BACHRACH: They never did do that. Of course, human factors were never a high priority in the service. I remember, before I went to work at NMRI, that I was invited to go to Woods Hole for an ASR conference. I said I didn't know anything about ASR. They said that they wanted to bring about ten people who had no experience at all, in the field of anti-submarine warfare, to bring a fresh voice and a fresh look at the problem.

Well, it turned out that it took days to inform us of what the problems were. I can recount one of the things that I remember, and I think this is true also for other aspects of military application. You have a PB-3, basically an Electra airframe, Orion, and it was the anti-submarine plane. Engineers have never been terribly kind to people who use equipment. To get more time on the station, we were told, they took the head out of the plane and put a bucket in. The crew would boast about having ten-hour bladders because they didn't want to use the honey bucket, so they just held it. Well, I'm not sure what impact that would have on performance, but it was certainly a human factor aspect that was ignored. I don't think that was unusual.

ONR asked me to look at the habitat at SeaLab III and give them a human factors report, which I did. Bob Barth took me on a tour of the habitat and I looked at the microwave oven they had and it was right across from the head. I said to Bob Barth, "That seems to be poor placement because you've got the head right where you're preparing food." He said, "Yes, I guess it is. Well, Duncan-Hines isn't going to recommend us." But I'm being prolix here. I'm talking too long about this.

I think basically what I'm saying is that I don't think that human factors ever really were considered that critical, except when we were doing the MK-12 vs MK-5 evaluation. When we were tasked, as you remember, to do the MK-12, I wanted to also do the MK-5. I had to go downtown. It wasn't BUMED then, Research and Development. I went down and said, "You've got to do the MK-5. You've got to do the same studies." They asked, "Why?" I said "Well, if you're going to replace the MK-5 with the MK-12, you should know whether it is superior and the only way you're going to find that out is to do the comparative tests." Glen Egstrom was involved in that and we did range of motion studies and physiological cost studies and we did what I thought was a pretty thorough study of the MK-12 and the MK-5. For example, in the MK-5, working overhead was more difficult because of the breastplate. Working overhead is the least successful aspect of any kind of work.

At the Bureau of Standards, I took an accident methodology course once. The instructor asked, "Where do you think the highest incidence of chain saw accidents are, on the human body?" We all said, "Legs." He said, "No, it is the neck and shoulders. That's because people will be sawing and it kicks back." We found that in the MK-5, they were less successful in application overhead than they were on the MK-12, because there was more freedom. The range

of motion, I think, was one study in which human engineering and human factors did have some impact.

INTERVIEWER: Well, it had to have had a great impact. I know that for a fact. It was the human factors study that convinced the powers that be in the Navy to bring that MK-12 system into existence and replace the MK-5. That was the overriding factor that caused them to decide to make that a system, and it stayed in service for twenty years.

DR. BACHRACH: No one ever told me that, but it's nice to hear.

INTERVIEWER: I can tell you for sure. That's what did it.

DR. BACHRACH: Well, we worked pretty hard on that. Mike Curley was very much involved in that. He was another person for whom I had a tremendous respect and still do. He's a marvelous scientist and a great person. Mike was very active with the human factor aspect of it. Yes, we were proud of that study. Of all the research I've done over the decades and decades, I think the two things I feel the most proud of are the JIM studies and the MK-12 studies.

INTERVIEWER: I think that answers my next question. I was going to ask you of all the things you've been involved with what brought you the most satisfaction, and it would be JIM and the MK-12?

DR. BACHRACH: It would be the JIM and the Mark 12.

INTERVIEWER: That's good. What would you say would be your most important contribution to diving and submarine rescue?

DR. BACHRACH: I don't think I've contributed anything to submarine rescue. For the Navy, I think my contribution was to get basic quantification, for want of a better word, of some of the activities and performance that Navy divers are doing.

Tom Berghage and I did a study once, and it was not well received. We found that the majority of Navy divers were diving at fifty feet, for less than a half-hour. We did that report and we found a high percentage of shallow diving. But there was not that much research in shallow diving and the budget was geared toward saturation diving, which was always a fraction of what the Navy was doing.

I think my contribution was to get some quantification of, well, just the range of motion studies, the heat stress studies, and the cold stress studies at NMRI, instead of getting subjective evaluations of equipment, like 'that one works better than this one.' What we were doing wasn't a diving project during the last couple years of my time in NMRI; we were studying the chemical defense suits for the Persian Gulf war. We ran them through all sorts of human factors and physiological costs in the heat and cold chambers, the treadmill and the full field pack. Then, we wet the suit and we found out that when you wet the suit, it no longer protected against chemical agents. I reported that at a meeting with the Air Force, Army, and Navy, all working on the chemical defense suits. The Army colonel in charge said, "What difference does that make. They're not going to get that wet." I said, "By definition, a Marine gets wet." I think my inquiring mind was probably what contributed to all of it because I kept thinking, "What is he actually going to *do*? How can we measure what's going to happen if he does?" That's simplistic. Task analysis is basic to equipment design and to operational use.

To submarine rescue I contributed nothing, but I like to believe I contributed to diving. My interest in diver panic was less applicable to the Navy than it was to the civilian community, but Glen and I really got into this whole business of diver panic. I feel that was a contribution, to start getting some analysis of accident methodology.

I subscribe to the school of accident methodology that argues an accident is an unforeseen event. It's not preventable. 'Accident prevention' is a meaningless term. You can get accident *mitigation*. If you have a hard hat you're not going prevent an accident. But it could mitigate the consequences. That was something that I kept pushing, for accident methodology. The aviation industry is much better at accident reporting than the diving industry. They report near misses and we never do, and I think you could learn more from near misses than you can from accidents. But an accident is something you're not going to prevent but you can prepare for in training. I think that was something I pushed hard and maybe had some impact.

INTERVIEWER: Tell me, is there a story or incident you've never told? If there is, can you tell it now? Now, that's getting a little personal, maybe, but I want to ask the question anyway.

DR. BACHRACH: Well, I'll tell you. A bunch of us on SeaLab were sitting in the Bali Hai in Shelter Island and we had one Navy grog after another.

INTERVIEWER: What would that be, a grog?

DR. BACHRACH: It was the rum drink at the Bali Hai. George Bond said, "Let's all go downtown and get 'SeaLab' tattooed on our arms. We said, "What a great idea." So, we went down to, I think it was First Avenue in San Diego, probably half a dozen of us. I can't even remember. We went down and the tattoo artist looked at the SeaLab patch that someone was wearing and said, "I don't think I could do justice to that, but there is a tattoo artist in San Francisco who could do a beautiful, beautiful job." George Bond asked, "What's his phone number?" and the tattoo artist gave George the phone number. By the time he got around to phoning, we all sobered up a little bit and we decided no, we didn't want a tattoo. If that tattoo artist in San Diego had been sufficiently confident in doing a good job I'd probably be walking

around with a Sea Lab tattoo. I don't think I've ever told that story but George could lead you anywhere. People would follow him. He was a remarkable person.

INTERVIEWER: He really was.

DR. BACHRACH: I told Barth this story. I was down for the dedication of the George Bond Saturation System in Panama City and afterward, a bunch of us went out to a bar and had some drinks. I was sitting next to this young diving officer and he said, "Sir, could I ask you a question?" and I said, "Sure." He looked around and he asked, "Who was George Bond?" I thought, "Oh my God," and I told him. I got hold of Barth and said, "You got to brief these guys." Some of them, or at least this one man, didn't know who George Bond was. I guess there was an assumption that well, everybody knows who George Bond was. But here was a diving medical officer, or maybe a diving officer, and he was embarrassed to ask. I guess he could feel comfortable asking an outsider because I wasn't going to see him on a day to day basis. But that was something by which I was really astounded.

INTERVIEWER: Is there anything in your career that, if you had it to do over, you'd do differently?

DR. BACHRACH: I don't think so. I've been very fortunate. I had opportunities that were incredibly wonderful experiences. I've worked with some marvelous people. The 18 years I spent with the Navy as a civilian scientist were very rewarding. I still have lifetime friends from all over the world with whom I've worked and with whom I still correspond. I don't think I would do it differently, except maybe get into it earlier.

INTERVIEWER: If you look back over the last fifty years, what single achievement in the underwater field would you say was the most significant, not just in your work, but in the whole field? What was the most significant?

DR. BACHRACH: I think that would be decompression. I think the understanding of decompression, the physiological and performance aspects of decompression were the most significant. It just allowed for much more performance and many more opportunities for diving. I think Workman's work and others, starting with Paul Bert, was very important, and I think if I had to pick one single thing, it would be decompression.

INTERVIEWER: Go back to your own career in undersea technology. If all the barriers had been removed, and you had been given complete and absolute authority to do anything you wanted, what would you have changed or done differently?

DR. BACHRACH: I can't think of anything I would have. I think that the barriers were healthy, in a sense. As I mentioned, it took me two years to have the ability to do a study on JIM. But in those two years, when I was trying to get the research proposal through to study JIM, got me into a situation in which I had to learn more about one-atmosphere diving to convince the research people to fund the study. I think that was healthy, in the sense that it made me go out and do a lot more homework. I spent twenty years in university. The freedom I had in the Navy, and the people I worked with, were much more rewarding than the university, although I cherish my academic years. The University of Virginia was a marvelous place. But in terms of getting things done, I think I had a lot more freedom in the Navy. I think the barriers were there but they were positive, in a real sense.

INTERVIEWER: In this book, we're going to look at a hundred-year time line. Pick out three events or three developments that you would say were the most significant, in the way man views undersea technology and the philosophy of Man in the Sea today. I mean, I don't want to put answers in your head but you sound like you may have mentioned one, decompression.

DR. BACHRACH: Yes, I think decompression was one. I think the work on High Pressure Nervous Syndrome [HPNS] was another because it brought reality to what we thought about undersea habitats, living cities, cities under the sea, and people still want to talk about those things. I think the HPNS told us that there was definitely a physiological barrier. We could not really expect to dive below 1500 feet, probably. I remember a MK-14 dive out off of San Diego in which they were at 1400 feet, and that was a remarkable depth. I think HPNS taught us something about what physiological events were happening with deep diving. It taught us a lot about compression.

INTERVIEWER: What about the third event that changed the way man looks at undersea technology?

DR. BACHRACH: Well, I think you can attribute the popular interest in the undersea to Cousteau and Lloyd Bridges. I think they opened up the whole world to what the undersea is about. Some people think Cousteau is the Walt Disney of diving. I think that can be viewed positively, that he did open the world to what the undersea world was about. Lloyd Bridges also helped, even though he violated a lot of safe diving practices in *Sea Hunt*, and Zale Parry, who was this marvelous wonder gal, who is still marvelous and wonderful at her age right now, I think it wasn't underwater technology as much as just making people conscious that there was an underwater world.

Underwater photography goes back to Thompson in the 1800s and Boutan, in Algeria. Underwater photography is at least a hundred years old but I think it was basically Hans Haas and Cousteau who popularized it. Well, as a technology it gave us the ability to photograph underwater and relate it to the world, and I think that was a very important step. It made the world more conscious of the underwater world.

INTERVIEWER: As we conclude the interview, give us your opinion as to what we ought to be looking for in the future and what we ought to be doing in the future in undersea technology.

Where do we need to go from here?

DR. BACHRACH: Well, I think the first thing you need to do is define the goals. What do we want from the sea? Technology has always followed problem solving or has been problem solving. I became interested in underwater time in which I'm trying to do some research. You didn't really worry about keeping time underwater until you started decompressing because the diver would go down, stay as long as he could, and come up. Right now I'm fascinated with how they keep time. I'm having trouble finding it in the logs that I've been reading. John Bevan has been very helpful in finding some old logs for me, but they didn't really tell how they did it and I'm interested in that. So, that is an example.

We didn't need the technology of timekeeping until we had the problem of compressing and decompressing. So, I think that what we're going to look for in the future is what we want to do in the ocean. Do we want to farm? Do we want to have underwater cities, about which people still create science fiction? Do we want to work on global warming? Do we want to start thinking about what's happening to the salmon industry, which is almost turning into a disaster because farming isn't working?

This is simplified, but Santayana said once that first you define what is desirable and then, within the realm of the desirable, you decide what is feasible. I think if we establish goals, like what we want to do in the ocean, the technology can follow. I don't know what we want to do. Do we want to get drugs from the sea? That's been talked about, and so has fish farming. I think the military applications have been minimal. I don't think we've ever really thought of using saturation in a combat situation. But SOSUS, and just keeping track of submarines, is a

very useful device and extremely important. There is an example of a technology that followed a problem. How were we going to study the cavitation of a Russian submarine? How were we going to track a submarine coming out of the Baltic Sea, and so on? Then, the technology followed.

One of my heroes is Jules Verne. In his writing, he was very aware of the science and technology of his age. I have written about this in the history of diving. In *20,000 Leagues Under the Sea*, Professor Aronnax and Captain Nemo are talking and Nemo says, "I'm going to send my crew out to the ocean bottom." Aronnax asks, "How you going to do that?" He says, "By using a device invented by two of your countrymen, Rouquayrol and Denayrouze" and in the original engravings in the book, they're wearing the Rouquayrol-Denayrouze apparatus. Well, that was patented in 1865 and the book came out in 1870. Verne had to know about the Rouquayrol-Denayrouze apparatus when he was writing the book. He's a hero of mine, not only because of his writing, which is I think wonderful, but just because of the knowledge he had of the current technology and science.

INTERVIEWER: We need more Jules Vernes, maybe. We could use a few, couldn't we?

DR. BACHRACH: Well, Robert Heinlein was a kind of Jules Verne.

INTERVIEWER: Who was he?

DR. BACHRACH: Robert Heinlein was a science fiction writer but he also had an engineering degree from the Naval Academy. He was a graduate of Annapolis and he wrote science fiction. He was accurate in every detail when he got into fantasizing about space, or whatever, because of his Naval Academy training.

INTERVIEWER: I have one last question. Is there anything that you haven't said during the interview that you'd like to say?

DR. BACHRACH: No. I think I've babbled enough. I'm very flattered to be part of this and I think that *Naval Forces Under the Sea* was a very rewarding and exciting experience and I am delighted with the end product of the first symposium.

(Whereupon, the PROCEEDINGS were adjourned.)

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The Reminiscences
of
Chief Machinist's Mate
William Badders
U.S. Navy (Retired)

U.S. Naval Institute
Annapolis, Maryland
1986

Preface

As he brought out the first nine crew members of the 18 he was to rescue from the sunken submarine Squalus (SS-192) in May of 1939, Chief Machinist's Mate William Badders, USN (Ret.) says his first thought was for the S-4 (SS-108). He lamented the fact that the equipment he was using hadn't been available to save the six men who initially survived the sinking of the S-4 11 and a half years earlier, but perished because there was no known way to get them out. His aggressive and courageous rescue of the Squalus crew members earned Badders a Medal of Honor from President Franklin D. Roosevelt, and his selfless thought at the time of the rescue gives an indication of this man who had risked his life in the line of duty several times before. In his oral history Chief Badders gives his first-hand account of the rescue and salvage efforts on the Squalus, the S-4 and the S-51 (SS-162) lost in September 1925.

When Badders embarked on diving and salvage work in the mid-1920s, he was joining a community that was woefully underbudgeted, undermanned, and undertrained. From 1927 when the Navy finally established a full-time diving program at the Naval Gun Factory in Washington, D.C., Badders was at the forefront of experimental and practical diving and salvage in the United States. He was also a pioneer in underwater welding techniques and equipment in the mid-1930s.

But life was not all work for the athletic Badders. He played on the Pensacola Naval Air Station baseball team in the early 1920s that was one of the first teams to utilize air transportation to enlarge its circle of competition. During a 1921 cruise to Europe in the Kansas (BB-21), the crew put on non-stop exhibition baseball games for Norwegian fans. In the mid-1920s he played on the semiprofessional football team of the station ship Reina Mercedes (IX-25) at the Naval Academy. On the Asiatic Station serving in the Pigeon (AM-47) in the early 1930s, he was a contracted professional baseball player for a team in Manila where he went up against touring American pros Lou Gehrig and Satchel Paige. An injury with the Manila team sidelined Badders to coaching and managing the Holland (AS-3) team in the mid-1930s when they played against baseball great Ted Williams's high school team.

In 1940, Badders retired from active duty to take the position of master diver-salvage master for the Panama Canal, which was in the same backward state, as far as diving goes, that the Navy had been in 15 years before. Badders set up an organization, including a diving school, that kept the canal functioning for the 23 years that he held the job. One of the interesting incidents he recalls from that period was the salvaging of Anastasio Somoza's yacht, and the Nicaraguan President's kindness and generosity in return.

This finished volume is a tribute to Chief Badders's patience and to Dr. John T. Mason, Jr., former director of oral history, who conducted the interviews in 1971. The smooth typing was done by Mrs. Deborah Reid.

Susan B. Sweeney
Oral History Department
U.S. Naval Institute
July 1986

Chief Machinist's Mate William Badders, USN (Ret.)

Chief William Badders was born in Harrisburg, Illinois, on 15 September 1900, the son of George. W. Badders and Sarah Martin Badders. He attended Rose Poly High School in Terre Haute, Indiana. During World War I he enlisted at Indianapolis and was sworn in as an apprentice seaman on 13 August 1918. Following boot training at the Great Lakes Naval Training Center, Badders was sent to Pensacola where he performed squadron maintenance. He served as an engineer in the battleship Kansas (BB-21) in 1921 and in the station ship Reina Mercedes (IX-25) at the Naval Academy from 1921 to 1924. During engineering duty in the salvage ship Falcon (ARS-2) from 1924 to 1926, Badders assisted in the salvage of the USS S-51 (SS-162), for which he received the Navy Cross. In August 1926 when he received this decoration, he also was promoted to chief machinist's mate. From 1926 to 1927 he was back in the Reina Mercedes and played on that ship's semiprofessional football team. Badders returned to the Falcon between 1927 and 1928 and took part in that ship's futile attempt to rescue crew members from the sunken S-4 (SS-108) in December 1927. He was tapped to be first a student and then an instructor at the newly-organized Navy Diving School in Washington, D.C., and in 1930 he returned to the Falcon for a third tour, this time as the ship's master diver. In 1931 he was master diver in the Pigeon (AM-47) on the Asiatic Station and played professional baseball in Manila. He returned to the United States in 1933 and served as master diver in the submarine tender Holland (AS-3) until 1936.

During his final active duty tour at the Experimental Diving Unit at the Naval Gun Factory in Washington, D.C., Badders was rushed to the site where the USS Squalus (SS-192) had sunk in 242 feet of water off Portsmouth, New Hampshire, in May of 1939. For his dangerous role in the rescue of 33 crew members from this submarine, Badders was awarded the Medal of Honor in January 1940 from President Roosevelt.

In 1940 he went to the Panama Canal as master diver-salvage master in an inactive duty status. He remained in that position until 1962 when he was mandatorily retired at the age of 62. Badders has

been married since 18 November 1922 to the former Lavinia Emma Tydings of Annapolis. They have a daughter, Beverly Marie Badders Roberts, and a son, Albert William Badders.

Authorization

The U.S. Naval Institute is hereby authorized to make available to individuals, libraries and other repositories of its choosing the transcripts of three oral history interviews concerning the life and career of the undersigned. The interviews were recorded on 14 and 22 September and 8 November 1971 in collaboration with John T. Mason, Jr. for the U.S. Naval Institute. The undersigned does hereby release and assign to the U.S. Naval Institute all right, title, restriction, and interest in the interviews. The copyright in both the oral and transcribed versions shall be the sole property of the U.S. Naval Institute. The tape recordings of the interviews are and will remain the property of the U.S. Naval Institute. Signed and sealed this 14th day of June 1986.

William Badders
Chief Machinist's Mate
U.S. Navy (Retired)

Interview Number 1 with Chief Machinist's Mate William Badders,

U.S. Navy (Retired)

Place: Chief Badders's home in Riva Woods, Annapolis, Maryland

Date: Tuesday morning, 14 September 1971

Subject: Biography

Interviewer: John T. Mason, Jr.

Q: It's certainly good to meet you, Mr. Badders. Bill Searle has been telling me a great deal about you and about your exciting career.¹ Would you tell me about your first contact with the Navy and your enlistment, how you happened to do this?

Chief Badders: Well, of course, this was in 1918 when World War 1 was going and I was the proper age to go in the service, so I went to Indianapolis. My home was Terre Haute, Indiana; they had a recruiting station there. Then I went through Indianapolis and I was sworn in as an apprentice seaman on August 13, 1918. I was sent to Great Lakes training station for boot training. At the boot training, they lined

¹ *Captain Willard F. Searle, Jr., USN(Ret.), a salvage expert, is the subject of an as yet unpublished oral history that will eventually join the Naval Institute's collection.

about 300 or 400 of us up in ranks out on a big parade field, open ranks, and a couple of men walked through the ranks, looked you over and felt your muscle, and if you were healthy looking he'd have you fallout and fall into another company front. When it was allover, we had suddenly become third class firemen instead of apprentice seamen. We were going to be in the engineering branch of the Navy.

Q: You weren't consulted; you were just inspected and sent there?

Chief Badders: They figured we had muscle enough to do the job and would grow up in it, and that was it.

Then we left Great Lakes, 300 or 400 of us in a group, and went to Norfolk to a receiving ship, and from there we were sent in groups to a squadron of ships that was operating in the Atlantic. I was sent aboard the old coal-burning battleship USS Wisconsin. About 25 of us went aboard that particular ship. When we got aboard with our bags and hammocks and all our paraphernalia and were put up on the forecastle and told to sit down and wait a while; there were some people coming around with some forms for us to fill out. Before we got started on that, one of the old-timers--he looked to me to be an old-timer at that time--on the ship came over to me and said, "Hey, kid, you don't want to shovel coal on this ship, do you?"

And I said, "Well, no, not if I can help it."

He said, "Okay, when you fill that form out, you tell them that you took a lot of mechanical training in high school, manual training, that you're mechanically inclined and all that."

I said, "Maybe that isn't just true."

He said, "Nobody's going to check it, and that may get you out of the fireroom and get you a better job."
Then he walked off.

So I filled the form out in that vein and, sure enough, when they began to assign us to different divisions on the ship I was assigned to the engine room division. I stood watches in the engine room instead of shoveling coal, and I found out later that was the greatest thing that ever happened to me because the fellows shoveling coal on that ship really had to work.

Q: Yes, I've read stories of shoveling coal on battleships.

Chief Badders: So I stood watches in the engine room. At first, about all I did was wipe up the oil off the floor plates and things of that kind. Later I became kind of an oiler and just a general handyman on the shifts learning as much as I could, and I became really interested in the engineering.

We cruised around the Atlantic, short patrol runs that got us in the war zone--what was determined as a war zone at that time-- which made me eligible for the World War I Victory Medal, Atlantic Fleet. We didn't really know when the armistice was signed. It was a surprise to us. I guess some people on the ship knew it, but the crew generally didn't know it. There was no excitement or anything on the ship. I heard later that other ships had big celebrations and all that, but on the old Wisconsin we did nothing. I don't even remember where she was on November 11, 1918--moving around the Atlantic, somewhere. Then we came back in to Norfolk, and I was transferred back to Great Lakes Training Station in March of 1919. In December I did various things at the training station, mostly playing baseball and things of that kind to keep out of work. I became interested in aviation and put in for the aviation mechanics school at Great Lakes.

Q: You were not like a lot of them who had the urge to get out of the service?

Chief Badders: No, I didn't at that time. A little later that comes up, but at that time I had a four-year cruise to do, and I figured that was it and I was going to have to do it. So I figured aviation was coming along and I'd try to get in that branch. Well, I didn't make the school for some reason. I never did know why, but they did send me to the Naval Air Station at Pensacola. By this time, I was a fireman second class. At Pensacola I did various things, mostly squadron work, waterfront work, pulling planes in and out of the water. They were all seaplanes there then. They didn't have planes with wheels on them in the Navy, not around there anyway. I played football with the naval air station football team and baseball, and we had the first football team that ever was transported by air. We flew out of Pensacola and went to Mobile, Alabama, and I played Spring Hill College, the first time we ever flew, and from then on we flew most places we went away from the station to play. Then we did the same thing with the baseball team. We were quite proud of the fact that we'd pull into these towns with a couple of big old F-5L seaplanes with a football team aboard. Got a lot of publicity for the game!

Q: Give me a picture of Pensacola in those days.

Chief Badders: Well, they had two branches of aviation there. They had what we called heavier-than-air and lighter-than-air. Over in lighter-than-air were blimps and free balloons and the observation type balloon. We had a couple of old Eagle boats with winches on their fantail that would go out in the bay and release these observation balloons, and they'd go up in the air.² What they did up there I have no

² Eagle-class patrol craft (PE), named from a 1918 Washington Post editorial calling for "...an eagle to scour the seas and pounce on every German submarine," were the result of the first American attempt to mass-produce ships. These 200-foot escort craft never made it into service during World War I and were of questionable quality, but many of the 60 ships built were used after the war as aircraft tenders.

idea. But the blimps were real active. They flew all around the country down there. And then they had a lot of free ballooning, and they would ask for volunteers to go on these free-balloon hops. They'd take off from Pensacola with as many men in the basket as they could get in, and the first time it hit the ground, they drew lots for which one was going to drop out first, and when we hit the ground one would get out and, of course, that would relieve the ballast and make it go up and maybe travel some more, and so on down the line until the last two men were in and they used their regular sand ballast to go as far as they could. The last two men when they finally landed would have to make up the balloon and get back to the air station. Some of them got quite a distance away from the station. Finally we had a disaster there. One of the balloons got in a cross current somehow and went to sea and there were about 12 men in it—10 men, I guess. We never did hear or see any more of them. That kind of knocked the free balloon on the head. No one flew with parachutes, except the lighter-than-air -people. I think they had some parachutes on the blimps, but over in heavier-than-air, where I was, we had three or four types of planes but nobody fooled with parachutes over there.

Q: Why not?

Chief Badders: Well, I guess they had them, but they just weren't issued. No one cared about them.

While I was there, Read came in with the NC-4 after his trip across the Atlantic with his crew, and that was quite big thing around the station for a long time.³ That crew of men who made that trip made history at the time.

We had quite a football team at Pensacola. Some of the young college grads who were going through flight training and the enlisted men played all over that part of the country. I had a very pleasant tour of duty, but for some reason or other in March of 1921 I found myself on a draft heading for Key West, Florida, in regular service. I had never got my rate changed from regular service to aviation and I, being a kid and not knowing any different, I should have looked into that before, but it never dawned on me that I should have done that.

When I got to Key West, I found out that we were going aboard another coal-burning battleship, the old USS Kansas. But by this time I'd smartened up enough to look out for myself when I got aboard her. The same thing, when you got aboard you had to fill out a form about your past experience, your qualifications, and things of that kind, so I filled out another form that I had been in motorboats around a naval air station, which I had, and that I had some experience in aviation engines and things

³ In May 1919 three Navy-Curtiss (NC) flying boats attempted a transatlantic flight from New York. Only NC-4, piloted by Lieutenant Commander Albert C. Read, USN, was successful, eventually making it to Portugal via the Azores.

like that. That application got me into the motorboat division, engineering motorboats, and I ended up as engineer of the admiral's barge, old Admiral Hughes.⁴

This Kansas was part of a fleet that came to the Naval Academy in June of 1921 and picked the midshipmen up for a midshipmen's cruise. That was one of the highlights of my seagoing career. We went from here, from the Academy, to what was at that time Christiania, Norway, now Oslo, and from there we went to Lisbon, Portugal, Gibraltar, Guantanamo Bay for a big exercise and all. Each ship had a baseball team. We used to play baseball among ourselves in port to get away if we had time enough. When we got to Christiania--I'll refer to it as Christiania because that's what it was at that time--the ambassador asked the admiral to send baseball teams ashore and play baseball for the benefit of the people because they had never seen American baseball. The time we were there, it was in the summer, of course, it never gets dark. It's daylight 24 hours a day, and we played baseball around the clock. I played 28 games of baseball in 14 days, and the only break between games was so that they could get one crowd out of the stadium and let another crowd in. We lived right at the stadium. They brought our food to us, and we stayed right there, so I didn't get to see much of Norway.

Q: It would take the pleasure out of playing baseball, wouldn't it?

⁴ Rear Admiral Charles F. Hughes, USN, Commander Battleship Division Three and Battleship Squadron Two, Atlantis Fleet, in 1921. Admiral Hughes later served as Commander in Chief U.S. Fleet and still later as Chief of Naval Operations.

Chief Badders: It sure did. We tried to have some of their athletes mix in with us to play the game with us, three or four on different teams as we played along, but they didn't pick up much in the short time we were there. They enjoyed it and they enjoyed watching us. The stadium wasn't big enough for baseball. It was really a soccer stadium, and we had to have all kinds of ground rules. When you hit a ball that would have been an easy out, it would be a home run. It'd be out of the park there. During this midshipman's cruise I got very well acquainted with several of the midshipmen and I became interested in the Naval Academy, not to come here as a midshipman but for duty around here. I was told about all the boats they had at the Academy and all the athletics and all that business, and I thought, "Gee, that's the place for me to finish up my enlistment."

So, when we got back from the cruise, the Kansas was ordered out of commission. We got her put out of commission in December, and one of the rewards for doing a good job in putting the ship out of commission and all this is that they give the crew a preference of where they want the duty from that duty station. They would give them as near what they wanted as they could. Well, there were eight or ten of us on the ship who put in for duty here at the old Reina Mercedes and we arrived here.⁵ We got it. I came to the Reina Mercedes on December 31, 1921 and did an enjoyable tour of duty here.

Q: What were your duties?

Chief Badders: By this time I was a second class engineman mate. I made first class fireman on the Kansas. Then about the time I was transferred to the Reina Mercedes, I made second class - engineman.

⁵ The USS Reina Mercedes (IX-25) had originally been an unprotected cruiser in the Spanish Navy. She was captured by the United States in the Spanish-American War of 1898. She served as station ship at Annapolis from 1912 to 1957.

I went to work in the engineering branch on the old Reina down at the boathouse. The boathouse was down on the waterfront where some of the new Bancroft Hall is now; that street that runs behind the new Bancroft Hall was the waterfront street at that time. The boathouse was down at what had been a pier that went out to where the old Reina Mercedes was tied up. I operated the crew coach's boat for two years, and that was enjoyable work, but, of course, that was only part of the year. I went to Poughkeepsie with the crews. Dick Glendon was the head coach at the time I was operating the boat.⁶ He had relieved his father, and they were quite famous crew coaches. Young Dick was very temperamental and scared the pants off me one time. We'd been up the Severn River for a workout and coming back the crew had gone way ahead of us, and I wasn't paying much attention. The coach had got out of the front cockpit and had moved to the back of the boat. I wasn't paying any attention to him back there. I was watching the crews to make sure I didn't run into any shell's oars or anything, and when I got close to the old boathouse, which was right across the street from the drill field down there at the time, I didn't have any coach in the back of the boat. Nobody in the boat but me!

I couldn't imagine what had happened, so instead of making a landing I turned around and went back as hard as I could go, retracing my steps almost to the railroad bridge, and here's Dick L Glendon swimming. I went over to try and pick him up and he ran me off. He said, "Get away from here, I'm swimming back." Well, that was still a long swim he had, and when he went overboard I really don't know--somewhere around the old railroad bridge. I stayed behind him and kept along with him all the way back anyway, although he kept hollering at me to get away from him and let him alone. I don't know yet why he jumped overboard at that point. I think he was a little disappointed with the workout or something.

⁶ Richard J. "Young Dick" Glendon, Jr., was a crew coach at the Naval Academy from 1919 to 1925. His father, "Old Dick," coached crew from 1903 until 1922.

In 1924 they brought the alumni crew back to the Academy that had won the Olympics in 1920, Frawley and everybody in the crew except the stroke they had that stroked the crew in 1920, a man by the name of King.⁷ For some reason he didn't come back. I don't know what the reason was. But they had the original coxswain and the whole crew, and they worked out for a couple of months down at the Academy. Old man Glendon came back to coach them. They were going to represent the Navy in the Olympics if they could. We went to Philadelphia for the tryouts, and they had wonderful time trials down the Severn River, and the Navy varsity shell crew at that time was great, too. We were so sure that the alumni crew was going to beat everything in the Olympic trials that they even had a cruiser ready to take the shells and the men, me, and the coach boat and everything to Paris; the Olympics were in Paris. Well, it turned out that we didn't win. Yale beat the alumni crew, and our two Navy crews came in second and third. The alumni crew--some of them were officers and some were civilians--beat the midshipmen by a quarter of a boat's length of something.

Anyway, we didn't get our trip to Paris. Instead of going to Paris, we came back to the Academy.

⁷ The crew team from the Naval Academy that won the gold medal at the 1920 summer Olympics at Antwerp consisted of Midshipmen Virgil V. Jacomini '21A, Edwin D. Graves, Jr. '21A (captain), William C. Jordan '22, Edward P. Moore '21B, Alden R. Sanborn '22, Donald H. Johnston '22, Vincent J. Gallagher, Jr. '22, Clyde W. King '22, and Sherman R. Clarke '22. Midshipman Edward R. Frawley '22 rowed on the second varsity team, but was not a member of the Olympic squad.

During this tour of duty on the Reina Mercedes I served under Abram Claude, a famous name here in Annapolis, Captain Claude, and his executive officer was Henry Hartley, a lieutenant.⁸ I got very well acquainted with Hartley, and his tour of duty was up about the same time mine was here. He told me that he was going to the only salvage ship that the Navy had, the old USS Falcon, and he would like for me to go along as the salvage ship had a lot of salvage equipment aboard, gasoline engine driven pumps, and things of that kind, and he thought I would maybe like that type of work.

Q: This meant that you had to reenlist?

Chief Badders: Yes, I had reenlisted. In October of 1924 I left the Reina Mercedes. By this time I was an engineman first class. I went aboard the Falcon in the Brooklyn Navy Yard, and I never was so sorry for asking for anything in my life as I was when I saw the condition of that thing. She was just a glorified tug, actually a minesweeper converted, and she had a recompression chamber aboard and an air system and a lot of salvage equipment⁹. But that was the dirtiest, hottest, most disorganized ship I've ever seen

⁸ Captain Claude's first American ancestor, also named Abram, came to Annapolis from Switzerland prior to the American Revolution, and distinguished himself as an aggressive resister to the Stamp Act. Among his descendents have been an Annapolis mayor, state treasurer, and various physicians and military officers.

⁹ The USS Falcon was commissioned as a minesweeper in November 1918 and served in a variety of roles thereafter. She was officially reclassified a submarine rescue ship, ASR-2, on 12 September 1929.

in my life. I hadn't seen very many, but I knew what a ship should look like. And I thought, "Oh, boy, I'm going to get away from this thing just as soon as I possibly can." Of course, a big lot of this trouble was the fact that she was in the navy yard for an overhaul and she was all torn apart. But, of course, I had to go aboard and report in and I was put in the engine room. The engineering department, the interim crew, was doing about 50% of the overhaul themselves. They were working like Trojans. Hartley didn't get to the ship for quite some time, and I began to worry that he wasn't going to get there. I knew if he ever got to the ship there'd be some changes made, because he wasn't going to put up with anything as lousy as that. The crew was a helter-skelter bunch of people, no discipline. Uniform wasn't heard of--you'd see them in white hats, but overalls instead of regular dungarees. Oh, it was a disorganized piece of Navy equipment.

Sure enough, Hartley finally came aboard. They had a little change-of-command ceremony, and he waited until the man he relieved got off the ship, kept the crew at quarters back on the fantail--there were only about 65 men on this thing--and he gave them a little talking-to.

Q: He had inspected the ship?

Chief Badders: Yes, and he said the same thing that I had thought when I saw the ship. He said he had never seen such a disorganized, dirty ship as the one that he had just taken over, and that he would not tolerate any such conditions; changes had to be made. He said, "We'll make them gradually, and I'm sure you people will be proud of the results, and we'll see what we can do with this." And, sure enough, before we got out of the navy yard, by the time they began to put the ship back together he had enforced some regulations about uniforms and the food, the chow and the service, and things of that kind, the

With a displacement of 950 tons, the Falcon was 187 feet 10 inches long and 35 feet 6 inches in the beam.

stowage of clothing, the bunks, and the quarters, and all, and it began to look like a place for Navy men. The crew did start to become interested in keeping the ship up.

We left the navy yard and went to New London, Connecticut; the Falcon was part of the old Control Force, the submarines and the submarine tenders: the Bushnell, Camden, Savannah, and the Falcon. We made a cruise from New London, and the Falcon was getting to be more like a Navy ship all the time, and by the time we got back to the navy yard for another overhaul, that was some time late in 1925, she was really a nice-looking ship and a joy to be aboard.

As I say, we were in the navy yard in 1925 for a minor overhaul. The ship had had some main engine problems, and finally the main engine was up in the shops and one evening--I don't remember the date now--we got word that a submarine had been sunk outside of Newport, just off Block Island, and for the Falcon to get there with her equipment and any divers she had aboard as soon as she could.¹⁰ Admiral Plunkett was commandant of the Brooklyn Navy Yard at the time and he called the workmen in and they threw that ship together like nothing's ever been put together before.¹¹ By the next day at noon we were under way with navy yard workmen swarming all over the ship even yet. They followed them with motorboats and as one workman would finish his job he'd get in the boat, get a boat loaded, and get back to the Brooklyn Navy Yard.

¹⁰ On the night of 25 September 1925, the USS S-51 (SS-162) was rammed and sunk off of Block Island, New York. Of the 36 men on board, only three survived. She was raised on 5 June 1926 and sold for scrap in June 1930.

¹¹ Rear Admiral Charles P. Plunkett, USN. The shipyard at Brooklyn was known officially as the New York Navy Yard. Plunkett was commandant of both the navy yard and the Third Naval District.

As I said, this Falcon was a salvage ship, but she had no divers aboard at all. There wasn't a single diver aboard her. She didn't have a lot of equipment. Gasoline-driven pumps and air compressors and things of that kind, and she had a beautiful air system permanently installed in the ship with two big low-pressure air compressors in the firerooms and a big high-pressure system aboard, but no men who had done any underwater work.

Q: This had not been thought necessary?

Chief Badders: Hartley knew it was necessary, but the Navy just didn't have that kind of people then. They didn't have divers in the Navy that amounted to anything at all. Our only diving at that time that amounted to anything at all was around Newport, where they had a crew of divers whose main job was recovering lost torpedoes from the torpedo range, and they were diving 50, 60, 70, and sometimes as much as 100 feet out there. They were about the only divers we had. The only training facility they had for divers in the Navy then was the old seamen gunners school in Washington, D.C. They put men down 50 or 75 feet with a hand pump and put them on the bottom for 20 minutes, bring them up, and say, "Okay, you're a diver." That was it, and they might never make another dive unless they were on some ship that had diving equipment and got a propeller fouled or something or to look for something that dropped overboard, something of that nature.

When we arrived on the scene where the S-51 was down, by this time it had been determined there was no one alive in the boat.

Q: How deep was she?

Chief Badders: She was in about 132 feet of water, and the divers who were out there were the men from Newport Torpedo Station--Tom Eadie, Fred Michels, and Jimmy Ingram were the diving crew at the

Newport Torpedo Station¹². Ingram and Michels were in the Navy, both chief petty officers, and Tom Eadie had been in the Navy for 12 years or so and had quit and taken over the job as the diving boss at the torpedo station. They had been to the deck of the boat and pounded around on all the hatches and things and determined that there was no one alive at all, so there was no rescue operation involved here. It was strictly a salvage job. They brought cranes out from the Brooklyn Navy Yard and tried to lift her with cranes, but cranes in the open sea have never been any good, so we didn't accomplish anything.

Q: What had caused her to go down?

Chief Badders: She had been rammed by a commercial ship; the City of Rome hit her and cut her almost in two. She was on what we called at that time a ten-day patrol run, running with lights out and all that business, and was on the surface when the City of Rome hit her. The only men who got off of her were the men who were in the conning tower. It was at night, dark, of course, and the only men that got off were the men on watch in the conning tower. I think one man, maybe, got out of the hatch before they got the hatches closed. Anyway, there were five men who got out of her, and three of those five were picked up by the lifeboat of the City of Rome and two others died in the water, waiting to be picked up. The three men who were picked up said they knew that time stretched out in a case of that kind, but they were fully convinced that they were in the water over an hour before the City of Rome put the lifeboat in the water and picked them up.

Evidently, the City of Rome didn't know what she had hit and didn't realize there were men in the water until finally they heard them holler or something.

¹² Chief Gunner's Mate_Thomas Eadie, USNRF; Chief Torpedoman Fred G. Michels, USN; Chief Torpedoman James C. Ingram, USN.

Q: What was the City of Rome?

Chief Badders: She was a coastal ship plying mostly between Boston and New York, combination passenger and cargo.

Q: Similar to what the Ward Line used to have?

Chief Badders: Right.

Well, here were all these men inside the submarine, dead, and the parents of the people and wives and so on wanted these bodies recovered, so they decided they were going to salvage this submarine. Admiral Plunkett put a lieutenant commander in charge of the job. I guess he was famous before that, but he became famous after, Lieutenant Commander Edward Ellsberg, a famous name in the Navy later.¹³ They started to work, first, trying to recover some of the bodies. They opened the hatches, put divers inside, and they recovered some of the bodies but couldn't get all of them. A lot of places they couldn't get to.

¹³ Lieutenant Commander Edward Ellsberg, USN, top man in the Naval Academy class of 1914, first came to prominence as salvage officer on the S-51 (SS-162) in 1926. He resigned from the Navy that same year, returning for reserve duty for two blocks of time and eventually retiring from the Naval Reserve as Rear Admiral in 1951. He is best known as a prolific inventor in the oil industry and author of many books, including On the Bottom (New York: The Literary Guild of American, Inc., 1929), about his experiences with the S-51. The book contains a photo of some two dozen Navy divers who were involved in the salvage of the S-51.

The system of raising a submarine was to use the Navy submarine pontoons, and seal off as many tanks as they could and get rid of as much water inside as they could to lighten the load as much as possible. What they couldn't lighten, they'd overcome with the pontoons. They worked until late in November. The weather was terrific. They worked one day and were off three, running for shelter to stop them from turning over themselves, ice cold, and the thing that made us finally have to stop altogether was that the divers' air hoses were beginning to freeze up. We almost lost a man. He was on the bottom, and his air was stopped all at once. We brought him to the surface and his air hose was full of a kind of frost.

Q: Condensation.

Chief Badders: Condensation that froze up in the hose. So they decided they'd quit until the warm weather.

The Falcon went back to New London, and we made a cruise to Panama with the submarines. We were supposed to take a bunch of young fellows, including myself, and start breaking them in as divers down in Panama, but we never did get around to that. We were too busy towing targets and towing submarines and things around for the submarine maneuvers. We never had a dive in the water. They had a grand total of six men on the job up to that time that were capable of making dives to the bottom. They were scattered all over the Navy, and they called them together for that particular job.

Q: Were you anxious to learn to be a diver?

Chief Badders: Oh, yes, I wanted to get right in the thick of things, but I didn't make out for quite a while.

We went back in the spring and went to work on the submarine and finally got her ready with all the pontoons down, and that became my job, rigging the pontoons and getting them ready to go down for the divers to work on them. That was quite a job at that time. The pontoons were not as modern as the ones we had later, and they were quite a thing to handle.

Q: How many were required?

Chief Badders: We used eight pontoons on the S-51.

Q: What was her tonnage?

Chief Badders: Each pontoon lifted 80 tons.

Q: What was the tonnage of the S-51?

Chief Badders: I don't remember, I'd have to look it up.¹⁴ We got the thing all ready to blow and we were going to raise her in the morning. There were bad weather reports coming, and by morning it really was bad. Too choppy to attempt to bring the submarine to the surface, but we had a lot of leaks. You could see bubbles coming to the surface all around from some places in the pontoons and some from compartments and hatches that we had put in place. By this time I had made a dive or two.

So Ellsberg decided to go back in the morning, hook up some of the air hoses, and compensate for some of the loss of buoyancy that was in the tanks and pontoons, overcome some of these leaks.

¹⁴ The USS S-51 displaced 1,230 tons submerged.

They hooked up to some of the bow pontoons and didn't blow more than a minute or two before there was a terrific commotion in the water almost right under the fantail of the Falcon. One man grabbed an axe and cut the mooring line leading out of the chocks on that side and let the Falcon swing free just in time, and up came the bow of the S-51 with four pontoons. I have a picture of that right over there. After this bow came up, Ellsberg decided to try to raise the stern anyway, regardless of the weather which was getting worse all the time. So they blew everything out they could and, with the bow up, put an angle on the boat because they couldn't get all the water out of the engine room that they had planned to get out due to the angle of the boat. So they went ahead and blew the after pontoons and the after pontoon chains broke and let that pair of pontoons come to the surface. Then they knew they couldn't raise her. Here she is beating herself to death up there and the pontoons are beating themselves to pieces, and the only thing to do to save her was to get her and the pontoons back on the bottom.

Sometime before that, they had closed off all the flood valves on the pontoons and they couldn't be flooded in the condition they were in to let them go back to the surface. Somebody had to get aboard the pontoons and open the flood valves so the pontoons would flood and let the bow go back, and that became my job. I volunteered, I guess. I could probably have refused to go, but...

Q: Kind of dangerous, wasn't it?

Chief Badders: Yes, because the seas were breaking together over the pontoons and they were banging together. If you got washed in between a pair of pontoons, why, you'd have had to be scraped off or something the next day or two. But you never thought of those things when something had to be done; you just went ahead and did it.

When we went back in the spring to work on the boat, Captain Ernie King, who was the commanding officer of the submarine base at New London, Connecticut, had become the overall officer

in charge of the salvage operation.¹⁵ I always have thought that was one of the only mistakes that Admiral King made--he was later Admiral King but I refer to him as admiral all the time. He made me put on a great big old kapok life jacket to go out on those pontoons with a line around me to a motorboat. Of course, when those seas hit me and I was on that pontoon with that big old kapok jacket on, I could hardly hang on. I'd have been able to hang on much better without the life jacket. He thought he was making it safer for me by putting me in a life jacket.

Anyway, I got enough of the valves open to flood enough of the pontoon to put the bow back on the bottom, and when the weather calmed down we went to work again and cleared everything up. Some of the pontoons had to be brought to the surface, repaired, and put back down, but eventually we brought her to the surface and headed for the Brooklyn Navy Yard. We got within sight of the dry dock gate, and the pilot we had aboard to take her through Hell Gate ran her aground on what they called, and I guess still do, Man-o-War Rock out in the river. That created quite a problem. We had to shorten up the chains on the pontoons, let the pontoons down farther on the chains to get more lift to raise her off of this rock. That was accomplished with a lot of risk and work and some luck. While we were lowering the pontoons, we had a crane out there holding the chains up through the hawsepipes and we'd flood the pontoon down as far as we could and hold it there, then put the toggle bar back through the chain at that point. While one of these operations was going on, somebody got through the Coast Guard patrol that was out in the river keeping traffic away, went by and kicked up a swell and made the crane bob up and down and broke the sling that was holding one of the chains up, and it flew back down through the hawsepipe. It created quite a job getting the chain back up and holding the pontoon. I stood on the pontoon in water up to my neck, with my thumbs in the holes--I was actually on my knees, I wasn't

¹⁵ Captain Ernest J. King, USN, Commander in Chief-U.S. Fleet during World War II, commanded the submarine base at New London, Connecticut, from 1923 to 1926.

standing--with my thumbs in the holes where we had taken valves off until we got some wooden plugs to plug them up until the valves could be replaced.

Anyway, finally we got everything all ready. The big rush on this was to get one of the highest tides they were going to have in the river for some long time. They wanted to catch it right at high tide and try to lift her off this rock. As it turned out, that's exactly what we did. We got this thing in dry dock, removed all the bodies and all that business. Then she was scrapped.

Well, from that work I did opening the valves on the pontoons and other work there and the work on the pontoons in the North River where she ran aground, I was recommended for and received from the President the Navy Cross. Commander Ellsberg and Hartley, when the S-51 job was completed, made many recommendations for changes aboard the submarines. For instance, the salvage air system that they had on the old S-boats, the R- boats, and the O-boats there was one fitting in the conning tower that a diver could hook a hose to and supposedly distribute air all through the submarine. Well, if that line got damaged any place in the boat, that's as far as the air went. Their recommendation was that there should be fittings on deck for air connections in every compartment and that some investigation should be made into the possibility of rescuing people from submarines in case anyone's alive when a submarine's on the bottom, and some changes in the construction of the pontoons. That was done. The changes in the pontoons were actually performed, but nothing else.

Q: What kind of changes were they?

Chief Badders: The old pontoons had only one bulkhead, in the center, which meant that when you opened the flood valves on the bottom of the thing to flood it, you had no way of controlling the amount of water you put in the pontoon, except turning the air off on the vent hose and closing the flood valves. When you get this thing heavy enough to sink itself with the water aboard, somebody had to close these valves, which meant that she was already underwater 6 or 8 feet. And that was another one of my jobs

on the salvage operation, to get these flood valves closed. They were great big 12-inch gate valves that required 17 turns to close them, and that took a long time.

Q: And meanwhile she was going down?

Chief Badders: No. They were holding her as best they could at that point. As soon as it would go in the water, they'd turn the vent off and hold everything they had on the lowering lines, but it continued to take some water in compressing the air in the top, and it would be getting heavier all the time and putting strain on the lowering lines. It would get a little deeper--we'd have them, before I could get the valves closed, go down as much as 10 feet. I'd be on a diving stage over the side, lying on my stomach, turning a big key wrench, a big long, extended-handle key wrench to close the valves and I'd be under 10 feet of water before I could get them closed.

But the new alteration on the pontoons, they put two bulkheads in some of them and in some they put a buoyancy chamber in the center, which meant you could flood the two ends and keep the center compartment dry, and you could control the amount of water you put in the two ends and make the thing weigh any tonnage you wanted. On the S-4 and Squalus jobs, we put the pontoons down weighing about eight tons, although we had to handle the lowering lines to put them down in place. That was about the only thing that was really accomplished out of all the recommendations that were made. Another thing--Hartley, seeing the big need for divers in the Navy, wanted some means of training more divers and making the ones we had better divers.¹⁶

¹⁶ In an article in the March 1931 issue of the Naval Institute's Proceedings entitled "Some Historical Facts on Diving," pages 341-349, Lieutenant Hartley discusses improvements in diving techniques and equipment, the salvage operations on S-51 and S-4, and the Navy's recruitment and training of divers.

Q: Why did the Navy not have divers up to this point?

Chief Badders: They had no reason for them, they thought, up to then, I guess. They'd only had one submarine disaster and that was out in Honolulu in 1914. That was a little old F-boat out there, and they picked her up by sweeping wires under her and bringing her in to shallow water which required very little diving. They just hadn't had any need for divers.

Q: Had private enterprise had salvage. ..

Chief Badders: Yes. Merritt, Chapman, and Scott had their own divers, but there again I'd say 90% of their work was underwater construction work. It wasn't so much salvage, and a lot of their salvage work required very little diving. It was mostly groundings and things of that kind.

After the S-51 job was finished, I was discharged and reenlisted, and I came back to the Academy, to the old Reina Mercedes, supposedly for a football season. I played football with the old Reina Mercedes semipro team. We called it the Reina Mercedes. We had a few sailors playing, but we also played a lot of the assistant coaches, graduates of the Academy were assistant coaches, and we had quite a football team. We played all over the country.

Q: By that time you'd decided to make the Navy your career?

Chief Badders: Oh, yes. Right after I reenlisted, I found out that--in 1926 I became chief machinist's mate, part of that was due to my Navy Cross decoration.¹⁷ I was on the list for chief. At that time you took examinations for chief, whatever your rate was, and you competed with the whole Navy. If you were on the list, according to the marks you made in the examination, and at the end of the year if you hadn't reached the top, the list was wiped out and you had to take another examination. I'd done that twice, made the list, but nowhere near the top but somewhere close to the top. It could have been another two or three years before I'd made it. It was part of my reward for the work we'd done--I wasn't the only one; there were three or four others in the same condition I was on the list, with different ratings, boatswain's mate, carpenter's mate. Ellsberg recommended that we be jumped off of the list to our chief grade. All of us made chief. I got chief a year or two ahead of time, ahead of what I would have normally.

During this football season, I got a knee torn up at the Academy and spent a lot of time in the hospital. I ended up being here almost a year. In fact, it was a year. In August of 1927, I went back to the Falcon, and after I was on the Falcon a short while, in 1928, the S-4, we learned, was on the bottom in New London, Connecticut. I was here in Annapolis on leave-- Christmas leave. The S-4 was rammed and sunk. She was hit by a Coast Guard patrol destroyer, what they called a rum-chaser. The S-4 was running the measured mile outside of Provincetown, Massachusetts, submerged, and the Coast Guard destroyer Paulding evidently didn't know she was in the area and ran through that measured mile area, slammed into her, and did enough damage to sink her.

¹⁷ Engineman first class Badders received the Navy Cross on 2 August 1926, signed by Chief of Naval Operations Admiral Edward W. Eberle, USN, as acting Secretary of the Navy for President Coolidge. Badders was on the list for chief, but the engineman rating was being phased out. When he received his citation he was jumped off the waiting list and rated chief machinist's mate.

On her there were six men alive in the forward torpedo room.

Q: How far down was she?

Chief Badders: She was down 102 feet. I was on leave here in Annapolis, and I went right down to the Reina Mercedes and told them I had to get back to the Falcon as soon as possible. By this time, I knew the Falcon was under way to Portsmouth. While I was there, Captain King came through there. How we got together I just don't remember, but anyway we caught a plane out of Annapolis somewhere. We went aboard a seaplane and flew to Boston, and from Boston we went to Provincetown and aboard the Falcon.

Well, here were these six men alive in the forward torpedo room and no way to save them, no way of getting them out of there. The divers had hooked up the salvage air hose to this conning tower arrangement that I mentioned was on "the S-51, and when they turned the air on, it just squirted right out about 10 feet forward of the control tower at the end of the pipeline where it had been cut in two when the Paulding hit her. So there was no way of getting air into the forward torpedo room. The divers were doing different tasks on the bottom. Fred Michels got fouled up on the bottom. The seas were terrific, there was just a terrific blow, and that is one of the worst spots on the Atlantic Coast when it gets bad, right off the point of Provincetown. The Falcon was in a four-point mooring, and he had two big seagoing tugs over on her seaward side with lines running to her and trying to hold her up in the moorings so the divers could work on the bottom. She was yawing back and forth, as they tried to hold her steady, but they just couldn't do it. Fred Michels got all fouled up on the bottom in the wreckage, part of the bow of the Paulding and part of the wreckage of the S-4 submarine. He couldn't get out of there, and Tom Eadie was put back down--he'd already made one dive that morning, but he was put back down to try to get Michels freed, which he did after an hour or two. By this time Michels had a very severe case of bends, and the Falcon was tearing up her mooring lines. It was just impossible to stay

there and do anything, so they decided they would have to get out of there and they disconnected everything and left. And there were these six men aboard in the forward torpedo room, but nothing could be done. But the fact that the Navy had to leave so soon really put headlines in the papers about the Navy abandoning their men on the bottom of the ocean and all that kind of thing. Of course, the people who wrote these articles couldn't have been there and seen the conditions or they'd never have written them.

We got back as soon as we possibly could, got back on the moorings and sent divers down again. They were receiving taps, signals by hammer raps on the hull from the inside from these men for 30 hours, and after 30 hours they didn't receive any more, which indicated they had become unconscious and died shortly thereafter. By the time the Falcon got back on the moorings and got men down, it was an established fact that the men were by this time dead. Nothing could be done. So then this became strictly a salvage job, and here again we only had a very few divers, scattered all over the Navy. Myself and a man by the name of Frazer who had been on the S-51 job were the only two men in the Falcon's ship's company who had had any diving experience at all.¹⁸ The other men had to be called in from all over, a couple from the Torpedo Station, Newport, and one from as far away as Honolulu came in. It was a month or more later before he got there. And we had even a civilian on the job. They put him in the Naval Reserve, a fellow by the name of Anderson, so they could use him as a diver.

Captain Savvy Saunders was the salvage officer in charge, and from all the experience we had on the S-51, the placing of the hatches and pontoons and all that kind of thing, was more or less a repetition of what we had done on the S-51 job.¹⁹ It was just a matter of doing again what had been done before. She was raised very successfully and put in the Boston Navy Yard dry dock.

¹⁸ Chief Torpedoman James W. Frazer, USN.

¹⁹ Commander Harold E. Saunders, USN.

In the meantime, while all this was going on, here were all these people raising all this commotion about the Navy letting these men die on the bottom, and Admiral Brumby, one of the finest old men that ever served--by the way, he was my commanding officer years before in the old battleship Kansas when he was a captain.²⁰ By this time he was rear admiral and commanding the Submarines Control Force. He was put on the pan terrifically because, being the big man in charge, he should have facilities to do things. Of course, anybody who knows anything about the Navy knows they can only do what they have the money to do with and the time to do it and so on. At that time we just weren't spending money for that type of business.

Anyway, before this job was finished, the politicians in Washington had decided, well, we're going to do something about this, and they gave them unlimited money and time and everything else to set up diving schools and buy equipment, experiment with equipment, and all this, and really get a salvage and rescue organization in the Navy. Well, when the job was over, the S-4 in dry dock and everything, by this time Captain King was in aviation. He had just finished his flight training at Pensacola and he told me, "Look, you ought to get out of this general salvage and get into aviation."

And I said, "Well, admiral, I've got news for you. I was in aviation at one time and liked it very much, but I've never been able to get back in it."

He said, "Well, that's the thing to get into in the Navy now. Get out of this, it's too hard work. When this job is over, come over to the Bushnell and I'll get you sent back to Pensacola, get your rate changed to aviation."

Fine. The job was over and by this time, as I say, here was everything all set, we were going to go right into big schools and everything for salvage and diving...

Q: And you're going to step out!

²⁰ Rear Admiral Frank H. Brumby, USN.

Chief Badders: Yes. Well, I went over to the Bushnell. to see King and he said, "What do you want?"

I said, "Here's my service number and everything. You were going to send me to Pensacola."

He said, "You're not going to Pensacola. You're going to Washington with Hartley to set up a diving school. You'll do the Navy more good in diving and salvage than you'll ever do as an aviator. Get out of here." That was the end of my aviation.

Q: Were you sorry?

Chief Badders: I was at the time, but later it turned out that I was just as well pleased with the other. I went back aboard ship, and Hartley knew what I had done and I told him what I was going to do, and he said, "You won't get there because I've already arranged for you to go to Washington. I don't know when we'll go, but it won't be long."

And, sure enough, in August of 1928 I went to Washington, and we set up the diving school. By the time I got there the school was pretty well set up.

Q: Where was it located?

Chief Badders: In Washington, at the navy yard. At that time, it was the Washington Gun Factory. When I got there, I went right into the class that was in progress and came out a first class diver. Then Hartley kept me there as an instructor. I stayed there until June of 1930.

Q: How many men would be trained and for how long a period?

Chief Badders: The classes ran six months, and at that time we were using about 20 men in a class--it started with about 20 men and ended up with probably 15 out of the 20. .

Q: The others couldn't take it?

Chief Badders: For different reasons they'd flunk out, physically, mostly, and some mentally, and others just didn't have the mechanical ability and things of that kind to cut the mustard.

Q: Then, where were they being employed once they had gone I through this course?

Chief Badders: By this time, in addition to the school, they had decided--up until then the Falcon was the only salvage ship they had, but during all this big commotion thing they decided they were going to have more salvage ships, so they took four more of these same type ships and converted them just like the Falcon, put the recompression chambers aboard, the air systems, and all this business, and made billets for personnel aboard in that line of work. We had a submarine rescue vessel with each squadron of submarines. We had one out of New London, Connecticut; we had one out of Panama Canal, Coco Solo Submarine base; we had one at San Diego with the submarines on the West Coast; one in Honolulu; and one in China. Five of them we had, instead of one, and they were all in the areas where the submarines operated. And they built pontoons. They built a complete array of pontoons for each base, and supplied the ships with diving equipment and about everything we had used on the S-51 and S-4 was made available at these points with these different salvage ships.

Q: This must have automatically given greater assurance to the men who were in submarines.

Chief Badders: I think it did, although we did have problems with submarine men later.

When I went back to the Falcon after the diving school, we used to have submarine drills--this was much later after we'd devised the rescue chamber. A submarine would go out and submerge, then

the Falcon or whatever ship the squadron was with--I'm saying the Falcon because I was in her--would go out

and locate the submarine, plant a mooring around her, put divers down, hook up a hose to some particular compartment and vent that compartment, and then they'd operate the rescue chambers, take a couple of men out of the submarine with the rescue chamber, and then they would blow up different ballast tanks and raise the submarine. That was the drill. Before we'd do these drills in New London, we'd know what boat was going out and that would be all we'd know, and I'd take my divers over to the submarine, go over the thing and see what tank we were going to hook up, what ballast tank we were going to hook up to, and what compartment. We kind of rehearsed the thing. I'd try to get the chief of the boat to help me out, cooperate with me, tell me a little about the different parts of the boat, and he'd say, "Oh, the hell with it. Do it yourself. We don't need you. If anything happens to us, we'll take care of ourselves or we'll stay there." So, okay, Buddy, I'll fix you this time.

Well, they went out and they submerged and we found them. When we hooked up the air hose to the compartment, that went all right, but when we hooked up the rescue chamber we opened the hatch and then dumped a bunch of water right down the hatch. We had a lot of trouble hooking up the hose to the deck fitting; which required him laying on the bottom three or four hours: longer than he would have if he'd been a little more cooperative. We could have brought him up much quicker, but we just wanted to teach him a little lesson!

Q: A hard way to learn! '

Chief Badders: But they really had things lined up in pretty good shape after the S-4 job.

Q: Go back to the submarine school again. How deep dives did you make with the students?

Chief Badders: We went to 300 feet on compressed air. I was one of the first ones in the first class to make 300 feet. We started, of course, in shallow water and worked down to that depth. The 300-foot dive was made in the last two or three weeks before the end of the class.

Q: Where would this be, in the Potomac?

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Chief Badders: No. These things were simulated, in water, in a tank, with air pressure, simulating the depth.

After leaving the school I went back to the Falcon in 1930, and shortly thereafter I made master diver.

During all this time the S-4 had been patched up and put back in commission--not commission, really, they took the engines and everything out of her, but her hull was tight and she had to be towed everywhere. We took her to Key West and did a lot of experimental work down there with her. Momsen had taken over the perfection of the Momsen lung, as it turned out later.²¹ Also in Key West, we had several prototypes of rescue chambers. We had five or six different types of chambers we worked with, developing a means of bringing the men out in chambers instead of using the Momsen lung.

²¹ Lieutenant Charles B. Momsen, USN, developed the Momsen lung in 1928 and first demonstrated it at the Washington Navy Yard.

We spent quite a time down there with that work and we finally ended up selecting this so-called McCann chamber out of the pile.²² The Momsen lung was becoming proficient. It had been used in water down to 250 feet and had come to the surface. So the rescue end was pretty well perfected, in Key West off of the Falcon with the old S-4. And from that, they built the two lung training tanks, one in New London, Connecticut, and one at Pearl Harbor. All submarine men were trained in the use of the Momsen lung....

Q: At this point, would you describe the Momsen lung?

Chief Badders: A Momsen lung is nothing more than an air bag the men wore on their chests, with a mouthpiece, and they charged the bag with pure oxygen. They could rebreathe that as they came to the surface. To come out of the submarine, they'd have to either flood a compartment or use an escape chamber, come into the chamber with the air pocket in the top, put their mouthpiece in their mouth, and fill their air bag with oxygen similar to filling their spare tire at a gas station, and then they could duck out of this compartment hatch or escape trunk--some submarines had one and some had the other--and slide up a line to the surface, the point being to come to the surface slowly, not come too fast, breathing as they came up. When they got to the surface, they could blow this bag up. If they had used all the oxygen, they could blow it up with their mouth and keep it in place and it acted as a life preserver.

Q: How much time was given them by the lung itself? I mean how much oxygen?

Chief Badders: We used them in water as deep as 300 feet and they had plenty of air because you rebreathe this mixture, and in the lung there was a canister of material that took some of the carbon monoxide out as you rebreathed. The only gas you actually lost out of the bag was through what we

²² The 10-foot-high McCann chamber was developed by Commander Allen R. McCann, USN, in the late 1930s and used for the first time in an emergency situation to rescue crew members from the USS Squalus (SS-192) in May 1939.

called the flutter valve on the bottom of the bag that let the excess air out as you came to the surface, to get that same pressure in that thing all the way to the surface you had at the bottom. Even in 25 or 30 feet of water, the bag would bust before you got to the surface by air expanding.

Q: There's no harm, then, in breathing pure oxygen?

Chief Badders: No, not for a given length of time.

Q: And you say that there were training centers set up in Hawaii and New London for the use of these lungs?

.Chief Badders: For training the submarine crews. Every man who qualified for submarine duty had to also be qualified to use the Momsen lung proficiently. Those tanks had 90 feet of water, and they'd come in from the bottom, lock out, and come to the surface. Of course, that was in stages. You'd do it in shallow water and work down. But every man who was in submarines had to be trained in the use of the Momsen lung.

Q: How frequently has that lung been used effectively as a result?

Chief Badders: Actually, to my knowledge, there's never been a real emergency escape with one. And in fact, now they've discontinued it. They don't use it. They found out that a man could come to the surface with nothing just as well as he can with a lung, what we call free escape. Just come up, exhaling as you come, you jump halfway out of the water. . . ²³

²³ The Momsen lung has been used once in a successful escape attempt from a sunken submarine. On 24 October 1944, the USS Tang (SS-306), commanded by Lieutenant Commander Richard H. O'Kane,

Q: And that's not harmful to the body?

Chief Badders: No, because they're not under pressure.

Q: You mentioned the McCann chamber. Now what is that?

Chief Badders: It's a rescue chamber that was finally perfected to the point where it was the device we used on the Squalus, to rescue all the men off the Squalus later on.

The Falcon went back to New London, operating with the submarines, and in May of 1931 I got orders' for the Asiatic Fleet. I went to Tsingtao, China.

Q: Was this something you sought? Did you want to go out there?

Chief Badders: No, nobody wanted to go to the Asiatic Fleet, particularly a married man, a family man, like me. I had two children at that time, a son and a daughter, and I didn't want to go to China Station, but somebody had to go. They only had one master diver out there. They were supposed to have four, and the one they had, his tour of duty was way overdue and he had left, so actually when I got out there there wasn't any, except me.

Anyway, I got ordered to China. I went aboard the Pigeon in Tsingtao.

USN, the most successful submarine skipper during World War II, was sunk by her own malfunctioning torpedo in Leyte Gulf during her fifth successful war patrol. Of 22 crew members, including O'Kane, who managed to escape the submarine using the Momsen lung, nine survived to be picked up by a Japanese ship and held as prisoners until the end of the war.

Q: And your family had to stay here?

Chief Badders: I didn't take my family out there, because the Pigeon and the submarines would operate five months out of Manila, and then we'd take a month to go to China and operate five months in China, then make the same trip back. We were operating all the time. We were out practically every day, except some weekends we'd get in. Once in a while, we'd have a week or two lay-in at Mariveles or Manila, and sometimes in China we'd lay in a week in Tsingtao or somewhere in that area.

Well, I was the only master diver on the whole Asiatic Station. I had ten first class divers on the Pigeon, 12 second class, and I had anywhere from eight to ten first class divers on Canopus. We had to keep those men requalified. Regulations required a man to make four dives every six-month period to retain his qualification, which meant we had some diving to do. In each case we'd get some projects on the bottom to try to keep the men in some kind of training for any disaster that might come along. Fortunately, we had no submarine disasters during my time out there.

Q: Incidentally, was it similar for the submarine, requiring to dive frequently, and the men got extra pay as a result? Did divers get anything?

Chief Badders: Yes, a first class diver got \$15 a month. A master diver got \$20, a second class diver got \$10, and if you made a dive more than 150 feet you got 20 cents a foot for one dive. You could only earn a certain amount of money. If you made ten dives, you only got paid for one. You could make as much as \$30 a month extra pay, but this would only happen about once every six months. But, as I say, a master diver got \$20 a month; that was as long as you were qualified.

Q: Was there any difference in diving in the Far East, as contrasted with the Atlantic?

Chief Badders: No, there was practically no difference. There was some difference in the undersea light. For instance, in Mariveles Bay we were making some night dives and using a diving light. The custom

was for the master diver to make the first dive. Then he can come up and be on deck to take charge of all the other diving operations as diving officer.

Q: He surveys the situation?

Chief Badders: Right, supposedly. So I made the first dive; I hit the bottom. I wasn't down there very long when I see all these, I thought, little eels about the size of my thumb in diameter and about a foot long and they were darting around this light. Some of them got inside the wire mesh protecting the bulb of the light, and I told them topside to take the light up, it was only creating a disturbance down there, eels and things were attracted by the light so that it was doing more harm than good. So they pulled the light up on deck, and I heard a commotion over the telephone up there, and I couldn't imagine what it was. Then I got orders to come up. I came on up waiting for decompression. It took me about half an hour to get out of the water. I'd been diving in about 160 feet of water, and when I got up, a pharmacist's mate while I was on the decompression station said, "Look at your hands. Make sure your hands are not scratched up." Your hands are the only thing not protected in the water, you know. I couldn't see any scratches or anything on my hands, and that's all he said.

Then I found out that these damned things weren't eels; they were coral snakes. I must have landed right in a bed of them because there were millions of them down there.

Q: They're poisonous!

Chief Badders: Very poisonous. They're little black snakes, they never get very big. Panamanian fishermen brought them up by the bundle sometimes in their fish nets, and they'd pick them up by the tail and knock their heads off on the side of the boat.

Q: They're more deadly than rattlesnakes!

Chief Badders: That's right. At that time, out there, they'd say if you were bitten by a coral snake, that's it, you've had it. I guess maybe I was lucky, I didn't get the least scratch or anything, but they were more interested in the light than they were in me. They probably didn't even see me; the light would blind them. While I was out there we got an SOS--we were in the China Sea at the time--and we went to see what it was all about. It was a ship on fire, apparently a Japanese ship, the Kaku Maru. The crew had all abandoned her already and was all out in lifeboats, and we went alongside and started pumping water into her. We fought the fire for 24 hours and put it out. The crew came aboard and by this time the engine room was all out of commission; the fire had burned, and the cargo had never caught fire. We had looked in the cargo hatches and the hatches were all coal from what we could see, so we figured it was a cargo of coal going to Japan.

Later this ship was brought in to Manila Bay and they started to unload this thing, take the coal out of her, and there were only 3 or 4 or 5 feet of coal on top of five-gallon cans of aviation gasoline in cases, two cans in a case. Everyone of the cargo holds was full of cans of aviation gasoline. If the fire had ever gotten to the cargo holds, we'd have been blown sky- high, everybody.

Q: What was the purpose of disguising it?

Chief Badders: I don't know, never did find out just why they did that. There had to be some reason, trying to smuggle the stuff in or tax or duty or something. I don't know.

Q: That's why they abandoned ship so quickly!

Chief Badders: Yes, absolutely. They thought the fire was going to get into that gasoline. They weren't going to stay there and try to fight it. They got off. They could have probably put it out if they'd stayed aboard and kept their firerooms going for steam for pumps. They could have pumped water, but they just

pulled fires and beat it! And they didn't tell us anything until way the next night, and our crew was really hostile with those people. We finally brought them aboard the Pigeon and fed them and let them wash up and things of that kind, and they still didn't say anything. Some other commercial company brought it in, unloaded her, and they called our skipper over.

Q: That was an example of their secrecy.

Chief Badders: Yes. There was another passenger ship that hit the rocks and turned over on her side, and we did some work on that. We didn't salvage it. The Japanese themselves went in and salvaged that. On this fire thing, I got a letter of commendation from the Commander in Chief of the Asiatic Fleet.

Q: What was that at the time?

Chief Badders: It wasn't Hart. It was the man ahead of Hart.²⁴

Q: Yarnell?²⁵

Chief Badders: Might have been. It was a funny thing about that passenger ship. She hit the beach and hit the rocks and she was rolling over on her side as she flooded, and never would have been completely under water, of course, because she was aground, but the passengers were abandoning this thing. They'd come down the high side of that ship on lines and hang onto those things with their feet out of the water. They threw hundreds of lines over the side, and these people would hang on the lines with their feet and

²⁴ Admiral Thomas C. Hart, USN, Commander Asiatic Fleet from 1939 to 1942.

²⁵ *Admiral Harry E. Yarnell, USN, Commander Asiatic Fleet from 1936 to 1939.

knees pulled up under their chest, wouldn't even get their feet in the water, until they'd almost pass out and then they'd drop off the lines and damned if a lot of them didn't drown. If they'd had sense enough to let themselves into the water and take their weight off themselves, we could have rescued dozens more than we did. Twenty-five or 30 people died before we could get to them. They couldn't understand what we were trying to tell them, to get in the water and hold onto the line. There were lifeboats out there trying to pick the people up and instead of picking up people they were picking up suitcases. People had thrown suitcases and great big old grass bags overboard, and the people were picking them up instead of picking up the people. The Japanese took that over and salvaged her and brought her in.

Q: Did the British have any salvage operations out there?

Chief Badders: They had some with their submarine squadron out of Hong Kong, nothing near to what we had on the Pigeon, though. Just how much they did have I don't know, but I do know that they weren't nearly as well equipped as we were. For instance, they didn't have a salvage vessel designated as such, and the only divers they had were on the tender.

Q: In Far Eastern waters, were sharks a problem?

Chief Badders: Not a problem, really. We had them. Also in Mariveles Bay I guess there's more sharks per square foot there than any place else in the world that I've ever been, but they didn't bother anybody. They were nosy. They'd swim up close to you and look around, but you make a quick move and they're gone. If you ever got excited and maybe cut one of them and started blood flowing around, that might have been a different story, they'd start fighting among themselves. But we never had anyone from the boats be attacked by a shark.

That was something in Key West when we were working on the Momsen lung, which meant that we were just in swimming trunks coming out of a tank we had on the bottom and coming to the surface. Around Key West and Dry Tortugas and all that area down there is alive with barracuda, and those things were flocking around in our area pretty rapidly. We finally became so concerned about them that

we built a big square of netting and put this tank down inside it so that the barracuda couldn't get through. They were notorious for getting things that were shiny and bright, and we had a lot of valves and things on these lungs and we were afraid they might snap at them and grab a hand or something.

Interview Number 2 with Chief Machinist's Mate William Badders U.S. Navy (Retired)

Place: Chief Badders's home in Annapolis, Maryland

Date: Wednesday morning, 22 September 1971

Subject: Biography

Interviewer: John T. Mason, Jr.

Q: It's very good to see you again this morning, sir. Now I hope you'll resume your account of your tour of duty with the Asiatic Fleet.

Chief Badders: I don't remember just exactly where we were when we cut off the last time you were here, but I believe it was diving operations in Mariveles Bay. I

Q: That is it precisely.

Chief Badders: That was just one of the many experiences we had out there. The diving conditions were not the best normally. Fortunately, most diving that we did, we had no real accidents, particularly in our Navy. We had some work to do for other shipping outfits that didn't pertain to diving. There were two cases of fire, one a grounding and the Pigeon was involved more in saving the vessel. The grounding was trying to save some of the people that were abandoning their ship. It was a Japanese passenger liner that had run aground and was turning over on the rocks as she flooded, and the passengers were slipping down the side on lines and whatnot and going into the water. The crew had lifeboats in the water, but they appeared to be more interested in picking up luggage and stuff of that kind that had been thrown overboard than they were the passengers. The consequences were that some of the people died. We never did know how many, but we did know that some few drowned.

Q: Life is considered somewhat cheaper out in the Far East!

Chief Badders: Yes. Evidently the crew just hadn't been trained in rescue, for one thing. At least, they didn't appear to be. They didn't appear to know how to handle their boats, to maneuver them around among the debris and people. It was just a very disorganized-looking operation. The captain of the Pigeon worked the Pigeon right alongside the vessel, and we took all the people aboard that we could handle. Then we layoff of the wreck for a while; then were told to get out of there, that the Japanese Government would take over, which they did. We turned the passengers over to some other ship that came alongside and we left. Some months later, we were in Tsingtao, China, with the submarine division, and they brought the ship in. They had refloated her and were noticed as she went by where we were anchored they had cofferdamed the whole length of the vessel, pumped her out, and brought her in more or less laying on her side. I understood at that time that they rebuilt the ship and recommissioned her and she went back into service.

We had one other experience. We had an SOS, got to the area, and found a ship burning. The crew had abandoned the ship and were in boats, laying off. We went right alongside and started pumping water aboard and fighting the fire. We fought the fire for about 30 hours and finally extinguished it altogether. It was mostly staterooms and things of that kind that were burning, mostly topside fires. It never did get down in the cargo holds. We had looked at the cargo and assumed that it was coal. Everything that we could see in the hatches was coal, pulverized coal, so we had no concern really of danger as far as the fire was concerned of explosions and things of that kind. This was a Japanese ship, Japanese crew, Japanese flag.

They had in the meantime brought these men who were in the lifeboats aboard the Pigeon and fed them. They couldn't speak to them very well. Very few of them could speak any English and we didn't have any people aboard who could speak much Japanese, so we didn't get many details. But they wouldn't go near the ship until the fire was completely out. We wondered why they had abandoned because it didn't appear to be too awfully bad, except it was a contrary fire to put out.

Some time later we were in Manila and we saw this same ship come in under tow and being unloaded in Manila Bay. We paid very little attention to it, except we happened to look over one day and we see small wooden cases leaving the ship in cargo nets. We wondered what they were. We hadn't seen anything like that in the holds we'd inspected. Then we went over to see what was going on. A couple of us were curious, so we got the boat and went alongside. The contractor that had salvaged this thing and brought it in had discovered that these cargo holds, particularly 1 the forward holds--I'm not sure they were all that way--were full of five-gallon cans, two cans in a case, and these cans contained high-test aviation gasoline. Evidently, they were smuggling this stuff into Japan or wherever they were going--we assumed they were on their way to Japan--and they had put these cases in the lower part of the hold and put about a 10-foot layer of pulverized coal over the top of them. We couldn't imagine any other reason for it being there except to fool somebody about the type of cargo they had.

Then, of course, it became clear to us why the Japanese crew had left the vessel. They were afraid the fire was going to get into that gasoline. If it ever had, it'd have been a real explosion.

That was about the extent of my experience of salvage out there. As I say, fortunately, we had no submarine accidents of any kind. Oh, we had the usual once or twice--mooring lines and propellers and things of that kind which were more or less routine.

The rest of our diving was just more or less a continuation of training, re-qualifying our divers. At that time, and I assume it's still in effect, first class divers, master divers, and second class divers had to make four dives every six months in given depths of water to retain their qualification. So that required about four days out of every six months for diving operations. Sometimes we got four days in succession; sometimes they'd be split up, one day a month or something like that. The first class and master divers had to make their dives in 150 feet of water or more, and the second class were required to go 90 feet and perform some task on the bottom. We used to cook up different things for the divers to do on the bottom.

Then we had scheduled what we termed search, rescue, and blow' operations. A submarine would go out and submerge on the bottom. The Pigeon would go out and locate it, tie a mooring round it, and we would send divers down to hook up salvage hoses to the compartments and circulate air through a compartment, blow a ballast tank, operate the rescue chamber through either the fore or the after hatch, take a couple of men out of the submarine. This was to keep the equipment in operating condition and the crew trained in the type of work that we would have to do if we did have an accident or anything.

Q: May I ask, what is the maximum depth for comfortable diving?

Chief Badders: At that time our first class divers and master divers--they could be qualified first class or master if they were capable of going to only 150 feet, but we preferred to have them qualified to a depth of 300 feet, and most of us were.

Q: What's the difference in technique required?

Chief Badders: The pressure effect on the men's systems was what governed how deep they could go. Some men could take more pressure than others and retain their senses of direction and capability of performing tasks. Pressure affects different people in different ways. I'm speaking strictly of using compressed air as a breathing medium, because we hadn't got into the helium-oxygen gases yet. We tried to make our re-qualifying dives for first class and master divers between 150 and 200 feet, somewhere in that neighborhood. Very rarely did we put men down over 200 feet because it took extra time for decompression and it wasn't likely--well, you're just as likely to have an accident in 200 feet of water as in 100 feet, but it was figured 200 feet would be about the normal working depth for first class divers. We tried to keep our men well-trained and in physical condition to go 150 to 200 feet at any time they'd be called on to go down and do any kind of a task that they were qualified to do.

That just about took care of all the diving operations.

At that time the Pigeon had dual duty. Her primary function, of course, was working with the submarines on the surface, towing targets, and maneuvering with them, and things of that kind, which required the majority of our time. Although diving and salvage were primary requirements for her out there--and that applied to all the rest of the salvage ships we had in the Navy at that time--they all had other things to do that appeared to be more important than the diving and the salvage program they were supposed to carry out.

Q: Well, diving and salvage are related to emergencies, aren't they?

Chief Badders: Yes, and of course the farther apart the emergencies come up, the less interest is shown toward that type of work. You'd say, "Well, we haven't had an accident in three or four years. It looks like we're not going to have any for a while so we have other things that are more important to do."

We had other activities out there. I played a lot of golf in Manila, and some in China, not too much. I played baseball in a professional league in Manila. In China I played with the submarine division team and my team coach and manager at that time was a submarine captain, Lieutenant Roscoe Good. He later became a vice admiral and had one of the big commands in the Far East.²⁶

We won the championship, too, by the way, three years in a row under his coaching and management. When he was sent to the Far East, I sent him a letter and told him that it was quite a jump

²⁶ Lieutenant Roscoe F. Good, USN, who later held the three-star billet of Commander Naval Forces Far East from 1956 to 1957.

from lieutenant and baseball manager to go up to supreme command. I had a nice reply from him that he still remembered the old days and the baseball and what wonderful duty it was.

Q: Athletics must have been a very important element for the crew on duty so far away from home.

Chief Badders: Well, it was a source of entertainment. There wasn't much for people to do out there except go sightseeing. If they didn't want to hang around the gin mills and dance halls and places drinking and hanging round with the girls, there wasn't much to do except go to baseball games or any other entertainment that the Navy could cook up. So this baseball was a great thing. We played as often as we could and practiced a lot which, in turn, turned out some pretty good teams. We had the submarine division team and the destroyer division team, and the heavy cruisers had a team. Then the individual ships had teams. Individual destroyers had teams, and they played against each other. It created quite a bit of entertainment for people that were interested in athletics.

A great number of the enlisted men played golf, particularly in Manila, at the old municipal golf course. We used to run tournaments and things out there among ourselves and we had quite a time. By the way, I made a hole in one on the municipal golf course in 1933, on April fifth, which is my son's birthday, so I thought that was quite an occasion. It just proves that a hole in one has to be all luck. It can't be science, because I was probably the worst golfer that ever golfed, but somehow or other on a par-three hole I got lucky enough to roll the ball in on my drive.

I have gone ashore on Sunday morning and played 18 holes of golf and sometimes another nine. We would play 18, then go to the 19th in the old Manila Hotel, have a sandwich and a stein of beer, and if we felt real good we'd go out and play another nine. Then I'd get out of my golf shorts into baseball uniform right in the locker room and head for the baseball park and play a baseball doubleheader in the afternoon. As I said, the league in Manila was a professional league. It had two military teams from different Army positions around there. They had a team from the Cavite Navy Yard, a civilian team from in town sponsored by one of the rubber companies, either Goodyear or Goodrich. Then the only

place in the world that I ever heard of a college playing professional baseball, the University of the Philippines team played in the league.

It was strictly a professional league, because you signed contracts and you got a salary, just like the leagues here in the States. It was a good league. It compared to, oh, I'd say AA ball in the States.²⁷ We not only played among ourselves, the league schedule, but we played independent teams that would come down from Japan. I played against the American League All-Stars. Lou Gehrig brought a team out one year.²⁸ Then I played against the colored team that Satchel Paige brought out there, two years.²⁹ I hit the longest ball I ever hit in my life off of Satchel Paige. Strictly luck again, the same as my hole in one in golf. He had a three-and-two count on me, and I knew what the next pitch was going to be. It was one of his high, hard ones that he could throw and make it look like a golf ball coming at you. Well, I started swinging when he started winding up and I , caught the ball just right and knocked it completely out of the park. The hardest ball I ever hit. We'd gather an all-star team from our league and play them, and then we'd take an all-star team from the military organizations and play them. They ended up playing

²⁷At the time, AA was the top classification in minor league professional baseball.

²⁸Henry Louis Gehrig (1903-1941), longtime first baseman for the New York Yankees, most valuable player in the American League in 1936.

²⁹Leroy "Satchel" Paige (1906-1982), star pitcher in the Negro League from 1924 to 1948, entered the major leagues at the age of 42 and played five years with the Cleveland Indians and the St. Louis Browns.

five or six games in Manila, and then they'd go on to Japan and different places. I enjoyed playing with those colored people more than any baseball I ever played, I believe, because you could certainly learn things from them. They were, without a doubt, the finest baseball players in the game at the time. Paige would pitch not every day but every other day anyway, because, after all, he was the big drawing card. The thing about Paige, at that time he not only was an outstanding pitcher, but he could hit a ball anywhere any time he wanted to. We had some darned good pitchers out in that league. We had a couple of Marines out there who quit the service and came up and played in the Texas League. Another man who was pitching for us quit the I Navy and came up and pitched in the International League. So they had to be pretty good ballplayers. I've seen Paige stand in the batter's box until he got two strikes on him and he'd point to one of the outfielders to put him in position and tell him: that's where he was going to hit the next pitch that got over the plate. And, sure enough, he hit a line drive or a ball almost in the man's hands out there, if he didn't want to get a hit. If he wanted a hit, of course, he'd try to put it somewhere else. If he needed a run or two or he didn't need a run, it was just showmanship, he'd just drive the ball to a particular man in the outfield against one of these pretty good pitchers.

We had a lot of fun with the colored fellows. We never beat' them. We couldn't beat them. We'd come close, and they'd turn on the works and go just as far as they had to go to keep from losing. That's about all the athletics we had out there. We didn't play basketball, but we had fighters. We had fighters and wrestlers in the fleet, and they were pretty active. I never did go in for any of that. I guess I was a little old for it. I wasn't cut out for fighting and wrestling, anyway.

Q: What percentage of the men would you say went in for athletics of one kind or another?

Chief Badders: Percentagewise, it's kind of hard to say. On my particular ship there was only myself and one other man that played baseball. Our crew was too small to have a team in the ship. The two of us

played with the submarine division team. So that was two out of, say, 75. That's a darned small percentage.

Q: Yes, it is.

Chief Badders: We didn't have any fighters or wrestlers. We had 10 or 12--I'm speaking strictly of the enlisted men now--that played golf. I think just about all the officers played golf. I would say maybe 10% of the crew of the majority of the bigger ships would be in some type of fleet competition--what you'd call in school intramural stuff. They had boat crews, some boat racing, whaleboat racing and stuff of that kind. There was no track, basketball, or any of that kind of thing. I didn't even see swimming events. It seemed to me that would have been a good sport to produce out there, but I didn't ever see any of that going on. Primarily baseball and fighting and wrestling in the fleet just about took care of all the competitive athletics. Playing golf, of course, didn't amount to much.

So in 1934 I was playing ball. We were getting ready for a fleet championship, and Lieutenant Good had our team up in Olongapo getting some practice for the first championship game we were going to play the coming weekend. I used to slide when I was going into a base on a close play. I'd slide on my chest and go in headfirst and only give the baseman a hand to tag at when I went into the bag. I was trying to score on an infield ball and I made my dive for the plate. I went too far, my spikes kind of carried too far, and I rolled over. I stuck my arm out to protect myself, and my elbow stuck in the sand and shoved my arm all the way up to my neck, tore my shoulder all to pieces. I went to the hospital. They fortunately had a great bone surgeon in the Canacao hospital at that time, in Cavite, and he fixed my arm up real well. It took about three months to do it.

In the meantime my enlistment had expired--my enlistment expired before that, but they were keeping me out there overtime because they hadn't sent another master diver out there to relieve me. I think the commanding officer of the Pigeon thought that I hurt my arm intentionally to get off of the

ship so I could catch a transport to come borne. The prime thought in everybody's mind out there was what transport you were going to get to get home. I remember one time I was back on the fantail of the Pigeon sitting on a winch. I'd been fishing and I had my fishline off of the reel going down into a manhole going into what we called the after cargo hold of the ship. I'd been drying the line off, and I was reeling it back up. The captain walked back to the fantail and he saw me there with this fish pole and reel with the line down a manhole going into the after hold. He said, "What are you fishing for in there?"

I said, "I'm fishing for a transport. I'm trying to get out of here. See if I can't catch a transport."

He said, "Well, give me that rod and move over. I'm looking for one, too."

But, of course, that's not the reason I tore my arm up. I ended up doing a little over three months in the hospital and, as I said, by that time I was about four months overtime on my enlistment. They loaded me on a transport and sent me back to the States. I was discharged in San Francisco and reenlisted right away. I came here to Washington and looked around to see what kind of a billet I could get. There was nothing open at the diving school, experimental unit for a master diver. I had never had duty on the West Coast, and there was a billet open in the old USS Holland submarine tender and repair ship, for a master diver. So I asked them to send me out there and they did.

The family and I went out. We drove across country. First time I ever drove a car across the country. I bought a big old Buick and passed everything on the road but a gas station. I went broke before I got to California and had to send a telegram to friends of mine to meet me with some money in Phoenix, Arizona. I didn't have enough money to make the rest of the trip. I had enough to get to Phoenix, and when I got there I'd be broke. Sure enough, when I got there I had some money waiting for me at the telegraph office, to get the rest of the way out to San Diego.

I had a very pleasant tour of duty on the Holland. There, athletics was a big thing. I had a nice bunch of equipment on the Holland, diving equipment, and she was designed to make a lift over her

bow. She had big sheaves up in her bow that could be rigged for making a lift, I think capable of about 80 or 90 tons. We never used it during my time on the ship but it was there in case we ever needed it. I think it was there primarily to assist in changing propellers, to lift the stern out of the water for propeller changes. I never saw it used all the time I was on the ship.

There, again, diving was a very primary activity. They had also in San Diego the Ortolan, a salvage and rescue vessel the same as the Falcon and the Pigeon, and when it came time for me and my divers on the Holland to make our re-qualifying dives we were sent to the Ortolan for three or four days and we'd go out in deep water and make our dives. That's about all the diving we did in the Holland, re-qualifying dives. I used to take my second class divers out in a motorboat and put them down in 90 feet of water from a motor launch, using high-pressure air for them to breathe.

I was active again in baseball and football. I wasn't able to play much baseball at that time. My arm never did completely recover from the accident I had in the Philippines. We had a real good baseball team on the ship. We played different ships around that area and civilian teams ashore. By the way, my team--I was manager and coach of the team on the Holland--played the San Diego high school some practice games and Ted Williams was playing ball for the San Diego high school at that time.³⁰ Even then, and this was in 1936, we could never get him out. He'd just drive the ball down somebody's throat in the infield or send it out of the park. He was quite a ballplayer even when he was a high school boy. Of course, none of us ever thought at that time he'd ever become the great ballplayer that he did.

That was strictly a ship's team, and then we had the submarine division football team that operated from the Holland. All the equipment and everything was on the Holland, and the players came

³⁰ Theodore S. Williams (1918-), longtime (1938-1960) outfielder for the Boston Red Sox, was the most valuable player in the American League in 1946, earned six batting titles during his career, and is a member of baseball's Hall of Fame.

from the Holland and all the submarines. We had a real good football team. Oscar Hagberg was the regular coach.³¹ He was executive on one of the submarines at the time. He later became head coach here at the Academy. I don't remember the years he was head coach here, but he had a very successful time. I guess he might have been one of the last active duty coaches that the Academy had.³² I'm not sure about that either because while all this was going on I was in the Panama Canal. But I was one of his assistant coaches for the football team. We used to leave the ship every day at noon during the football season, go to the foot of Broadway, where the Navy had an athletic field. We kept all our equipment in a locker room ashore, and we'd practice all afternoon about four days a week, and we played our games on Saturdays, sometimes on a Sunday, but generally our games were on Saturday afternoons. We played everybody. We played the different ships, the battleships up in San Pedro, and the different division teams around. We played San Diego State College, scrimmaged against them about twice a week, every week. We won way more games than we lost. Our big competitor there was the Marine Base. The San Diego Marine Base had a crackerjack team, too, but they didn't play quite the way we did. For some reason, they didn't seem to have quite the same rules. We could only have two officers on our team, whether they were playing or not. There could only be two men who were considered players on the team. That was the Navy regulation.

Q: What would be the reason for that?

Chief Badders: Well, you could pad a team up with Naval Academy graduates, stars from the Naval Academy, and have a much better team than the one that didn't have the number of officers aboard.

³¹ Lieutenant (junior grade) Oscar E. Hagberg, USN, then serving in the USS Bonita (SS-165).

³² As a lieutenant commander in 1944-1945, Hagberg compiled a 13-4-1 record as head coach of the Naval Academy football team. He was succeeded by another active duty naval officer, Captain Thomas J. Hamilton, USN.

And, after all, they figured that this type of endeavor was an enlisted man's activity anyway, not so much for the officers. But the Marines had a regulation that they could play two men at a time. They could have as many officers on their team as they wanted so long as they didn't have more than two playing at a time. I don't know why their regulations didn't come under the same heading as ours because I always figured a Marine was a sailor with his--well, I won't say what I was going to say--but they should have come under the same regulations we did. Anyhow, they would have some pretty good ex-college men, a couple of Naval Academy men and they played pretty good football. They used to give us about as much trouble as anybody we played. Always good clean rivalry and a lot of fun.

Well, in 1936 one of my old commanding officers from the Pigeon had taken over the experimental diving unit in Washington, and I received a letter from the Navy Department--we were on a maneuver to the Panama Canal. When we arrived in Panama and the mail came on board, I had this letter from the Navy Department, from the man who detailed divers all over the Navy, telling me that Lieutenant Commander Hollowell had requested that I be considered for duty at the experimental diving unit.³³ At that time, that was strictly volunteer duty and I didn't have to accept it if I didn't want it.

So I wrote right back and told them I would accept it, because I was very interested in what was going on and what was expected to go on in the experimental diving unit. When the fleet got back to San Diego, I was detached and transferred to Washington.

Q: That intrigues me. What was expected to be developed at the diving unit?

Chief Badders: Right at that time, I wasn't sure of everything that was going on, but I knew that underwater burning and welding were being developed. I had been with underwater burning in the Navy

³³ Lieutenant Commander John A. Hollowell, Jr., USN.

from the time we used it on the S-51, and I'd had about as much experience with it as anybody in the Navy at that time. I thought that I could be some help to them there in developing the I technique and equipment. So anyhow, I accepted the duty at the experimental unit, and when the fleet returned to San Diego, I was transferred to Washington.

For the first year or so we devoted most of our time to underwater burning, both gas and electric arc, and underwater welding. It just started at that time, 1936. We had many crude tools to work with, in the welding particularly, and we spent our time redeveloping these things and getting material and equipment that we could really work with. It became apparent in a short time that arc welding could be done underwater.

Q: This would be on the exterior, on the hull?

Chief Badders: Yes.

Q: Would you explain that a little more, the method?

Chief Badders: Well, it's done exactly the same way it is on the surface except that the electrode holder must be insulated from salt water, or any water, fresh or salt, and the electrode that was being used must have an insulated coating on it to protect it from the water. Otherwise, the arc would go out the side of the rod, which has happened many times, and we had a bubble in the insulating material. We used many different insulating materials, trying different things out. We started out with beeswax, dipping the rods in molten beeswax. Then we used cellophane dissolved in acetone, dipped the rods in that, and that was a pretty good insulating material. Later there was some commercial stuff that was used to dip these electrodes in. You use the same electrodes that you use on the surface welding, except in this instance it was dipped in this insulating material before it was used underwater. The method of welding was almost

exactly the same as welding on the surface.

Q: At what depth was it feasible?

Chief Badders: Any depth. Depth has very little effect on welding. Originally the idea was that you just wouldn't be able to strike an arc in water. It had to be an area where there wasn't any water. We used different things to try to make little air pockets for the electrode to work in, similar to the gas- burning torch, but, of course, that didn't work. Then we found that the arc would form itself underwater just as it would on the surface, almost the same. The arc is so hot that it created its own air pocket around itself. The thing about underwater welding, of course, is that it's cooled much quicker than it is on the surface and it becomes brittle. But I had welders in the Panama Canal--we'll get to that later but it's a good time to mention it here.

We developed welding in the Panama Canal to the point where I could take expert welders out of a boiler shop or a shipfitter's shop and make divers out of them, and they could perform welds underwater on ship hulls and things of that nature with 80% of the efficiency that they would get in the boiler shop. So that would be darned good temporary repair and, in some cases, they proved permanent.

Q: In some cases it didn't have to be done over again?

Chief Badders: Right. Then the Bureau of Mines Safety Appliance Corporation in Pittsburgh came out with a new tool. At that time, they called it the velocity power tool that drove steel projectiles into steel plates for bolting up plates over holes and hollows and things of that kind. That was a lot of work perfecting that unit. They had four or five different tools. They had one for driving in studs, one gun would drive a solid .stud in a plate with a threaded end on it, put a nut on it, slip a plate over the stud, and hold another plate down. The same gun fired a hollow stud that you could drive through the hull of a boat and hook something up to it, an air hose, and circulate air through it--a small stud, of course, but after all it would be enough air to sustain life in a compartment, which we could have done, for instance,

going way back on the S-4 job if we'd had something of that nature. We could have slammed it in the hull

of the S-4 in that forward torpedo room and circulated some fresh air and kept those men alive.

Then they had a so-called rivet expander. It would drive a stud into the center of a loose rivet and expand it, tighten it up. A cable cutter for cutting steel cable up to about an inch and a half in diameter. These things were all fired like firing a gun. The projectiles had a firing cap and were loaded with powder, and that's the secret of the whole tool. The number of grains of powder in the load determined how thick a plate you could drive a given stud into. We had studs that were good for from 3/8 plate up to 1-1/8 inch, but, of course, the thicker the plate, the more powder had to be in. These studs were all marked with the plate thickness that they were designed for.

That required a lot of time, bringing these tools to the point where they could be used. They were developed, or at least they were accepted primarily by the Navy, for fire control work aboard ship, and they could be used in many phases of salvage. I used it extensively in the Panama Canal later.

We were diving deeper in the unit by that time. Most of the men there--I guess all of them--were qualified for 300 feet when they left the diving school. We had another master diver there and myself, two masters, and ten first class divers. We were considered to be guinea pigs more than anything else when it came to diving, for working out new decompression tables to prevent the bends and other tables for treating the bends for the men who were afflicted with them.

Helium and oxygen mixtures were just beginning to see the light of day as a breathing medium for deeper diving. There had been some experiments with this gas as a breathing medium back in 1925. Gunner Tibbals and two or three men had done a little bit of work with it, but it never was developed to any extent.³⁴ But it was known that it could be used as a breathing medium, and it had two advantages

³⁴ Chief Gunner Clarence L. Tibbals, USN.

over compressed air--one that the men could dive deeper. When you go as far as 300 feet with compressed air, it affects the thinking ability of the men. You get two or three different symptoms. One, you're over-exhilarated; you think you can do great things and think you are doing great things when you're doing nothing except getting in trouble. Another condition is the man just more or less passes out. Oxygen exhilaration is what it amounts to, because, at that pressure, the oxygen content of the air is just too great for men to breathe. So the oxygen content has to be cut down to go any deeper, and that's exactly what the helium would do. Instead of mixing helium with compressed air, they'd mix oxygen with helium and bring the oxygen content to the percentage required for the depth the man was going. We were working with this and getting some results, not too good, but we had designed a re-breathing system for the diving helmet where the gas could be re-circulated through the-helmet and breathed over, because you couldn't just shoot helium and oxygen through an exhaust valve to the surface like you did compressed air. It was too expensive and too big a problem of supplying it.

Q: Was there any special danger, too, in handling helium?

Chief Badders: No. Helium is a very safe gas to have. In fact, I would rather have helium--our helium was all handled in steel flasks like the oxygen, and I'd rather handle the helium bottles than the oxygen bottles. There was always the possibility of fire over the oxygen and, of course, helium was just nothing. We never had any problem at any time with either one of them really, but I think oxygen would create more of a hazard at any time than helium would in storage and handling. Of course, anything under that high pressure--those bottles are charged up to 1,000 pounds--there's always the potential for an explosion of some kind, something tearing away.

We went ahead with our deeper diving with the helium, and we'd go down to about 350 feet, I guess. We had worked out recompression tables, both for diving and for treatment of bends, in the tanks

of the experimental unit, and then we went to the Falcon in New London and went out and did the same things in the open sea. That was a cold-water operation. They wanted to prove these both in cold water and in warm water. So we went to the Falcon out of New London and went up around Portsmouth and the Boston area, up in through there, and tried these tables in cold water to see if it made any difference to the effect on the human body.

Later we went to the Mallard in the Panama Canal to do the same thing. Working these tables, we'd start at 100 feet. We'd put all the divers down, like today we'd be down 100 feet and run the tables that were designed for that depth. Then the next day we'd go out to 125 feet, and 200 feet and on down. Well, we had worked up to the 200-foot depth and each time we made a new depth it had generally become my function to make the first dive at each new depth. We were making a 225-foot dive way out in the Pacific from the Panama Canal--when I say way out I mean 100 miles or so out, somewhere between the Panama Canal and Cocos Island--and I got dressed to go down. We'd been diving in the tropical waters there which are warm, of course, and I was using under my diving dress a pair of dungaree trousers and sweatshirt, well, undershorts, of course, and that was all the clothes I had on. We used our diving dress with the cuff on it and not the gloves, which meant your hands were exposed. I started down, and I got almost to the bottom on this descending line and something hit me just like ice skating and the ice had broken and I'd fallen in the water. It was just that cold, that quick. I told topside, over the phone, to stop me, there was something wrong, hold me there for a minute. Meantime I stopped myself as best I could from sliding down this line. I said, "I'm freezing down here. It's cold. I'm about to freeze." Nobody would believe me, so I said, "Well, my hands are getting numb, it's so cold, I can't control my valves. You'd better take me up out of here and find out what this is."

Well, they were still debating up there. They thought old Bill Badders had finally gone nuts or something. So I said, "If you don't bring me up, I'm going to blow up," and I began to tighten up my suit

and up I went. I was only down for a minute or two, so it required practically no decompression. I think I stopped at 10 feet for a few minutes and then came on up.

Commander Hollowell wanted to know what had happened to me, and I said, "I don't know what it was, but there's something down there. Just all of a sudden you hit cold water. It's actually so cold that you've got to be prepared for it. You've got to have the dress with gloves on it and wear heavy underwear, or you're going to be too cold to dive."

So they put a maximum and minimum thermometer down and, sure enough, the temperature of the water changed from 70-some degrees to down in the 40s. It was that Humboldt Current coming in there, underwater. They didn't realize it was in that area. So we had to move operations. We weren't getting any warm-water dive there, at that depth. We had to move out of that particular area and get warm-water diving.

We finished that operation in the Canal Zone and went on back to Washington. About that time Hollowell was detached, and Momsen took command of the experimental diving--Swede Momsen who, previous to that, had developed the Momsen lung.³⁵ Then we really got going on the helium and oxygen procedure of diving, and we were working down deeper and deeper all the time. I don't just remember the year, but it must have been 1937 when McDonald, the other master diver in the unit, and myself, made a dive apiece at 500 feet in the simulated dives in water under pressure in the diving tank, using

³⁵ Lieutenant Commander Charles B. Momsen, USN.

helium and oxygen, and we came out with no ill effects.³⁶ And the beautiful thing about these dives, as I said, with compressed air anything over 100 feet you would have been very inefficient. You'd have not been able to think clearly and do things that you should be able to do on the bottom. But with helium and oxygen you were practically normal, almost as normal as on the surface, and we proved that by doing mathematical problems and conversation and other things. So these 500-foot dives were made with no effects at all. Neither one of us had the bends. Our recompression table proved efficient.

Then again we left the unit and went to the Falcon in New London. We were going to make these same dives in the open sea. Here again we were working down a few feet each day. We had just got to 375 feet, I guess, and we had bad weather--fog, as no place else in the world has it like Portsmouth, New Hampshire. We just couldn't get out and operate. We had a limited number of days to use the Falcon. She had to go back to New London and operate with the submarines and our date was set and firm; we had to be finished with her on a given date. The day before our last day with the Falcon it cleared enough to let us get out to sea far enough to get in 420 feet of water, and I made a dive from the Falcon to the bottom in 420 feet of water. That was the deepest dive that had ever been made at that time in the open sea.

Then we had to get out of there and get back in, get our gear and stuff off the Falcon and drop them at New London, and we went back to Washington.

We were still doing more work with the helium and oxygen and perfecting the equipment, working on the recompression tables, and on the 23rd day of May 1939, about 10:00 o'clock in the morning, we got word that a submarine was down just outside of Portsmouth, New Hampshire, for us to stand by with our personnel and equipment for orders. We would probably be ordered to the area as soon as more details were learned.

³⁶ Chief Metalsmith James H. McDonald, USN, who later was awarded a Medal of Honor for his part in the May 1939 rescue of the crew of the USS Squalus (SS-192).

So we began to get what meager equipment we had together and ready for shipment. We didn't know how we were going to get up there, if we had to go. Some of the men rushed home and got a change of clothes, packed a small bag, and things and sure enough, about 11:00 o'clock it was determined that the submarine was down and there were men aboard--all hands were aboard, but some of the men were alive—and for the experimental unit, equipment and personnel, to get to the scene of operations as soon as possible.

Q: This was the Squalus?

Chief Badders: That was the Squalus.³⁷

Three other men and I took quite a bit of the equipment over to the Anacostia Naval Air Station, and we caught a Marine Reserve amphibious plane from there and flew into Portsmouth. We got in that evening.

Momsen, Dr. Yarbrough, and Dr. Behnke and some other divers had taken another plane and got in a little ahead of us.³⁸

³⁷ U55 Squalus (SS-192), commissioned in March 1939, began a series of test dives off Portsmouth, New Hampshire, in May of that year. On 23 May, failure of the main induction valve caused flooding in her aft engine room and she sank stern first to the bottom.

³⁸ Lieutenant Oscar D. Yarbrough, MC, USN; Lieutenant Albert , R. Behnke, MC, USN.

We arrived at the yard that evening, and by this time it was determined that there were 33 men alive aboard in the forward part of the submarine, but they hadn't been able to make any communication with anyone in the after part. They weren't sure whether there was anyone alive back there or not.

Q: How deep was she?

Chief Badders: In 242 feet of water.

We got our equipment in operating condition and were transported by fast boat out to the sister ship of the Squalus, the Sculpin, standing by out there, and we were waiting for the Falcon. She was in New London, Connecticut, and she was speeding to the scene of operations as fast as she could with men and equipment and the rescue chamber. She arrived sometime early in the morning and got in position for diving operations. All of us people who had come down from Washington left the Sculpin and went aboard the Falcon.

Of course, the first order of business was to see what could be done about the men who were trapped in the submarine. They had broken the telephone cable on the buoy that was released internally from the submarine. The Sculpin had picked it up, and it drifted away with the buoy too far and put a strain on the cable and broke, so the only communication was through oscillators and people hammering on the hull. But before the telephone cable had broken, Lieutenant Naquin, the captain of the submarine, had told the commanding officer of the Sculpin that he had 33 men up there and he was unable to communicate with anyone aft. He didn't know whether anyone aft was alive or not, but he knew there were 33 men alive in the forward torpedo room and all in good shape.³⁹

This buoy cable being broken loose from the Sculpin left us with no means of knowing just exactly where the submarine was. The Coast Guard was out, and one of their boats was dragging

³⁹ Lieutenant Oliver F. Naquin, USN.

grapnels around and he hit the grapnel into her. They plumbed that up and down and indicated where the ship was. When the Falcon planted her moorings, they were planted around this area, of course, and then that line was used as the down line for the first dive that was made. The first business, of course, was for a diver to go down and hook up the down-haul wire and the rescue chamber, the wire that pulls the chamber down through the hatch to rescue survivors.

Sibitsky, one of the divers on the Falcon, made the first dive.⁴⁰ He went down this line, and after he hit the bottom, just a second or two after he reached the bottom, he said, "You're not going to believe this, but this grapnel hook is caught in the railing not more than 3 or 4 feet from the forward hatch of the Squalus, where we have to take the men out."

It couldn't have been placed any better if a diver had gone down and put it there himself. So the down-haul wire was shackled on with this grapnel line and lowered to Sibitsky and he hooked the down-haul wire up all in one dive and came up. The rescue chamber was put in the water ready for operations. The crew went aboard to operate it, a diver by the name of Harman and my later partner, operator Mihalowski, were the first two operators for the first trip. The chamber went down, and everything worked fine. We had had previous drills and all. And they brought seven men to the surface.

Q: The chamber could accommodate that number at one time?

Chief Badders: That's what it was designed for, seven passengers and two operators. I was put in the chamber for the second trip with Harman, and I got to thinking on the way down I had operated this chamber probably more than anyone else in the Navy and I knew that it could handle more than seven men. On the way down to the hatch, I decided that I was going to bring more than seven men out on my

⁴⁰ Boatswain's Mate Second Class Martin C. Sibitsky, USN.

trip, for the simple reason that if we only brought seven men out at a time, it was going to require a fifth trip to get all the men out. I knew that they could be brought out in four trips if a man or two extra was brought out in the other trips.

Q: Was oxygen inside becoming an urgent thing?

Chief Badders: No, no. In the rescue chamber there was atmospheric pressure all the time. There was fresh air circulating.

Q: No, I mean within the submarine, so it became imperative to get them out.

Chief Badders: Oh, no. There was no apparent danger to the men. The first trip down, fresh air was circulated through the compartment from the rescue chamber. Clothing, blankets, food, and things of that kind were given to them. The only danger that we thought about was that there's always the possibility of a bulkhead carrying away or something and flooding that area, or gas getting in.

My concern was to get the men out of there as soon as we could because--fortunately, in this operation we had good weather at that time, but there's always a possibility of one of those crazy squalls coming up that they have in that area and having to run to get away with men alive on the bottom. So on my first trip, I brought nine men up. I hadn't said a word to anybody on topside about it, but I came up with the nine men with no difficulty at all, unloaded them, still hadn't said anything. Of course, they're counting these men when they get out of this chamber on the deck of the Falcon. We unloaded them out of the chamber on the deck of the Falcon, and a doctor would examine them real quick. Then they'd load them up and take them to the hospital in Portsmouth.

Well, I was also going to make the third trip in the chamber, and I knew that when I made the second trip. I got the men out of there as soon as I could, dogged the hatch down, and got started down again. I think it was Momsen who said to me on the phone, "You brought out too many men on that trip, but do it again and bring up nine the next time." So I brought nine up on the second trip, which left only

two trips required to bring the rest of the men up. I brought 18 men out of there, out of that sunken submarine. There are their autographs on the wall, on that list of survivors.

Well, on the fourth trip, the operators went down to bring the last survivors out, and on the way up the chamber got fouled up in the down-haul wiring. The down-haul wire got in the gears of the drum somehow or other and fouled the chamber. It couldn't go up or down, so we had quite a time getting that chamber-load to the surface. It took three or four hours to get them up. We had to send a diver down to cut the down-haul wire loose at the submarine, and the chamber had to be pulled up very carefully, because if it came up too fast it could displace water out of the ballast tank and cause some damage or something.

The next day, after all the survivors were off, Admiral Cole, who was the admiral in charge of the operations--he was commandant of the Portsmouth Navy Yard at the time--said, "We've got to determine if there's any life left aft in the submarine. It will require a trip of the rescue chamber, open the hatch aft, and determine for sure if the after part of the submarine is flooded or dry."⁴¹ Well, some overhaul work had to be done on the chamber to replace this down-haul wire and everything, and they waited until the next morning. They did this work during the night, and the next morning Mihalowski and I were selected to make this so-called fifth trip with the rescue chamber to the after hatch. The down-haul wire was hooked up, and Mike and I got in the chamber and down we went.

To make this trip, the chamber had to be secured over the hatch and then pressure built up in the chamber equivalent to bottom pressure; otherwise if you unscrewed that hatch and the after part of the submarine was flooded at 240 feet of depth, and the rescue chamber was under atmospheric pressure, the water would have come right up out of the submarine into the rescue chamber.

⁴¹ Rear Admiral Cyrus W. Cole, USN.

So we had to sit the chamber down in place over the hatch, dog it down with the holding-down bolts, and then build a pressure up in the chamber equivalent to bottom pressure. That meant that Mike and I were in the chamber with pressure built up to 240 feet aft and bolted to the submarine with bolts internal. If we had become incapacitated or passed out from compressed air, we'd have been hooked up down there just like the men in the submarine and no way of getting us out. But fortunately nothing happened.

We got everything all set and let the pressure build up, then opened the hatch and, sure enough, when I first partially undogged the hatch a gush of air came out of the submarine into the rescue chamber. I was down in the lower compartment of the rescue chamber handling the hatch. Mihalowski was handling the valves, pressure gauges, and all in the top compartment, and he hadn't built up quite enough pressure; otherwise the air wouldn't have come out. As soon as he built up a little more pressure in the rescue chamber, the air stopped coming in, and I opened the hatch the rest of the way and it was flooded right up to the neck of the hatch, which indicated there couldn't possibly be any life down there.

We made a report to the topside, dogged the hatch down, released the rescue chamber, and came on to the surface.

That indicated that rescue operations were finished and it was strictly a salvage operation in bringing the submarine up, which we did. We went to work on it with pontoons, drying as many compartments as practical with ballast tanks and whatnot, and raised her. That's a long story of salvage and I don't think you want me to go into too many details of this. I think everybody's read about the salvage of the Squalus.⁴²

Q: Yes.

⁴² See Edward Parks, "Fate Toyed with Squalus Crew on 19th Dive," Navy Times, 3 March 1986, pages 10, 32, and 36. The article is accompanied by paintings which depict the rescue chamber and its attachment to the submarine.

Chief Badders: She was successfully raised.

Q: That must have been a thrill, though, to rescue the 33 men.

Chief Badders: Oh, you know, the first thing I thought of when I made my first trip with survivors, when I opened that hatch and the first couple of men came out of that submarine into the rescue chamber--the first thing that entered my mind was, boy, just why couldn't we have had this when we had those six men alive in the S-4. They had to finally die down there because we had no way of getting them out. If we'd just had that rescue chamber then, we could have saved those six men just as easily as we saved the 33 on the Squalus, in fact much easier because she was only down in 102 feet of water. And we should have had that chamber then because things of that kind had been suggested after the S-51 job, but absolutely nothing was done about it. I'm not blaming the Navy for this, because the Navy can only do what it has the money to do and time to do it, and there just wasn't anyone interested in giving us the money and time to develop things of that kind.

Q: Mr. Badders, with the use of helium and oxygen, what has become the maximum depth for a diver?

Chief Badders: I was just reading in this magazine that there were two men down 1,600 feet for something like 10 or 12 hours. They have gone into now, of course, what they call total saturation. It's supposed to be new, that is in the last two or three years they've gone into it extensively, but we knew that we could do that back in 1938. We knew that the human body would only absorb so much gas, and then it wouldn't absorb any more regardless of what depth the diver was or what pressure he was under or how long he stayed there. We had more or less accidentally discovered that, and it was familiar, but we didn't pursue that procedure.

It became apparent from these deep oil well operations and some of these things that required diving operations that men had to go deep and stay a long time to get anything done. We needed some operating procedure that could prevent this short time on the bottom and extensive time in decompression, which made these operations cost so much money that they were impractical. So they began to experiment with this total saturation thing. They'd put a diver down, for instance, to 300 feet and leave him there until he had absorbed all the gas that his system would absorb, and then he could stay there for a week or two, 10-15 days or longer, for that matter, without absorbing any more gas.

In other words, from that time on decompression time wouldn't change coming up appreciably. So that's the way they're working it now. They're going down and they have a job to do in, say, 200 feet of water and the men are totally saturated on the surface before they go down in chambers. Then they go down in a pressurized chamber, open the chamber, and whatever type of diving equipment they're going to use for the job, work six or eight hours, if they want to, or whatever the work requires, and back into the chamber, bring them to the surface and hook them up to the dry chamber on the surface, keep it under the same pressure all the time, feed them, change clothes, whatever. And while they're up another team of divers is down under the same conditions. They keep rotating in that manner until whatever job they're on is completed. Then they go into the long-drawn-out decompression requirements on the surface to bring them back to normal pressure.

Q: Do temperatures become a factor at these great depths?

Chief Badders: Very definitely, but the Navy and civilian concerns have developed means of keeping the divers warm electrically. I think they're still in the electrical field, but mostly circulating warm water through a part of the clothing that they wear, heating elements that keep the water at different temperatures required for the bottom to keep them warm. The deep-submergence outfits on the West Coast, the Navy's Sealab is a total saturation thing. They go down 15 days or more out there.

Q: For the individual diver does the underwater life constitute an obstacle of any kind?

Chief Badders: You mean detrimental to the health in the future?

Q: Well, I mean to the effectiveness of his operations as a diver? Sea life, sea creatures, what have you?

Chief Badders: Oh, no, they haven't been bothered in any way. There are a lot of wild stories, mostly fictional, about divers being attacked by manta rays and sharks and things of that kind, but actually I don't know of one case where it actually happened, where a diver was attacked by a shark or manta rays or anything of that kind. An octopus will wrap around a guy once in a while, I guess, if he gets around a big one, but that's no problem. They can cut themselves loose or get away somehow. We've had no real casualties in that way; that's for sure.

Q: About the time you were talking about, the French diver, Piccard, was operating, was he not?⁴³ Did we learn anything from his operations that was useful to us?

Chief Badders: I think the most we learned from him was how to build pressurized vessels to keep men under atmospheric pressure and put them down for observation at great depths.

Q: He had his bathysphere?

Chief Badders: Right, and from that have come these high-pressurized units that are going down 15,000 or 20,000 feet now. I think that's an offshoot from his original exploratory work.

⁴³ Auguste Piccard and his son Jacques established a world record, since broken, for descent into the sea when they took a bathyscaphe to more than 10,000 feet below the surface in the late 1940s.

The work that he could do from the inside of a vessel of that type was very limited. The fact of the matter is I don't believe he had any means of performing any task other than observation. It could be used for directing operations from topside, for instance, lowering explosives and putting them in the proper place, things of that kind, or hooks to hook into objects on the bottom and things of that kind.

Since the time of his first work in that line, they have developed mechanical arms and things that they are using pretty successfully for a lot of different tasks on the bottom. My understanding is that the Navy is working right now on units of that kind that will be almost purely mechanical; there will be no outside help at all from the diving angle. All the work will be done from inside of a pressurized--pressure-proof--vessel through mechanical means of electronics and mechanically-operated arms. They're doing great things.

Q: So the individual diver will not have to operate outside the lab?

Chief Badders: Not at great depths. I'm speaking of depths of 10,000, 15,000, 20,000 feet. I don't believe the time will ever come that we're going to get divers down and perform any useful tasks out in the water any deeper than 1,000 feet. I don't believe it's going to work. Things are happening to human bodies that have been exposed to these pressures, and it just hasn't been determined yet what these effects are going to be in the future on a man's system.

For instance, not long ago a man was down over here in Washington in a normal dive; it was 200, 300, or 400 feet. He came up and everything was supposed to be perfectly normal, but the man is stone deaf. He never has regained his hearing, and the last I heard of it there is no indication why he had gone deaf. His eardrums weren't ruptured, nothing that they found. It had to be some action on the nerves, I suppose, but it didn't show up on examination. He was stone deaf, and it still seems he'll be permanently deaf--a chief petty officer with about 18 years' service.

Q: During your period of activity as a diver, were there any limitations on the length of time that a man could normally engage in diving? Was there anything of this sort that began to develop?

Chief Badders: No. We had no real permanent effects on anyone. Practically all of us had the bends from these experimental tables we were running. You couldn't tell how far a table would go until you went to its limit and saw what would happen, and sometimes we would get the bends. I had the bends several times pretty severely, but proper decompression and recompression overcame it and, as far as I know, I don't have any effects from any of that. I have a very bad shoulder and neck right now in the area where I was hit the most often and the hardest with the bends, and I sometimes wonder if that didn't have some effect on my condition now, but any doctors that I've talked to say no, it's something else. So during my work we had no aftereffects that amounted to anything at all. Nothing that wasn't cured in time.

We had one man who went into shock and he was not in bad shape, but some of his faculties didn't work the way they should for a couple of months. But he eventually recovered, totally recovered, as far as the doctors could determine.

Q: So, unlike an athlete who has a limited period of time for his profession, the diver isn't limited in this way at all?

Chief Badders: Not time so much, but age. During my time--and I think it's still in effect--first class and master divers, when they become 40 years old, are automatically disqualified for deep diving, but they can be waived. Those regulations can be waived if he is still in physical condition to go ahead. That happened to me. While I was still in Washington I was 40, and agewise I was supposed to be disqualified, but the doctors found me in excellent physical condition. You had to be examined every three months, once a quarter, to make sure that you stayed in that condition.

Q: What is the thinking behind a regulation like that? Why 40 as the cutoff date?

Chief Badders: I really don't know. It's like everything else in the Navy. If something weighs a certain amount and a certain sized wire will lift it, well, we'll use a wire twice that big to do it for safety. So I think maybe a man might go to 50 or 60 years old and still be all right, if he's physically all right, but the Navy says, well, it can be done that far, but let's make it safe and cut it off at 40, which, in some cases, takes men out of service that are right in their prime, if the regulation was pushed without his waiver thing.

I don't know if that waiver is still in effect or not, but I believe it is because I see men around Washington that I'm pretty sure are over 40 years old. At least they're instructing and making some dives. I suppose that the doctors figure when a man gets 40 he has begun to deteriorate and he shouldn't speed up the process. I know in my case I felt, and it was proved by all the physical exams that they could give me when I was 40 years old, I was in as good shape as I was in my 20s--I felt as good or better.

Q: And you had much more experience and wisdom to employ.

Chief Badders: Right.

Q: How long did you continue to dive, actually?

Chief Badders: Of course, I wasn't doing any deep diving in the Panama Canal, but I was diving not too regularly but regularly enough up until the time I retired when I was 62 years old. Of course, there again, as I say, diving down there was shallow diving, mostly ships' hull inspections and some construction work that would take you down maybe 60 or 75 feet.

I had one job in the Panama Canal that came up a couple of times, one of the dams that required diving to 120 feet. That was the deepest we ever had in the Panama canal. I was considered to be in very good condition when I retired in the canal. Down there you have to retire when you're 62 years old.

I knew I was good for five or six more years in my job down there, but there again somebody said age is age, and that's it regardless of who you are. Like my automobile out there. I've got a 1968 automobile that's a better automobile than a lot of 1971s that are running around today, and it's the way I've taken care of it, and the way I take care of myself has to do with my physical condition.

Q: You said that Admiral Cole had the Squalus put in dry dock on your birthday in Portsmouth.

Chief Badders: Well, previous to that we had had quite a problem of getting a line under the stern of the Squalus to get the chains in position for the pontoons. It was too deep for the tunneling operation that had been done on the S-51 and S-4 jobs for working the chains under, and we were trying to work a line under the stern with a lance, a combination of water and air being forced under the submarine. As I say, we had quite a lot of trouble with this thing and had consumed an awful lot of time, and the day that we finally completed the operation, the lance completely circled the stern, under from one side and up on the other side, and we knew we were going to get a line under the boat, happened to be the morning of Admiral Cole's birthday. He hadn't come out to the operation that morning, so I sent in a message to him, a personal message myself, congratulating him on his birthday--I forget what birthday it was now, but he was getting up in age and retired right after the Squalus job--and said the lance is completely around the submarine, we'll have lines under it by tomorrow, and signed it Bill Badders.⁴⁴ He was so pleased with that and when we got the submarine in it was supposed to arrive on the 14th and he said, "I want to get that thing in dry dock tomorrow, on your birthday." It turned out that there was a lot of work to do to get the submarine itself ready and the dry dock, mostly work on the submarine, getting the pontoons off of her and getting her on an even keel and in proper trim for going in on the blocks. So we

⁴⁴ Cole was born 21 June 1876.

had to work real late that evening so as to be sure and get her in on the next day, the 15th of September, which would be on my birthday, so that was my birthday present from Admiral Cole.

Interview Number 3 with Chief Machinist's Mate William Badders, U.S. Navy (Retired) j

Place: Chief Badders's home in Annapolis, Maryland

Date: Monday morning, 8 November 1971

Subject: Biography

Interviewer: John T. Mason, Jr.

Q: It's good to see you again this morning, Mr. Badders. Last time, you gave me that most interesting account of the rescue from the Squalus and you concluded your remarks at that time with the dry-docking of the Squalus on the 15th of September 1939. Do you want to resume the story from that point?

Chief Badders: A couple of days after the Squalus was placed in dry dock, our group, the experimental diving unit group, left the Portsmouth, New Hampshire, area and returned to our duty station at the experimental diving unit in Washington, D.C. We had two or three weeks' work getting our equipment cleaned up and overhauled and back in working order that we had used on the Squalus.

Q: And the inevitable reports, too, I suppose?

Chief Badders: Yes, miles and miles of reports to be made. Rough logs had been kept, of course, of every activity and every phase of the operation. That all had to be smoothed out and shortened up for the bureaus concerned, and that took time. So we really didn't accomplish much the rest of the year in the line of diving.

We had made the two deep dives previous to the Squalus disaster, and it was determined that we wouldn't go that deep again with the equipment available at the experimental unit. The diving tank wasn't built for that pressure, so we had gone as deep as we could.

Q: That being 500 feet?

Chief Badders: Five hundred feet, right, and it was a matter of perfecting some of the tools and some of the procedures that we had inaugurated on the Squalus job, smoothing some of them out and getting them ready to be approved by the bureaus and adopted as standard procedures and standard pieces of equipment for future use in the Navy. It didn't take long for the end of the year to come along. In the meantime, there were ceremonies in the Navy Department and different places, different men were decorated for different phases of the operation. The divers received Navy Crosses late in the fall, and I guess it was sometime in late November or early December that we got the word that four of us were definitely going to be decorated sometime in the near future with the Congressional Medal of Honor. Of course, that put us on edge. That was pretty great.

On the ninth of January 1940, McDonald, Mihalowski, Crandall, and myself went to the White House and received our Congressional Medals of Honor for the work that we had done in the rescue and salvage operations on the Squalus.⁴⁵

By this time the war was inevitable and we were sure we were. . . .

Q: And the presentation was made by the President?

Chief Badders: Right, President Roosevelt.

Q: Can you recall the incident?

⁴⁵ The other Medal of Honor winners were Chief Metalsmith James H. McDonald, USN; Torpedoman First Class John Mihalowski, USN; and Chief Boatswain's Mate Orson L. Crandall, USN.

Chief Badders: Well, the incident at the White House didn't amount to very much, because the President was not well. He was very ill, and we didn't even have the news media or photographers there. He presented the medals and shook hands with us and gave us a little pat on the back, and from there we went to the Secretary of the Navy's office in the old Navy Building and then the whole thing was done all over again with him presenting the medals with the news media and the newsreel cameras and all of that. That's this picture over here on the wall, the Secretary of the Navy hanging the medal around my neck.

Q: Who was the Secretary of the Navy?

Chief Badders: It was Edison.⁴⁶

So we began to work with different gas mixtures, making different dives and testing our recompression tables, and whatnot. Several of the men were transferred to other activities. Two or three of them, the so-called guinea pig crowd, the personnel attached to the experimental unit were sent out to different billets. New men came in.

I got the word that the Panama Canal wanted a master diver-salvage master. At that time I was a senior master diver in the Navy, and they anticipated sending me to the Panama Canal for the job that they wanted to set up for the war effort there. Well, I figured that I wasn't going to be around Washington very much longer; I'd be at the Panama Canal. Sure enough, in early March 1940 it was determined that they wouldn't send me down there on active duty. The governor of the Panama Canal, being an Army general under the Army Engineer Corps, wanted a man there that no other branch of military service would have any jurisdiction over. In other words, when he got a man there, he wanted to

⁴⁶ Charles Edison, son of inventor Thomas Edison, was Secretary of the Navy from January to June 1940.

be sure he was going to keep him there. He didn't want naval orders to come in transferring him away about the time he got an organization set up.

Q: One would be under Civil Service then?

Chief Badders: Right. So they transferred me from the regular Navy--at that time I had 22-1/2 years of active duty--to the Fleet Reserve, which put me in a civilian status and, of course, still subject to naval orders.

Q: How did you feel about that change of status?

Chief Badders: At the time it was going on, I was very enthusiastic about it all. I thought, "Gee, this is great. I'm going out here with 22 years' service. I'm going to draw my 22-year Fleet Reserve pay, and I'm going to draw a salary from the Panama Canal." In the meantime, I'm going to be doing something real great for the war effort, if things go on the way it had been explained up to then.

Q: You didn't mind the idea of the Panama Canal?

Chief Badders: Oh, no, I had no regret about being considered for this. In fact, I thought it was quite an honor. I went through all this procedure and went into the Fleet Reserve on the 12th day of March, left New York City the 13th day of March for the Panama Canal. There wasn't a day lapse of service between active duty in the Navy and on the payroll of the Panama Canal.

Q: Did you take your family with you?

Chief Badders: Not at that time. My family couldn't go down there until I had been on the job long enough to provide quarters for them. All employees of the Panama Canal had to live in what they called Panama Canal Government quarters, and people were coming in there by the thousands for new construction projects for the defense of the canal and so on, which meant that the place just didn't have quarters available for everybody immediately that went in there. That was the only unpleasant thing about the whole deal.

Immediately upon my arrival at the canal, they laid out the program that they had in mind. They wanted a diving organization--diving and salvage organization--to keep the Panama Canal open under any conditions. If we had ships bombed or lock gates damaged by bombing or sabotage or ships ramming or anything of that kind, we had to make immediate repairs and keep this thing open. The governor told me at the time, "Put in simple words, your job is to keep this canal open from Buoy 1 Atlantic to Buoy 1 Pacific. Whatever it takes to do that, you have the funds and the backing of the organization here to get the people and equipment to get ready for it."

Q: I take it there wasn't any such organization in being then.

Chief Badders: The only divers in the Panama Canal was one diver at each set of locks to do minor repair work in the locks--pick things that were dropped in the lock chambers, unplug valves that were jammed up, and things of that kind. I guess there were about four or five divers in the whole Panama Canal.

Q: Were they Navy divers?

Chief Badders: No, they were civilian divers, employees of the Panama Canal, and they were so far behind they were still using the old hand pump system of diving, men turning the hand pumps cranking air down to them. This was in 1940, and that's how far behind they were.

Q: What had they done in the case of a real salvage job?

Chief Badders: They hadn't had a real salvage job in the canal up to then. They just hadn't had anything other than groundings, and they don't require much diving generally. It's a matter of pulling and tugging and getting the thing floating again, unless the ship is damaged, has a hole knocked in it when it went aground. But they hadn't had any problems like that down there.

By this time they were having all this bombing over in Europe, plugging up harbors and stuff of that kind, and they didn't want it to happen in the canal. They just couldn't have it happen, because in addition to the Navy ships going through the canal both ways, the merchant ships, tankers, and troopships and things of that kind just had to get through. Otherwise, as you know, they'd have to go all the way around the point and it would take days and days longer to transport material and people. So I went to work drawing up a plan, and when I'd finished with it, it was approved. My first main function was to establish a diving school. You couldn't hire divers. There weren't any available anywhere by that time. I had to build a diving school, make up the curriculum, designate the qualifications of the candidates for the diving school, and so on. That was all approved not only by the Panama Canal, but my curriculum was sent to the Navy Department and the Navy approved of it to the extent that they allowed me to use the same curriculum putting Navy people through my school in the Panama Canal, if and when we had space available and the time to train them. And I did; I trained over 100 Navy men down there and made salvage or second class divers out of them.

Q: How many men did you feel that you needed for your project?

Chief Badders: We figured we were going to need about 50 men on hand at all times to be absolutely safe, which I never did reach--never did reach 50. I put a class of people through--let me go back to establishing the school, first, before I go into that.

We had to have a lot of equipment, air compressors, welding machines, pumps, and things of that kind, and by this time these things were hard to get. There was high priority on them for other purposes all over the world. And the Normandie turned over at Pier 88 in New York, and that was a major salvage operation.⁴⁷

Q: Indeed it was.

Chief Badders: I went sent up there as an observer on that job and to be associated with, at that time, Commander Sullivan, who was in charge of that operation, and get a line on the equipment that would be most suitable for our operations in the Panama Canal.⁴⁸ I was there about six weeks, I guess, running from there all over the United States to different manufacturers of pumps and welding

⁴⁷ The French luxury liner, SS Normandie, was seized and interned in New York at the outbreak of World War II. In December 1941 she was designated as a Navy transport and renamed USS Lafayette (AP-53). During conversion she caught fire on 9 February 1942 and as the result of a chaotic and poorly planned fire-fighting effort, she was overloaded with water, keeled over and sank at her slip. The Lafayette was righted in August 1943 and reclassified APV-4, but had been so extensively damaged that plans to complete conversion were stopped. After the war she was sold to a New Jersey company for scrap.

⁴⁸ Commander William A. Sullivan, USN. Sullivan's oral history is in the Columbia University collection.

machines, picking up what we could for the canal. Sullivan helped us a lot by allotting quite a bit of the Navy-procured equipment that he transferred to us.

Well, I got back to the canal and my diving school building was about completed. I was building the school on the banks of Gatun Lake, right adjacent to the only ship that had ever sunk in the Panama Canal. She was lying on the bottom right at that area, a little old combination freighter and passenger ship that somehow started leaking coming through the canal. They ran it over against the bank, and it turned over and slid down to the bottom. They never did anything about bringing it up, so I thought that would be an ideal place for a training ground for training divers.

In the meantime, before I left to go to New York, I had drawn up the qualifications a man would have to have to enter the diving school. He had to be under 30 years of age. He would have to be a man who had completed an apprenticeship and served. at least a year in his trade, and the trades that were more apt to be used underwater, such as welders, burners, riggers, shipwrights, carpenters, machinists, pipefitters, shipfitters, those ratings. When I came back, I had over 300 applications on my desk to sieve through for people who met that much of the qualifications.

Q: Where were these people?

Chief Badders: All over the Panama Canal. All the employees of the Panama canal, the different shops and activities of the Panama Canal.

Q: Oh, they were all there, within the family, so to speak?

Chief Badders: Oh, yes. All the men were already employed by the Panama Canal, but the ones that I selected would be transferred to me for each class that I ran.

Q: And what was the inducement for them? Was it higher pay?

Chief Badders: Slightly higher pay than they were making in the shops. Oh, I'd say a half more. And I suppose it was considered a kind of glamorous job at times, interesting at least.

As I said, I considered that I wanted about 50 men available who were qualified divers, and I set my curriculum up originally so that it would be about a three-month course of instruction. By this time the war was really going. Pearl Harbor had been hit by the time I finally got the diving school and everything all organized. So they said, "Well, we can't take three months to make divers. We've got to have some men that can do something in a shorter period of time than that. What are you going to do about it?"

I said, "Well, I'll take a class with the equipment I have and the personnel I had on hand." I figured I could handle 12 divers, and I trained the diver tenders at the same time. By the way, the diver tenders were supposed to have been apprentice boys, men who were in the apprentice program for the canal.

Q: Would you define a diver tender? What is he?

Chief Badders: He's the man that dresses the diver and tends his lifeline and air hose while he's on the bottom, takes care of his equipment, and assists him by getting the tools to him that he requires, taking care of things topside, watching the air compressor and--if welding machines are used--the welders and all that business.

Q: The diver's Man Friday!

Chief Badders: Right. In other words, a very good candidate for a diver in the future, and that was the reason I had taken the apprentice boys, hoping that they would continue on as tenders and eventually get out of the apprenticeship program and then they would be available for the diving program. But this never happened. These apprentice boys were all subject to draft, and as fast as I could get a group of

them through the school the next thing I knew they'd all be gone on the draft. So it wasn't very long until I saw that that end of the program wasn't going to work at all. I had to get away from the apprentice boy idea and use what we called the local rate people for tenders, the Panamanian laborers. I had a choice of the very best caliber of Panamanian laborers like welder helpers and rigger helpers and carpenter helpers and things of that kind. They were the people I called in.

Q: How did they compare with the others?

Chief Badders: There wasn't any comparison. You can't compare any Panamanian laborer with any American boy who's smart enough to be an apprentice boy in the apprentice program down there. The Panamanian laborer was one of the big headaches as far as I was concerned all the time I was in the Panama Canal, and I guess still is.

Q: You mean they just don't have the qualifications?

Chief Badders: That's right. They're illiterate, to start with, and they have a saturation point. You can teach them just so much, and when you hit that point, you just can't ever beat anything else into their thick skulls. They just can't absorb it. That's all there is to it.

Q: Are they largely of Indian origin?

Chief Badders: Everything, and about 80% of them are illegitimate people to begin with, as you know, the Panamanian general public. Some Indian, some Jamaicans, Colombians, Panamanians. They not only are not as smart, of course, as the American boys, but they wouldn't be dependable in any real emergency, and that's where you need some action, somebody who can think for himself. If a diver got

in really serious trouble all of a sudden, they'd just go all to pieces and couldn't do anything. Some of the American people, divers or anyone who happened to be around the operation on the topside would have to take over and do the job.

Q: I would think, faced with that problem and if the authorities realized it, some sort of protection from the draft could have been obtained?

Chief Badders: They attempted that, but the boys themselves wanted to go, and that's where 80% of my divers went. They'd get through the diving school and go back to their shop. You see, the setup was the men would go through the diving school, and if they successfully completed the course of instruction, they were rated a diver; they had a dual rate. Say a man's a machinist, he'd be a diver and machinist. Well, when he wasn't diving, he'd be working in the shop as a machinist. If I had a job that required a machinist's ability under water, I'd call him out from the machine shop to my organization as a diver. And then immediately he'd go on diving pay until that operation was finished, and he went back to the shop.

But many, many of these people, of course, were young men. They were all under 30, and I don't know how many of them went into the Seabees from down there, and a lot of them made out real well. They became good divers in the Seabee operations. A lot of them just quit diving altogether when they went in the Seabees and operated heavy equipment and became welders and all that kind of thing.

Q: But your operation was equally as vital to the war effort as were the Seabees?

Chief Badders: Right, but you couldn't stop a man if he wanted to go and enlist in the Seabees or something. There was no way to stop him from doing it; away he went, which put me in a bight in this respect. When they said, "Well, we've got to have some divers who can do something and get them quick," I said, "Okay, I've got my curriculum down to six weeks, and I'll put three classes through, 12 men. The first class six weeks, the second class six weeks, the third class six weeks, then I'll call the first

class back for a second six weeks and go on from there and advance them that much more." Well, I never did get the first class back, and I must have run 50 classes through during the war, because they would be dwindled down to where I just wouldn't have them available to come back for advanced training.

Q: That was a pretty discouraging operation!

Chief Badders: Yes! It really put me under a handicap. But these men were exceptionally good men, and we had a lot of underwater construction work in the canal, and these men were doing that work.

Q: What kind of construction?

Chief Badders: Piers and docks and dams, pipelines, and all that kind of thing. They ran three huge pipelines all the way across the isthmus, you know. They could pull a tanker in the Atlantic side and pump oil right into a tanker in the Pacific without putting the ships through the canal. That went through Gatun Lake and part of the canal. That took quite a lot of diving.

We gained experience all the time and were getting better and better. In the meantime, we were having things happen; ships were getting in trouble, by this time. The longer the war went on, the worse the ships became, not only mechanically, but it seemed that the people who were operating the ships--if it hadn't been for the war, they wouldn't have made good able-bodied seamen and they'd be up there as a skipper or chief mate or something operating the ship, and you never knew what was going to happen. We had a lot of groundings. Fortunately, nothing serious happened in the lock chambers. No gates were rammed or anything of that kind because the pilots, of course, had control. But they had control in the reaches and in the lake, too, for that matter, but things would happen--mechanical failures, steering gear failures. A pilot would holler so many degrees right rudder and he'd get twice that many degrees left rudder, and in a canal that narrow you don't have much time to correct that and you ground, and good

and hard, if you're making eight or ten knots. A ship would go aground, and I'd have to get all of my facilities out there and get that thing out. Sometimes it would require partially unloading the ship, sometimes bringing the big dipper dredges out and dredging part of the mud alongside, put tugs on her and pull beach gear, any way to get them afloat, and I if they weren't damaged, well, that would be the end of that. But if the ship had a hole in it from going aground, which some of them did--they didn't only hit soft mud--that had to be patched up, and in some cases it had to be patched well enough to get them into dry dock down there and make permanent repairs. In other cases we made repairs that were strong enough and permanent enough to get them on to their destination, the South Pacific or wherever.

I wouldn't even hazard a guess at how many ships we had aground and damaged. In Culebra Cut they'd hit the bank, and when they hit that they invariably knocked holes in the side. We never had one that was damaged enough that it sank in that area. We were always able to get it into some beaching zone where we could run it aground and it wouldn't sink any deeper, and make repairs to the damage.

We were kept pretty busy. In addition to trying to keep up with my new divers, keep enough diver~ on hand--I never did really have enough--and then doing these jobs when they came up. And that's another thing. When these jobs would come up while I had a class going in school, I'd take everybody right from the school, all the student divers. I'd take them right to that job and use them as much as I could on the job. At least they would be there and see how things were going on, and that period of time would not be considered a part of their six weeks' training because I wouldn't be at the school to handle them during that period anyway.

Q: Did you do all the instructing?

Chief Badders: I had two assistants who took care of some of the instructing, but I did most of it. I was a pretty busy boy, 12 hours a day, seven days a week down there for about two and a half years.

Q: What kind of administrative staff did you have to back you up?

Chief Badders: I had my own secretaries and timekeepers and whatnot. Then my big bookkeeping expenditures of funds and all that kind of business went through what we called at that time the mechanical division offices down there. They just took my budget and my program and all my big letter-writing and things of that kind went through their office. That was the division that had shipyards, the mechanical division of the shipyards, a big yard on the Pacific and one on the Atlantic side. The offices at the Atlantic end did most of my work, and I came directly under the Navy captain who was in charge of the mechanical division. We called him mechanical division superintendent. During the war it was old Captain Kiernan, a fine old man, an old MIT graduate.⁴⁹

Q: On average, how many ships went through the canal a day?

Chief Badders: It varied. To hit an average I wouldn't even hazard a guess. You see, what would happen was they'd come in there in convoys, and if they were coming from the Atlantic and going to the Pacific they would bring in maybe 50 ships in a convoy. Then they would refuel, resupply, whatever they needed in that area to get everything all set for the final run on to the South Pacific, and then they would run them through just one right after the other till they got them all through. Actually, they're putting more ships through the Panama Canal right now than we ever did in World War II, percentagewise today more tonnage, more numbers of ships. They have modernized the handling procedures and all that.

⁴⁹ Captain James E. Kiernan, USN, Massachusetts Institute of Technology class of 1922.

Q: Did you have any problem with the super-sized ships?

Chief Badders: We didn't have the super-sized ships then. The biggest tanker we had, about the biggest, was the T2 tanker.⁵⁰ We had some large carriers, and the large carriers and the large battleships were our biggest problem going through the canal, that is sizewise. But we rarely had any kind of a problem with them other than the tight squeeze in the locks and so on. One did some damage to the bow. I think they scraped the bank in Culebra Cut a bit and just wrinkled up some plates and caused some slight leaks. We had to do a lot of welding on it, welding up small cracks and things of that kind.

Q: The Queen Elizabeth also went through, didn't she?

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Chief Badders: Yes, that was one of the big ones.

Our biggest headache was the old Liberty ships, Victory ships, and things of that kind. Darn those things, you never knew when one of them was going to break in two on you, and they seemed to have the most helter-skelter crews of any bunch of people I ever ran into. Then, of course, we had our foreign flags going through there, too, that caused us a lot of trouble. The English ships going through there.

Q: Why would they cause special trouble?

Chief Badders: They weren't special trouble, but when we had trouble with them it was generally real trouble. They would have some kind of mechanical failure. Their equipment was in such deplorable condition, they couldn't depend on it at all. They'd try to drop an anchor, and the anchor engine wouldn't work. Couldn't even drop an anchor on a ship one time, which meant that he just kept going, and before

⁵⁰ A T2 tanker was approximately 500 feet long with a beam of about 70 feet and draft of 40 feet.

they could get the power they required and reverse, why, they barreled into the back end of the ship in front of them.

We had one Liberty ship--we had one convoy coming in the Atlantic end of the canal that was so large they didn't have enough pilots to put a pilot on every ship, so they put a pilot on every other ship, and the one in the middle that didn't have a pilot was supposed to watch the man in front of him and the man behind him and guide him in. Well, there came up one of the worst rainstorms that we'd had in years down there and, of course, the one in the middle just couldn't see the man in front of him at all--period. He couldn't even see the bow of his ship, and he got completely out of line and ran aground outside the breakwater. He went into Cristobal Harbor, and he ran aground good and hard on the rocks. The ship lay there and broke in two.

Q: These were filled with supplies, were they?

Chief Badders: Yes. This particular ship was loaded with drums of asphalt for runways and personnel carriers and jeeps, hundreds of them on the darned thing. We unloaded all the personnel carriers, jeeps, and things of that kind we could get off that were worth saving, put them in barges, and that's the last I ever saw of them. They went somewhere. And then we blasted the bow' section apart and sank it in the mud. They always broke right forward of the forward fireroom bulkhead, and the after section was watertight. So I ordered it flooded to keep it from going farther aground, but once we pumped that out, the water that I had put in her to keep her stable, it wasn't much of a pull to get the stern section off the rocks. And we took that way outside in deep water and set a mine off in the bottom of her and sank it.

Q: What was the cause of this weakness that made the ships break in two?

Chief Badders: Some construction design that wasn't figured out, I guess, when they built them. I don't know, but that was the weak part of all that type ship.

Q: Was it reflected in the attitude of the crews?

Chief Badders: Yes, it was. For instance, this one that ran aground, when this thing started to break apart--it was so rough we couldn't get boats out to get the crew off, that is, with any kind of safety at all. You were taking a chance on sinking your boats and maybe losing the boat crew or something. So we left the men on board. Nothing can happen to them. The thing's aground, nothing else can happen although it's breaking in two and it's popping. If you ever hear a ship break in two, the plates breaking, it sounds like guns going off, you know. This thing was making a terrific noise and working, and the crew went nuts. They wanted to get off that ship, and they kept screaming and hollering that we were--it was close enough to the beach that you could hear them through bullhorns. So to calm their nerves and try to do something, the admiral was on the scene by this time, the commandant of the 15th Naval District, and was advising we've got to do something, we've got men out there.

I said, "Well, we can't get a boat out there with any safety. Those people are just crazy, but nothing can really happen to them. Even if the ship fell over on its side, they'd still be above water. They're high and dry. It's not bad."

And he said, "Can you rig a highline or something out there and bring them ashore on a breeches buoy?"

I said, "Well, it can be done." I had highline equipment, but how are you going to get a line out there? I made them bring a target-towing plane out, towing this target sleeve, and they dropped the sleeve over on the beach and when they crossed over the ship, dropped the wire off the plane like they drop these things on runways. The wire landed across the deck of the ship and the sleeve was ashore. Well, the minute I got that little old stinking wire from that ship to shore, those people calmed down. They knew then there's something over here and from that we'll get something else. And we never did

put a breeches buoy out to get them off. They began to calm down; we could see that they were quieting down and weren't making so many demands for rescue.

The next morning, at daybreak, it had calmed down enough so we could get boats out from shore. Then some of them didn't come ashore; they stayed aboard for a day or two. But they really wanted to get off of that ship! They didn't know for sure what was happening. That's what it was. It was making so much noise in the dark, pouring down rain, just sheets of rain, and here this terrific tearing and ripping of steel plates, and they just, thought that ship was disintegrating right under them, working, you know, on the rocks.

Q: They were panicked!

Chief Badders: Right. They were just panicked. There were a few there that weren't panicking, but there weren't enough in that group to keep the others under control and convince them that they were in good shape. That was one of my most interesting experiences. It lasted about three days before we could even do anything. Then in the meantime a little old smart-alecky Coast Guard outfit came around there and he was going to go in and get these men off, and he ran aground and ran inboard of this Victory--this was a Victory, not a Liberty--where he'd be in the calm and then he'd run high and dry on the same rocks and his ship was a total loss.

Q: Was it a cutter?

Chief Badders: No, it was a little old vessel of some kind that the Coast Guard had taken over from some company--a little old steam-driven thing, a little bigger than a seagoing tug, with about 35 men aboard in the crew. A young lieutenant (j.g.) was the commanding officer. That thing rolled right over on its side. But they came ashore. They got off of there. They launched life rafts and came ashore in life rafts. Then, besides the Victory ship, we have him and it's a total loss.

I had some of my most interesting experiences in the canal after the war. By the time the war was over, I had my men--the ones that were really interested in staying there--were by this time becoming exceptionally good divers and salvage men.

Q: How many did you have at that point?

Chief Badders: When the war was over, I had about 15, and that was adequate for the peacetime operation. About 15 divers, and I guess that's what they're trying to keep on hand now.

Q: But not really adequate for wartime?

Chief Badders: Not war, no. Fortunately we didn't have any big major accident during the war. I mean we didn't have a ship come in there loaded with explosives and blow up and plug the canal, and nobody knocked a gate out of one of the locks or anything of that kind that would have really caused 24 hours a day diving, day after day, until the job was completed. I wouldn't have had enough divers for that big a job.

Q: Does this say something about the effectiveness of security control?

Chief Badders: Right.

Q: Tell me about that.

Chief Badders: The thing about that, we were set up with a tie-in with the Navy that if we had a real disaster, of course the Navy would move right in and help us, bring their equipment and personnel, which was a relief. But the Navy, wonderful men, know all about salvage and diving and all that, but

they didn't know all the answers in the Panama Canal like the men would have that I would have trained right on the scene. So it remained preferable to have had enough men of my own, trained there, local I men, trained on the job to do the job that we anticipated might happen, but it never did, not big.

Q: Would you talk a little about the security measures which the authorities took during wartime to protect the canal from sabotage? ,

Chief Badders: One thing, every ship that went through the canal a crew of military people went aboard. Two Marines on the bridge and two machinist's mates in the engine room. One Marine on the bridge, when the pilot would ask for a signal to the engine room for a change of speed, handled the annunciator--the Marine handled the annunciator, the other Marine would write the bells down in a book. And the machinist's mates down in the engine room would see that those bells were answered properly and at the right time.

As I said before, we had had occasions when the pilot would ask for 10 degrees right rudder and he'd get 20 degrees left rudder. He'd ask for full ahead and get two-thirds astern or something. So with these people aboard that couldn't happen.

Then they had other men aboard--just how many I don't know, but they had a few Marines and a few Navy people aboard every ship that went through the canal. They would board at the pilothouse. They put a huge big barge, really a boathouse, before the entrances to the canal, and the pilots and these crews would be on these barges when the ships came by. And when the pilot went aboard, the designated number of men--military people--would go aboard, too. The number of military people varied according to the size of the ship and in some cases what the ship was loaded with. Lots of ammunition ships went through there, of course.

Q: And the military people would inspect the ship?

Chief Badders: Right. They would watch everything as closely as they could and, as I said, fortunately we really didn't have anything, any big sabotage, happen.

Q: Was neutral shipping barred from the use of the canal during the war?

(: Chief Badders: No, neutral shipping went through. All of our allies' shipping went through. We had no problems with any of them. They did some experimenting with a net thing--they called it the "billion-dollar folly." They devised a net, a big steel net, and when a ship went into a lock chamber, this net, which was on floats, came up under the ship, and if anything fell from the ship this net would catch it, and bells would ring, lights would flash, and all that kind of thing, and they'd rush this net out. . . .

Q: And recover the loot!

Chief Badders: ...Recover the loot. A beer can or anything else would set off the alarm. It didn't work out. It was abandoned. It looked beautiful on paper, but it was cumbersome and hard to handle, held up the ships. That didn't work. That was done away with. t

Q: What about the question of fees, which are charged ordinarily in peacetime? In wartime what happened?

Chief Badders: I don't know. That is a phase of the Panama Canal that I never got the least bit interested in. I do know that fees today are almost the same as they were even before World War II, way before World War II. They haven't changed the fee rate in years and years in the canal. And it should have been increased a long time ago, but the shipping lobbyists are just too strong. Every time it comes up for a vote to increase the toll, as we called it down there, why, the shipping lobbyists would go to work and stop it.

Q: During wartime was there any real danger of sabotage from the local populace, or from agents working among the local people?

Chief Badders: It was known that there were agents in the area. In fact some were arrested. That was another part of my work down there. I was kind of assistant intelligence man to keep my eye on people and things, but they were never able to penetrate the defense and do anything down there that we knew of--at least, not that I knew of and I think I would have known if anything happened. They had cases of radio operators. They raided one place and found a complete radio installation where a man was relaying the information on the ships coming through the canal, what was aboard, and what ship size, even the name of the ship. They stopped that. A few things of that kind, but they never got around to where they could plant a charge anywhere and blow up anything.

Q: How well guarded was the canal?

Chief Badders: It was guarded as well as it could be. They had all kinds of military defenses around the canal. They had barrage balloons at all the lock areas, and searchlights, radio, all that business, and, of course, anti-aircraft guns. We were a long time getting this stuff. The war had been going on quite a while before we had any anti-aircraft guns down there. They figured it was important in other places, I guess, before we got it. They had thousands of military people and we had our air stations there, the submarine patrol, and all that business was operating all the time.

Q: Did they ultimately have radar also?

Chief Badders: Oh, yes, they had radar stations for spotting. It's a pretty complex place to defend really. Of course, now things on the site of the Panama Canal are practically useless. That's why they're pulling a lot of the military people out of there. They figure they've got to be 1,000 miles away to do any good protecting the canal now with bombs and stuff and missiles they can fly in. One big worry with

the canal was--you know Gatun Lake is held in place with a dam, and without Gatun Lake there is no Panama Canal. And that dam has a spillway in it for spilling the excess water, and there was always a fear that something might knock part of that spillway up and spill the water out of the Gatun Lake, and that would close the canal up until the spillway was repaired and the lake built up again. They built an underwater dam--well, I guess you could call it a dam; they called it a spillway. In other words, where this spillway was, there are 14 gates in the spillway that can be opened. Well, they built another spillway in front of that, all underwater, and bombproofed it. That was another diving job that we did there, and that was one of the jobs that held my diving school up because I was used on that job until it was completed.

The point of this thing was if they knocked the old spillway out--all the gates and everything were above water--this underwater spillway could be closed up by dropping gates in the steel structure that we left there and still hold the majority of the water in the Gatun Lake.

Q: It was a supplementary dam there?

Chief Badders: Right. But fortunately, there again, we never had to use the thing, but it was there if anything had happened. And many things could have happened. We had several alarms. People said one time that there was a raft of dynamite floating toward Gatun spillway. Of course, they had a power plant at this spillway, and it created a little current running in that direction all the time. Someone said they'd seen a raft floating toward the spillway and it'd be over there in another half-hour or so and blow that thing up. Well, that alerted everybody, all the lights and boats, but no raft was ever found.

Q: What was the attitude of the Panamanian Government and authorities at that time? Did they put obstacles in the way of the operations, the smooth working of the canal?

Chief Badders: No, no. During the war they were very cooperative, as far as I know. I never heard of anything of any magnitude. Of course, by this time they were beginning to get money-hungry and seeing where they can get rich quick. They cut in on everything they could money-wise, but they didn't hamper the canal operation in any way. There was no way they could really. They couldn't even furnish the people we needed for laborers on the canal. We recruited people by the thousands from Colombia, Costa Rica, even some from Puerto Rico, but most of them were from Colombia, Venezuela, and all around that area. They worked on these new construction jobs and extra men in the shipyards.

We had a very busy shipyard situation there. Ships coming in there to go on to the Pacific or coming the other way going back to the Atlantic Force, by the time they'd hit there they'd need repair work of different kinds. We had a big bottom-cleaning program in the Balboa shop area. Big tankers would come in there if they'd been to sea long enough and were fouled up on the bottom and, of course, foul bottoms slow you down and require more power. They worked out a program where some of them stopped off there to get their bottoms cleaned. That required a lot of men because this had to be done quickly. That's when they first started using hot plastic paint on ships bottoms, down there at least.

Q: Protects them from the barnacles.

Chief Badders: Right, take the barnacles and the sea growth off.

Q: I suppose there were examples of ships that were damaged by submarine activities in the Caribbean and thereabouts that had to come in there for emergency repairs?

Chief Badders: Right. We had one tanker--you could see it from the breakwater--that was torpedoed by a German submarine right close to our area, and he hit it on one side and knocked a tremendous hole in it. The ship rolled over on its side and the crew abandoned ship. The submarine surfaced to periscope depth and saw that he hadn't sunk the ship. Then he went around to the other side and fired another torpedo

which hit right opposite where the first one hit, knocked a big hole in that side, and the ship rolled over back on an even keel and sat there, didn't sink. By this time we've got our patrol planes out, dropping depth charges and things, and the submarine took off.

Then, after they'd watched the thing for quite a while and seen that she wasn't going to sink, the crew went back aboard and brought it in closer to the breakwater. I took divers out and when they saw how much damage was done, it was safe to bring the ship through the canal. The first diver that went down and came back up said, "My God, the only thing holding that ship together, the two ends of it, is tank tops and the deck. If it didn't have a mast on it, you could drive a destroyer right through the ship." So I made my report and said that ship was liable to break in two at any minute.

There it's sitting and they looked at it--all this damage was below water--and it's sitting there looking pretty good. It had sunk some in the water, I think the draft had increased about 10 feet or something like that, which is nothing in a tanker. They determined they were going to take her through the canal to the Balboa dry dock. The dry dock in Cristobal wasn't large enough to take it. They took it over and put her in and they had lots of tugs and handled it very carefully, and when they pumped the water down and saw how much damage really was done to it, the port captain in Cristobal who had ordered this operation to proceed almost fainted. He said, "If I'd realized that ship was that nearly broken in two, it would never have gone through the Panama Canal."

We had another one come in there, and he was supposed to wait in an area for a pilot, but he didn't wait; he kept creeping on in. He got out of the channel and of course outside of this place was mined and he got over in the minefield. These mines were, some of them, contact mines and some of them could be exploded with a paddle over at Fort Sherman, and this mine officer sitting there watching this ship, going over in the minefield, and he sent a recognition signal to him and this fellow didn't answer anything. He didn't know any recognition signals--he was a Czechoslovakian, I believe. So the only thing for the mine officer to do was push the button on a mine right under him and blow him right out of the water. It raised his stern up and gave him a start, and he slid right straight across the channel

with his stern sticking out about 50 feet right into the channel coming into Cristobal. He had a deckload of anti-aircraft guns. We had to go out and get the anti-aircraft guns and then with explosives get rid of the stern of that thing just sticking out in our channel.

Q: Those minefields were to prevent the submarines?

Chief Badders: Yes, or anything else.

By the way, we lost one of our submarines down there on the Pacific side, going out on patrol duty at night. The channel going through the minefield on the Pacific side was changed every so often and only a few people would know this channel where it would run through. Things had to be escorted through there. We had some cutters and things, and we had a great big yacht that the Navy had taken over and it was a so-called escort vessel, and that was its duty to escort people through the minefield. The commanding officer of this cutter would be informed of the route through the minefield.

Well, he had escorted these three S-type submarines through the minefield and when they got through the field, then he would cut off and come back in and they would go ahead. Of course, everything was blacked out. And when he cut off either he or the submarine, it was never determined, made a mistake and he rammed the sub and sank it, one of our submarines in about 320 feet of water.⁵¹ I guess two or three men survived.

Q: Was there any danger from German raiders?

Chief Badders: They thought there was. They were prepared for that. You mean air or water?

⁵¹ On the night of 24 January 1942, the USS S-26 (SS-131) was rammed by the PC-460 and sank in the Gulf of Panama. Of the crew, 46 men were lost and three survived.

Q: Water, raider ships.

Chief Badders: Well, no, they were more concerned with submarines than anything else. The submarines must have come in there awfully close, because we had a ship coming through the channel, right at the entrance to the breakwater, and it got something in its propeller and stopped the engines right there, just like it had hit a solid rock. Well, it drifted on in and they got tugs round it and brought it in to the dock, and sent for divers to go down and see what had happened to that propeller. I didn't have any diver available right at the time on the Atlantic side and this was a big hurry-up thing, so I got in gear and jumped down myself. When I got down there, it looked to me like a big hot-water tank or something had been picked up. It was a tank about 30 inches in diameter and about 6 or 8 feet long, and this thing had got crossways on the skeg, and the blade had hit it and just wrinkled it up around the tip of the blade, and the blade was right up and down over the skeg, and that's when it stopped.

I looked this thing over really well, and I looked up on one end of it and here's a round brass plate on it that had some kind of foreign language on it that I couldn't read. So I got out of there and came back up, and I sent for the mine officer or one of the mine officers over at Fort Sherman. By this time I suspected it might be a mine. I explained this whole thing to him, and he asked me to go down again, and take a better look at that plate and make out this lettering and bring it back to him, which I did. He said, "Well, it's a German mine," and he explained the type and everything else. Well, why didn't it go off, or what are we going to do to it from going off?

He said, "Well, that handhold plate that you see that had about 20 brass flat-head screws in it. Take them out and then you can pull that plate out and that will pull the detonator out. But you'll have to be careful when you do it."

So, when that operation got set up--we're not going to do that operation alongside the dock--the crew left the ship. They towed the ship out in the explosive area, and I took one tender with me and went down and took the screws out of this plate and started to bring it up.

Q: You did that job yourself?

Chief Badders: Yes. I moved the thing about 6 inches, and it wouldn't come any farther, got jammed. Well, I'm not going to force it--he told me not to put any force on it and be careful it doesn't hit the sides when it comes out--he explained it to me it was a thing about so long.

Well, I came back out and explained all this to him. I'd get him to come out and backed the boat away from this thing a couple of hundred yards before he can come out. I talked to him and he said, "Well, that detonator is down in there so far that that kink in the housing of the mine has got it jammed and you can't get it out."

This was an ammunition ship loaded with ammunition. Well, they want to get this out, they want to get the ammunition to its destination. They didn't want to unload it and transfer it to another ship. That would take days and days to do that down there. So I said I'd try one thing. I took a big long section of another chain and took a loop around that blade that was over the tank, the mine--by this time we're calling it a mine; we're not calling it a tank any longer. And I got one of our biggest tugs there and put two tow wires, his tow wire and another one, which put him a couple of thousand yards away from the ship, hooked up to the chain and he was right abeam of this thing. I made him back up to where he had a lot of slack in the wire and then go ahead just as hard as he could go, full speed, and jerk that blade to see if he couldn't jerk it back the way it went in. And, sure enough, it came clear, and it didn't explode.

Of course, I'm back out of the way of that operation when that happened; there was nothing near the ship.

Q: You'd think the jolt would have. ..

Chief Badders: The blade wasn't damaged enough to prevent the ship from going ahead, so it was only held up about a day with a German mine it picked up right in the entrance of the Cristobal breakwater. Whether that thing had been somewhere and floated in there, or whether it had been planted somewhere close to that area or dropped off. . . .

Q: Was that area swept with great regularity?

Chief Badders: Oh, yes, we had torpedo nets out there all the time, harbor nets, you know, and they had to be opened for every ship that went through and closed all the time, and boats ran back and forth with sounding equipment. But they didn't go outside the breakwater very often. I think they did after that. I think they began patrolling farther out at sea.

I had heard reports of Navy planes spotting submarines out there, outside our minefields, and dropped depth charges down to run them off. There was no record of any of them ever being sunk or captured out there, but they did claim sightings.

Q: What about the other side, the Balboa side?

Chief Badders: We never had any problems over there.

Q: Wasn't there always the fear that the Japs might come along?

Chief Badders: Well, we were standing around there with our hair standing straight up on our heads after Pearl Harbor. We just couldn't understand why they didn't come on and do the same thing to the Panama Canal. Then, of course, we found out later that they didn't want to damage the canal; they wanted to use

it themselves. That was the only reason they didn't. 'There wasn't a thing in the world to keep them from coming on and just blowing the Panama Canal right out of existence.

Q: I didn't know that story, that they wanted to use it.

Chief Badders: Sure, they didn't want to damage the canal, or they could have come ahead from Pearl Harbor. We didn't have enough Navy left then to stop them. We didn't know what was going to happen around there for a while, after Pearl Harbor.

Q: At one time there were some vague ideas that we might do something about fortifying the Galapagos and islands in that area.

Chief Badders: Yes, we had a lot of people out there. I went out there twice working on underwater pipelines and cables. It was sounding stuff, radar signal relay, and that kind of stuff. There wasn't much of a defense out there, but there were quite a few military people on that barren rock. What a place to do duty! Miles and miles from nowhere.

Q: Those must have been exciting days for you and strenuous ones, as you say.

Chief Badders: Yes, the days just weren't long enough, and there weren't enough of them to keep up with things that were going on; that was the trouble. I worked myself right down to a nub.

Q: You didn't have much family life?

Chief Badders: Very little. My wife would see me sometimes like today and I'd go off on jobs and when I went on a job I just had to stay until the job was finished. A lot of times I'd work as many as four days and nights without ever stopping. Then there were many jobs where I'd be out a week or two on the job. Of course, there would be rest periods at that time. But I've been on jobs that were in such a stage that I just didn't even stop.

That was one of the problems with my job down there. I should have had another man at least in my capacity, somebody who could relieve me.

I was on one job, and this was after the war, too. I'd been on the job four days and five nights, brought the ship back into the dock in the explosive area in the morning and my boss by this time is the marine superintendent, a Navy captain. He saw me and said, "When were you home last?" I had on a pair of khaki shorts and an old what had been white sweatshirt and a golf cap and a pair of sneakers. I was filthy dirty and I guess my eyes must have looked like burnt holes in a blanket.

I said, "I haven't been home since we took the ship out to the explosive area." I'd lost all track of time. After you've been up a certain length of time, you don't get sleepy anymore. You lose track of everything.

Q: But you're not quite as sharp as you were!

Chief Badders: That's the point, exactly. You can hurt yourself or hurt somebody else by not being as alert as you should be. Well, he sent me home, and right then was the crucial point of this operation. The ship had been on fire alongside the dock. They thought they had the fire out--they did have the fire out--a chemist and other people were going through the ship looking for gas and explosive areas before they could let people do different types of work, and they were down in the refrigerating section of the ship and went into the refrigerator part of the cold storage. There was no gas in there, but they opened a door

to go into the freezer section of the refrigerator compartment, and somebody must have struck a match right at that time or was smoking a cigarette or something, and that thing was full of explosive gas and it blew up and killed three men and maimed four or five others--a big thing about it.

So immediately this ship was grabbed and rushed out of there, taken to the explosive area, and that's when I went aboard. It had a lot of soybeans aboard, and we found out right then--it may have been known before, but I didn't know it and no one I talked to down there did--soybeans soaked in salt water put out 100% explosive gas. These soybeans were swelling up like popcorn. A soybean is not too big, but when that thing is soaked in salt water it's six to eight times its normal size. Several of the cargo holds of this ship were full of these bulk soybeans, and they were swelling up and throwing off this gas. I had to get rid of the beans.

Q: Did you get a special citation for all of this tremendous work?

Chief Badders: No, I have a folder full of letters of commendation. It was my job. That was what I was hired for.

I say "I" had to get rid of these beans, but I must have had 15 or 20 men working with me on that job. We moved those things with airlifts. They wouldn't let us use any kind of metallic equipment like shovels. Normally, to unload something like that you bring a crane alongside with a big scoop. . . .

Q: Why? Because of the friction?

Chief Badders: Yes, they're afraid that a clamshell might hit a hatch railing or something and make a spark and blow this thing up. We opened one of the hatch covers and this water would start working on these beans, and they'd swell up and run out over that hatch foaming just like popping popcorn. The darnedest thing I ever saw. I pumped I don't know how many hundred tons of soybeans right over the side in the Pacific.

After this operation had been going on for a couple of days, then the wildlife people got interested: "What's this going to do to the fish?" That's the greatest fishing country in the world down

there. We found out that the fish just got good and fat on it. They loved it. When we first dumped some of these over, they would sink to the bottom and then a day or two later they'd all come back up to the surface again. They were lying on the water out there it looked for miles, like an oil slick really.

Q: Did they discover any use for this gas produced by soybeans?

Chief Badders: No. Actually, I don't believe the gas was as bad as they said it was. I don't believe it was that gas that blew up. In fact, I know it wasn't that gas that blew up in this freezer compartment, because there was no way for it to get in there. I think the gas in there--well, I don't have any idea what kind of gas it was and nobody else did find out, because when it exploded the gas all deteriorated and there was no way of getting a sample of it. A couple of my good friends were hurt badly on that job. The chemist was killed.

In navy yard routine, when a ship is damaged, any work is going on on the ship that's in closed compartments or compartments that have been closed, and particularly a damaged ship, the chemist has to completely analyze the ship for gases and all that stuff. The chemist should have just been doubly sure that the people behind him were not smoking or getting ready to smoke or anything. Evidently he hadn't checked as well as he should. Of course, it's possible that something else could have set this off when he opened the door, but they couldn't think of anything else that would do it. Two or three men who survived in this work party said they thought they had seen a match struck or a cigarette lighter lit just before the explosion. They couldn't be positive.

But we had to unload this ship out in this explosive area. Then the operation of going around and trying to detect where this gas came from. You could smell this gas coming from the beans. They took a sample of that, and the chemist got all excited. The report was that it was 100% explosive, and it had to be unloaded before the ship could come back alongside the dock--that is, all the beans that were wet or liable to get wet.

That was the operation I worked on so long without stopping, because we were way out and it took a long time to get set up and get in and out, so I just stayed there.

I made a lot of trips from the Panama Canal to other countries down there. The canal would loan me to other countries for jobs. I went to Nicaragua and did a job for old President Somoza, the one who was assassinated, not the young son who's dictator down there now, but the original old Somoza that the United States put in power when there was trouble in Nicaragua.⁵²

We had a yacht on that lake down there, Lake Managua, and another tugboat. They were the only two vessels in the lake and they came together and sunk his yacht, and he wanted his yacht raised.

Q: This was during the war?

Chief Badders: Right after. I worked with him for about six weeks, I guess I was down there, to raise his yacht.

Q: Did they treat you well while you were down there?

Chief Badders: Very well. I thought I was eating like a king. We lived right on this other tugboat that had sunk his yacht. We were working from that, and a big banana barge, and he was living right there on the job. All the food that came aboard, anything like fish, any fowl, even pigs, were brought aboard alive. All water came aboard in locked cans, drinking water. Milk was in locked cans. The food was, I thought, out of this world, and it was. But one day I happened to be down below around the galley and I

⁵² Anastasio Somoza (1896-1956), president of Nicaragua from 1937 to 1947. His son, General Anastasio Somoza Debayle (1925- 1980) was president from 1967 until his overthrow by Sandinista rebels in 1979).

saw one of the cooks come out-this tugboat had only about 2 feet of freeboard, he could reach over the side and dip water out of the lake in this bucket, and this was right aft of one of the head discharges where the water was running right aft on the ship and he must have got some of that discharge into his bucket. I watched what he was going to do with it and he went in the galley and dumped it in the sink and that's what he was washing dishes in! Well, right then I got sick. I couldn't eat anything on that ship anymore, and I had about two weeks to go yet! I had all kinds of stomach problems from then on. The only thing I ate was bread and stuff like that, jelly, cheese, goat cheese. I ate goat cheese three times a day, and guava jelly. I just about lived on that the last two or three weeks I was there.

When we got ready to leave, he gave us all a present. I had a Navy commander with me who was kind of a liaison officer. The Navy really engineered this deal. It was one of those lend-lease things, you know, us and the equipment, and we took this Navy commander along as a liaison man between him, me, and the commandant of the 15th Naval District. By this time, we'd gotten really well acquainted with old man Somoza--he was a character--and he said, I'm going to give the commander a medal. I can't decorate you fellows. [I had two divers with me and a couple or three colored fellows as diver tenders.] I can't give you fellows medals, you're civilians, so I'll have my aide decorate you when we get into Managua." And he gave each of us a dozen handkerchiefs, myself and my two divers, that he said he had specially handmade. I believe my wife must still have them around here--the most beautiful things you've ever seen--handmade lace handkerchiefs.

We didn't know how we were going to be decorated when we got into Managua, but we were going to have to lay there for a day or two before a plane came in to take us back to Panama.

Q: That's a dull place!

Chief Badders: Yes. We went in by train and when we got there a Nicaraguan Army captain--I guess he was Army--met us and took us to the hotel and he told the hotel manager when we went in to register

that everything we wanted--it didn't make any difference what it was we ordered--went on the bill to be sent to the President. Then he handed each one of us an envelope and said, "This is from the President," and in the envelope were three \$100 bills, brand-new \$100 bills. That was our decoration!

He was quite a man. I talked with him a lot on that job, and I got to really like him. You know, he was considered to be a dictator in that country, making millions off of the country and off of the people, but he told me and I believe he was right, that he only did things for the good of his country, and he had built schools, he'd built roads, he'd built hospitals. He said, "I go up here in the mountains and I find a stand of mahogany [and they had beautiful mahogany in Nicaragua.] I try to get people interested in going up there to get that mahogany out of there and sell it, make money for the country and for themselves, too. Nobody's interested. They won't do it. So I go do it. I put men up there. I might use some of my road equipment trucks to haul it out and things of that kind, but I'm putting men to work. I'm making money and there's money going in the treasury."

I really think they assassinated the wrong man when they shot him. That son of his who took over when he left, he was a stinker. He was a West Point graduate, too, his son.⁵³

Q: Was he? He's not so much for the people as for himself.

Chief Badders: No. He's arrogant, overbearing. At the time this happened, our commercial air terminal was in the Canal Zone, they flew out of Albrook Field--they hadn't built the big Tocumen Airport out in Panama yet--and he'd been in Panama for something and he had to go down to the airport to catch a plane and go back to Nicaragua. And he came in the lobby of that terminal with double holsters and a big pearl-handled revolver in each holster--in the Canal Zone to catch a plane to go to Nicaragua. They

⁵³ General Somoza graduated in the West Point class of 1946.

had a big hassle over that, trying to get him to get rid of the guns. This was shortly after he had relieved his father.

When the old man was shot, they brought him to the Canal Zone. He was in the Canal Zone hospital when he died. He always wore a scarf round his neck and he had a ring that he'd slip up over the two ends of the scarf to hold it together up under his chin, and that thing must have had a ten-carat diamond in it. It looked like a headlight hanging under his chin. I told him one day, "You're going to lose that ring off that scarf. It's going to slip off and drop overboard or something, and you're going to lose it." But he was still wearing it when I left him. We used to go to all those countries down there. All the oil companies had offshore oil lines where they didn't have piers to bring their tankers in and unload. The tankers would pick up the hose at the end of the pipeline and pump the oil ashore. They were invariably having trouble with them. They'd slip in their moorings and break their hoses, or their pipes would get holes in them, deteriorate, and send divers. In some cases I went with them.

I went to where they were building the transamerican highway, building a bridge across one of the rivers, and they had some caisson trouble. I helped them out with that.

Q: That must have been in Guatemala, wasn't it?

Chief Badders: No. It was San Jose, Costa Rica.

So, all in all, the Panama Canal job was really an interesting job. When the war was over, I figured that I didn't know what was going to happen. That was one thing that I was a little perturbed about, but they left me on inactive duty all during the war down there with civilian status. I went down there as a chief petty officer and had been since 1926. I was a senior master diver in the Navy and had had experience in salvaging three submarines, and I figured that I was the leading man in the enlisted ranks in that type of work. They must have figured that, too, or they wouldn't have sent me down there.

They'd have sent me somewhere else. Well, I felt that after the war hit and I'd look around and see all the shipmates of mine going up to lieutenant and lieutenant commander, commander, and whatnot, if I'd been on active duty I'd have had that same opportunity.

Q: Naturally!

Chief Badders: Which I didn't have on inactive duty. I couldn't get advanced.

Then when the war's over, here I am still a chief petty officer, civilian. Panama Canal have decided by this time that they want this installation of mine to be a permanent part of the Panama Canal for future protection of the canal, to assist shipping and all that. They told me that they were going to keep the diving school and everything as it was--cut down on some of the equipment and some of the personnel--but to keep a force for me to figure out what was required for a force for ship repairs and construction work that might come up in peacetime operations. And they said that they would like for me to stay on the job. So I told them I would stay if they would make it Civil Service which all the employment in the Panama Canal is, so I dated back to the time I went there in March of 1940, and they did.

Q: You had some sort of tenure?

Chief Badders: Right. When I finally retired from there, I had 23 years' service in the canal and 22-1/2 years in the Navy--45 years and some months' government service. But I would have loved to have had the opportunity at least to have a commission at some time. I'm sure I would have had it.

Q: Did you make any effort to do this after the war?

Chief Badders: Nothing could be done after the war. I wasn't the only one in that situation.

Q: Your high-placed friends in the Navy might have helped you.

Chief Badders: There were attempts to do it. McNamara, even was interested at one time.⁵⁴ He said, "Well, it wasn't right. I don't see why we couldn't make a paper commission anyway." When I retired I combined my Navy service with my civil service. In other words, I take one paycheck instead of two. I would have taken a Navy check and a Civil Service check, or you can combine military with Civil Service and take one.

Q: That's more pleasing to the comptroller to make one!

Chief Badders: Not only that, but it increased my Civil Service time and gave me much more money than I would--not much more, but some. So if they were to give me a commission even now it would only be paper, it wouldn't be money-wise, but it would have given me the privileges and the social standing. Down there I was considered one of the big wheels, or whatever, in the canal and we went everywhere. We were accepted everyplace, in admirals' quarters, at admirals' parties, and the governor's parties, and everything else. But then every once in a while we'd be around some officers' club at a cocktail party or something--my wife never told me about this, but I know it happened--some officer's wife would ask her, "What's your husband's rank?" Well, she wouldn't think and tell them I was Civil Service; she'd say chief petty officer. Frost kind of fell after that.

⁵⁴ Robert S. McNamara, Secretary of Defense from 1961 to 1968.

Q: It does with some people!

Chief Badders: Yes, but to the people that count it didn't make any difference.

Q: Were you tempted at all to live down there permanently?

Chief Badders: Well, you can't live there, except live in Panama and I wouldn't live in Panama--no, I wouldn't even have lived in the Canal Zone. We wanted to get out when we did. We had become kind of tired of the place. It's monotonous, and politics were getting rough. I think we left at a good time.

I would have worked for a few more years. I was healthy, felt good, and I could have done a good job for another four or five years, but to not be working, I wouldn't have stayed there, which I didn't. As soon as my time was up we got out of there. I worked as long as I could. You have to retire down there when you reach 62.

Q: That's considered foreign duty and you have to?

Chief Badders: Right. But it's a shame, because not only me but other people had to go out down there the same way who were perfectly capable of doing a good job for a few years longer, and a lot of them wanted to. I didn't ask to, but I don't believe they would have let me stay anyway.

That's one of the reasons we came to this part of the country to settle down. We got so darned tired of everything being green all year long and warm all year. We like the change of seasons, but I tell you these winters are getting colder for me every winter!

Q: Well, you've got a great career to contemplate, a really great career, and I thank you very much.

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UNDERSEA & HYPERBARIC MEDICAL SOCIETY

INTERVIEW OF BILL CULPEPPER

Kensington, Maryland

June 30, 2003

PROCEEDINGS

INTERVIEWER: It's June 30th, 2003. I'm at the home of Bill Culpepper. First, thanks, Bill, for agreeing for the interview. I wonder if you could start off by giving us your background, like where you came from, where you went to school, and how you actually found your way into mine countermeasures.

MR. CULPEPPER: Well, it is, I guess, a relatively short story. I graduated from Pensacola High School in 1946 and entered Auburn University the same year. I took my freshman year, and I was 1-A in the draft, so I decided to get that out of the way. The Army was taking 18-month enlistments, and the GI Bill was still available, so four other guys from Pensacola and I joined the Army. I ended up in Korea for 13 months, but before the Korean Conflict, fortunately. I came back and went back to Auburn. I graduated in 1951, BSME. In March of that year, before I graduated, I had not interviewed with anyone, but the aircraft company, McDonald-Douglass, was hiring any warm body for \$4,000 a year to draw aircraft parts in St. Louis. I decided that was about the best I could do.

Fortunately, I met some people who became very good friends, Margaret and Danny Roberts. As it turned out, Margaret worked at the Navy Mine Countermeasures Station (NCMS) in Panama City, and Danny was the manager of National Airlines. Danny was often a great asset once I began to travel. Margaret asked me where I was going to work, and I told her what I thought. She said, "Well, why don't you come down to Panama City? We hire mechanical engineers." From that, I went to NMCS and interviewed with all the division heads and the technical director.

After that, the personnel officer asked me when I wanted to go to work. I said, "Well, nobody has offered me a job yet." He said, "Oh, yeah. You have a job. Just start whenever you want to come in." I indicated that I would like to take a couple of weeks off after graduation, and I ended up at the Navy Base the last week in June of 1951. I worked primarily in mine and torpedo countermeasures for the first 12 to 13 years that I was at the Navy base, mostly in underwater machine design.

In 1963, I was in the Mechanical/Hydrodynamics Branch of the Engineering Division. My branch head, Ray Kelly, was assigned to a study group for a six month period, and I was acting branch head while he was away. At the end of that period, in January of 1964, shortly after I was relieved from that assignment, I was asked if I would like to design a SeaLab. I said, "What's that?"

At that point, I had never been involved in diving, other than snorkeling and spear fishing, but not having another project to do, I said, "Sure." I was introduced to Captain Bond and a few of the other people, and we started having meetings in January. In February, we got funding and started to design SeaLab I in March. At that point, I think we had \$35,000 in the budget. Bob Port did the electrical and electronics designs, and I did the mechanical life support and structural designs. We did most of our own drawings, and we'd take them to the shops and have the hardware built.

INTERVIEWER: You don't have any idea where those drawings are, do you?

MR. CULPEPPER: Yes. I talked to Steve Segrest after I talked to you, and he assured me that the drawings were probably still there.

INTERVIEWER: Oh, great.

MR. CULPEPPER: While Steve was the head of engineering, he had made it a point to not destroy any of the information that was there, and he was relatively sure that the records would go back to the sixties, at least.

He said that I could get in touch with Fred Doepke, who is the head of engineering now, and he would take me to where the drawings are stored. I plan to go out one day this week and see what we can find. Steve seemed to think that the drawing logs are there, and if I can find the logs, it should be fairly easy because everything was in a window from February until June of 1964. We should be able to find the drawings.

INTERVIEWER: Can you talk a little bit about the design at the SeaLab I, as far as what you were really trying to accomplish?

MR. CULPEPPER: Well, the direction I was given was to design this craft, undersea house, or habitat, as Captain Bond titled it, to house four aquanauts who were to live on the bottom, at a depth of 200 feet, at ambient pressure for a period of two weeks. That was pretty much it. Tom Odum had sold the project based on the fact that we had these minesweeping floats, which were suitable for building the hull, out in the salvage area. They were 9 feet in diameter and 57 feet long. They each had a cylindrical body section, a conical tail, and an ellipsoidal nose section. Hull thickness was half an inch over the upper half and three-quarters of an inch in the lower half. They had been designed to resist the forces of mine explosions. They were adequate to meet the 15 pounds per square inch (psi) design requirement. We were able to cut the tail section off of one and take the nose section off of another and put those together. That made the hull. It was 40 feet long and 9 feet in diameter.

We were pretty much dependent on Captain Bond to keep us on the safe side, as far as what materials that we could use. For example, we didn't want to use any plywood because the

glues might outgas toxic or noxious fumes. We couldn't use anything containing solvents of that nature, certainly no hydrocarbons. It was a very challenging and interesting project, to say the least.

INTERVIEWER: How long a process was it from the time you got the award to actually putting it in the water?

MR. CULPEPPER: It was three months. We delivered it the end of the first week in June.

INTERVIEWER: That's amazing.

MR. CULPEPPER: That included outfitting the surface support vessel, also. On Armed Forces Day, May 16, we had SeaLab I on display for the visitors. It was structurally complete at that point. We were still outfitting the internals.

Much of the equipment that went into SeaLab I was purchased with a Sears credit card. We had a two-burner hotplate. We had a thermo-electric refrigerator that, as it turned out, didn't work because we didn't take into account that the temperature controller was pressure sensitive. It stayed off. It served as a storage compartment, I understand. For heaters, we had Nutone bathroom ceiling heaters, electric. The dehumidifier came from Sears. The water hose was a thing of its own. Commander Roy Lamphear, who was the project officer, selected the garden hose. He would go to Sears, buy a hose, bring it out to the Navy base, fill it with water and let it lay on the pier for a day. Then, he'd go out and sample it to see how it tasted. It took him three or four hoses before he got one that didn't affect the taste of the water.

INTERVIEWER: Was this all pumped down from the surface?

MR. CULPEPPER: Yes.

INTERVIEWER: The water, or the electrical power that pumped the water, was it battery operated?

MR. CULPEPPER: No. It was all surface-supplied, including water, air, helium, electrical, communications, electronic sensor data, and so on. Make up oxygen was stored below the hull in three 1300 cubic foot bottles. Emergency helium was stored in one 1300 cubic feet bottle. The only real background we had for a design reference was a *National Geographic* article written by Jacques Cousteau on his thirty-foot saturation dive. One of the big problems that Cousteau had was with helium leakage through hull penetrations.

Since we didn't have a lot of time or a lot of money, we totally had to take a shotgun approach with most things. One of the things that we came up with was to use an umbilical tube that penetrated through the bottom of the hull and extended well below the entrance hatch. We brought all of the surface supply hoses and cables through that tube, like the electrical, , air, water, gas, and electronics hoses, the whole nine yards.

We also set aside the after nose section, the nose cone section that we welded to the SeaLab hull as an air space. It was separated from the from the living area by a watertight bulkhead. We had the electrical transformers in there, along with several other things, such as circuit breakers and other electrical components that might have caused problems.

The air space had a hatch that was adjacent to the entrance hatch, and it was to serve as an escape chamber in the event that the habitat became contaminated. The aquanauts could exit the living space and climb back up in the air space temporarily, until they could get to the surface transfer capsule down there and bring them up. The umbilical tube worked great, and we had no problem with leakage or loss of helium. Some of these things are a little cloudy. It's been a while.

INTERVIEWER: It was years ago.

MR. CULPEPPER: Yeah. It's approaching forty.

INTERVIEWER: The helium wasn't just a steady flow of fresh gas, though. Were you circulating?

MR. CULPEPPER: Yes. We circulated with the DH machine, made up oxygen and had carbon dioxide scrubbers. We had two submarine auxiliary scrubber units utilizing lithium hydroxide.

INTERVIEWER: Was it lithium hydroxide in there?

MR. CULPEPPER: Yes. We also mixed the breathing gas for the Mark VIII semi-closed circuit SCUBAs. We had high pressure air but nothing to pump oxygen. We couldn't afford a \$6,000 PPI pump. Roy Lamphear said, "Well, let's build a pump, a water ram." I said, "How do you do that?" Well, he explained the principle to me, and I started looking for tanks. I could not find stainless tanks, so I ended up using carbon steel tanks.

We had three vertical tanks that were connected from the bottom of the air side tank to the bottom of the center tank, and from the top of the center tank to the bottom of oxygen tank. Tanks one and two at the air inlet side were filled halfway with water and oxygen or HeO₂ was cascaded into the third, or output, tank. Then, all of the water was forced into tank one, with the gas to be compressed filling tanks two and three. The output side was then valved to the flask to be filled, and HP air was valved into the first tank until all the water was forced into the center tank. The process was repeated as necessary to provide the amount of gas and pressure desired. We were able to find 3000 psi sight gauges, so we could determine where the water levels were. But I was quite concerned about the possibility of rust and fire, especially when jamming oxygen.

As it turned out, Roy Lamphear operated that ram. Nobody else touched it, and it did the job without incident. We were able to get that all together and build it. We even built air filters

with the air piped into the bottom at a peripheral inlet so that the air spun as it went into the filter. In the upper section, we installed cotton and charcoal.

INTERVIEWER: It was a cyclone that removed water.

MR. CULPEPPER: Yes. We had to put all this stuff together.

INTERVIEWER: It was readily available, but back then, you had to build everything?

MR. CULPEPPER: Yes. I had never had any experience with oxygen cleaning. We ordered some Jamesbury ball valves, and I ordered them oxygen cleaned. Then, when we were pressure testing some of the life support systems, I believe I was talking to a reporter.

At that time, the technician, Lance LaBrache, who had done the high pressure piping for me and was involved in the testing, came in and said, "We have a problem." I said, "What do you mean?" He showed me some black material that had blown out of one of the lines, and as it turned out, it was the ball valves that had graphite in them. We had to pull that entire system down, clean it again and start all over.

A major stumbling block occurred one Friday morning. I came into work and one of the leading men in the shop, Bill Hodges, called me and said, "Bill, you need to come down here. We've got a problem." I said, "What is wrong now?" He said, "Well, we've got a cracked weld." I went down to check it out. The legs were attached to the SeaLab hull with doubler plates to better distribute the load on the hull. These plates were cut from scrap hull material and were two feet square and three-quarters of an inch thick. The plates were attached to the hull by continuous three-quarters of an inch fillet welds on all four sides and had been in place for several weeks. One of those welds had opened up with a ten inch crack. The drawings for the floats had called out high tensile hull plate for the material. Therefore, we had selected the 125 low hydrogen rods that were specified for that material. We took a sample of the metal and sent

it over to the Pensacola Naval Air Station to be analyzed. They reported that it was similar to HY80, with which we had no experience.

I called over to the Biloxi Shipyard, and we were able to get a Navy commander, whose name I don't recall, to come over and look at our problem. He was knowledgeable of HY80 welding. He came over, and after looking at our problem, he said, "Well, the only thing you can do is go up to Charleston and get a couple of HY80-qualified welders and bring them down here to finish this job." At the time, I had already called in a x-ray crew and they were x-raying all the welds. We got the x-rays while the commander was there, and we looked at them. Only about ten percent of the welds were defective, and that was out of over 600 feet of welds. He said, "Well, you've got some good welders. I'm amazed that the welds are this good."

INTERVIEWER: It was all done at the lab?

MR. CULPEPPER: Yes. I told him, "Well, we had a problem to start with. They were tacking the plates onto the hull, a tack each corner. By the time they'd get to the last corner, the first corner was cracked. I told the welders to put on temporary clamps and run a bead all the way down the first side, immediately chipping the bead and running the next pass. I told them to keep it going and keep it hot. That was what seemed to work.

As it turned out, the commander gave us procedures for HY80 welding. We only had three welders in the welding shop at the time. One of the requirements was that if welding was interrupted, that weld and the heat-affected area must be thoroughly ground back to base metal, plus all sorts of re-prepping before you could start over again.

The last weld we had was the nose section to the hull, which was nine feet in diameter, requiring a 27-foot long, 21 pass weld, and we needed to preheat to 150 degrees Fahrenheit. Time was running out, so we decided to weld continuously, day and night, until we finished. I

had our three welders make the required sample welds using the HY80 procedures. All three passed with no problems. All defective welds were repaired and passed inspection.

Out on the pier was the only place we had to build this thing. We didn't have a house big enough to put it in, so they rigged up a makeshift heater, which consisted of a welding machine hooked to a steel band wrapped around the hull. Then, we paired two welders together and one welder with a helper. While one guy welded, the other one used a gas torch to preheat ahead. He used a temple stick to determine the temperature. They welded for 72 hours, 12 hours on, 12 hours off, to complete it. The weld was x-rayed and passed inspection.

INTERVIEWER: With all these unknowns and difficulties, still, in three months of time, you had a habitat ready to go in the water? Now, can you talk a little bit about the first operation, putting it in the water? It was actually tested out here, wasn't it?

MR. CULPEPPER: Yes. That's the sad part. They took it out on Friday, May 22. We anticipated that they were going to have some problems in handling because they really were not set up for it. They had the YFNB12, which was a barge. They had winches on the fantail with wire rope. They had a big fair lead, a roller fair lead, over the fantail, and they were planning to shackle the wire rope to the SeaLab.

Another story is the ballasting. Back then, lead cost 12 cents a pound, out of standard stock, and I could not buy 120,000 pounds of lead. I ended up at the Bayline Train Depot. I bought used railroad axles for five cents a pound. We had 167 of them, and those had to be put in the ballast bins with a small overhead winch that was supported by an overhead steel beam that extended out over the stern.

Another complication was the fact that there were three sizes of railroad axles, and there were six ballast bins on the SeaLab. The axles weighed about 550, 700, and 900 pounds each. I calculated the number of axles of each size to place in each bin.

INTERVIEWER: You wanted to go down?

MR. CULPEPPER: We wanted to go to level. I thought that was the best way.

INTERVIEWER: Yeah.

MR. CULPEPPER: Anyway, they were ballasting the thing down, and we had about a state two sea, maybe, with around three foot swells or so. It was enough that when the barge came up, it snapped that wire rope pretty tightly, and it got to the point at which it almost took off a sailor's leg. That was when they decided to change things.

They had a large air winch forward of amidships that they had been using for some previous project work. The winch was big, but it didn't have a lot of load capacity. There was also a set of two biaxial traction winches aft of the forward winch, and they had some nine inch nylon line. They reeved that line on the forward winch, then around those biaxial winch drums in figure eights about four or six times, then back to the fantail, which was about 120 feet or so. We talked them into using that nylon line because it had stretch, and it would tend to absorb the shock of relative motion between the barge and the SeaLab.

The next problem went like this. Since we could not afford a water tight hatch, both the main entrance hatch and the air space hatch covers were bolted on with flat rubber gaskets. Unfortunately, they required some 18 to 24 bolts each. Because of the anticipated difficulty in removing the hatch on the bottom, someone made the decision to lower the habitat with the main hatch cover removed. The plan was to keep the internal pressure above ambient during the lowering process by using air through the air supply hose. Well, the air hose had been specified

to be a half inch dive hose and 1000 feet long. The pressure loss through thousand feet of hose to the regulator below was great enough that the air supply could not provide sufficient flow. As it began to go negative while they were adding axles, which were not all in yet, a swell came along, and seawater apparently went up into the entrance hatch, flooding the inside. After one or two more waves, the SeaLab went quickly to the bottom, in 54 feet of water. It was half full of seawater, so they had to try to recover the habitat.

INTERVIEWER: The air hose just couldn't keep up?

MR. CULPEPPER: No. But after the SeaLab was on the bottom, continued pumping dewatered the SeaLab enough, and by removing axles three and four, it become buoyant. It was then a matter of surface handling, to control ascent as air bubbled out of the hatch. Once on the surface, more seawater was blown out, the hatch was reinstalled, and we returned to the Navy base. That was Sunday afternoon, May 24.

INTERVIEWER: This was at stage two?

MR. CULPEPPER: Yes. They brought it back in and put it on the pier Sunday afternoon. Bob Porter and I went in and started cleaning it up. It was fully provisioned. Toilet paper was everywhere and in everything. We had to pull out and wash all the electrical receptacles. Regulators were disassembled and cleaned. Everything had to be washed down and cleaned up. All the labels were coming off of the cans. Anyway, it was ready to go back out on Tuesday, May 26.

INTERVIEWER: That's great. Did you have to replace all the electrical systems?

MR. CULPEPPER: No. We just washed them down. They took it back out to the Stage II platform off Panama City. During the sea tests, we were out of the loop. They had shot the

engineers, so all we could do is stand by and cringe. Somebody else was in charge. Anyway, they took it back out and put it on the bottom without incident.

INTERVIEWER: What did you change to get it on the bottom the second time?

MR. CULPEPPER: We left that hatch on until it was on the bottom. Then, we took it off. I'm not sure. We may have improved the air flow, too.

INTERVIEWER: Now, you couldn't get air in there until you had the hatch opened, could you?

MR. CULPEPPER: No. The hatch could not be removed until the internal pressure was equalized. Ambient pressure would be higher, preventing hatch removal.

INTERVIEWER: The air hose would go in?

MR. CULPEPPER: No. The air hose went through the umbilical tube. The air regulator was in the air space.

INTERVIEWER: I see.

MR. CULPEPPER: We got it on the bottom. We got it open. Captain Bond went down and spent the night in it. He wrote a wonderful story about it. The SeaLab was successfully surfaced, returned to the Navy base and loaded onto the YFNB 12. A tug took it in tow on Saturday, June 6, and arrived in Bermuda on June 12.

When they got to Bermuda about two weeks later, and this was back when the fiscal year ended on June 30, Bob and I were permitted to go down the first week to get it on the bottom and witness the startup of the operation.

INTERVIEWER: Was that Bob Barnes?

MR. CULPEPPER: No. It was Bob Porter, the electrical engineer. Jim Bladh was there, too. We went down during the last week in June. All of our divers were out hunting for bodies from an Air Force plane that had augured near Bermuda, so nothing was happening. We were supposed

to come back in a week. Well, nothing had been done. We called home. They said, "Okay. We'll send you some more money. Go ahead and get in your funds request." We got some more money. We stayed another week. We ended up staying for a month, and they finally got it down, but not before they flooded it again.

This time was different. The commode, the head, had a three-inch drain line, a through-hull drain line. For double protection, we had a stop valve inside and a pipe cap on the pipe outside. We had provided two ten-foot sections of fire suction hose, which would attach to that pipe on the outside and take the effluent away from the habitat. However, the pipe cap was not to be removed, nor the hose attached, until the SeaLab was on the bottom and pressure equalized. During the pre-dive check, someone forgot to close the hull valve. That was the first mistake.

Again, someone decided it would be easier done on the surface, so it was the same scenario. The habitat was half full of seawater, but this time, it was in 187 feet of water. The nine-inch nylon hawser was stretching big time. You could see a little fish hook on the hawser, moving fore and aft a distance of up to eight feet. The deck had footmarks on it. We were in rolling swells of about six to seven feet. Captain Bond and I were on the aft bridge walkway, looking down on this operation. I could see that fish hook going eight feet back and forth. Then, the line started smoking. They broke out a fire hose and sprayed it down to keep it from burning. Again, we got to take the railroad axles out, blow it down, get it back to the surface, take it back in, and put it on the pier. Bob Porter and I got to clean it up again. I'm not lying. We got in and started cleaning it up. At quitting time, everybody went ashore except Andy Anderson. He was the only one that stayed there and helped us. I really don't remember how many days lapsed between that incident and getting back out the next time, but it was more than one.

The next day was a long, green table, and there was some very serious consideration of canceling the project at that point. There were questions like, "Now, what makes you think it's going to work the next time?" But we finally got an okay to try it one more time. That time, we took it back out. Everything went great. Then, we got it on the bottom and got it manned.

INTERVIEWER: You had all the valves closed and the hatch was closed?

MR. CULPEPPER: Yes. I personally checked.

INTERVIEWER: You made it slightly negative? Was that the idea, to be slightly negative to allow you to lower it down?

MR. CULPEPPER: It was about 3,000 pounds negative for lowering. I had planned to have it 15,000 negative for good bottom stability. I wanted it very negative so that it was not going to move or float away in any current. That was one of the questions that Captain Melson had for me while we had it on the pier that last time in Bermuda. He said, "Now, how about your righting moment?" I said, "Well, you know, we have that big hull up top, and we have the ballast on the bottom. This thing is 14 feet wide." He said, "Well, what current did you design for it?" I think I told him three knots. He replied, "What coefficient of drag did you use?" I told him it was 1.25, or whatever it was. He was satisfied with that. "Besides, Captain Melson," I said, "It's not going to turn over. It might walk a little due to turbulence, but it's never going to turn over. There's just too much buoyancy there for it to do that."

INTERVIEWER: Did you add extra ballast after it was on the bottom?

MR. CULPEPPER: Yes, for a total of 15,000 negative.

INTERVIEWER: Once you got the habitat on the bottom, the divers simply dove down?

MR. CULPEPPER: No. We had a personnel transfer capsule (PTC).

INTERVIEWER: You had a capsule.

MR. CULPEPPER: We had a single lock steel chamber, and we rigged it up vertically with a framework and a platform underneath the lock and ballast in the platform. Jim Bladh operated it. He bragged about getting in on the bottom, 187 feet down, in five minutes. The aquanauts were transported to the bottom in the PTC, from which they swam over to the SeaLab.

INTERVIEWER: Now, the intention was that they were going to actually decompress inside the habitat as it was raised?

MR. CULPEPPER: Yes. The habitat was slowly raised toward the surface without problem until it reached 81 feet. At that point, surface wave action caused shock loading in excess of twenty tons on the Argus Island crane. The aquanauts were then transferred to the submersible decompression chamber via the PTC and brought to the surface to finish decompression. .

INTERVIEWER: You said you weren't actually down there during that.

MR. CULPEPPER: No. We left after the first few days of operation, three or four days, maybe. I was there long enough. One of the chores that Jim Bladh and I had was patching holes in the Zodiacs, keeping them afloat.

INTERVIEWER: With all the problems, it still ended up to be an incredible success?

MR. CULPEPPER: Oh, yeah. It was great. We lost one light bulb in the operation. It was rather fantastic, I thought.

INTERVIEWER: Now, you were saying that it came very close to being canceled after that second flooding?

MR. CULPEPPER: Yes.

INTERVIEWER: Shortly after SeaLab I, SeaLab II had to start very quickly.

MR. CULPEPPER: Yes. We finished up all the paper work and reports probably in October or November in 1964. During the same time frame, Tom Odum and I attended a SeaLab II planning meeting at Scripps Institute, which was to be the SeaLab II test site and base of operations.

After that, I accompanied Captain Melson and Al O'Neal, of the Office of Naval Research, to Hunter's Point Naval Shipyard. Before we arrived I asked Captain Melson why I was going to Hunter's Point. He replied that he wanted me to show them how to design SeaLab II. I answered, "Yes sir, but I had never worked with a shipyard before," and I had no idea what was ahead. The meeting went well, and the shipyard was agreeable to accepting the challenge.

In January, we had the first organizational meeting for SeaLab II. It was held in Panama City, and folks from Hunter's Point come down. Larry Ju headed the Design Division there. He came down. We had previously put together a PERT chart for the operation. It started in January and was to be completed in October. The PERT chart was reviewed and met with general agreement. We missed the schedule by two weeks.

INTERVIEWER: That's just unheard of today.

MR. CULPEPPER: The habitat was designed and built, starting in February, and it was delivered in July. We were present at the shipyard, Hunter's Point. I had people out there almost continuously for that six months. I was there for at least half the time. One of the interesting things that developed was that Larry Ju wanted to design the habitat similar to a submarine. He wanted to put the variable ballast down low, with tanks on either side. My position was that we wanted that area clear so the guys inside could look out and observe the bottom. It came to a standoff late one afternoon. There were six or eight of us in the conference room. Ed Carpenter, a mechanical engineer from the Naval Ordnance Test Station in Pasadena, was there to provide final outfitting support at Long Beach Naval Shipyard, the surface support vessel, and some

onsite support. Larry just wouldn't move. He said, "You know, it's got to be designed like a submarine." I said, "No. It does not. Put the weight low and ballast up high." I had gotten up to go the bathroom. When I came out, I stopped to get a drink of water. Ed Carpenter was out there, and he said, "Bill, you've got to call back to Panama City to change this." I said, "I don't have to call anybody. I made the decision." We went back in. He said, "Larry, Bill has made the decision. You don't have to call anybody in Panama City." He threw up his hands and left the room. Later on, we became very good friends.

INTERVIEWER: What were some of the fundamental changes, or differences, between SeaLab I and SeaLab II?

MR. CULPEPPER: Well, SeaLab I was the initial operation. "Let's see if we can do it," we thought, "Let's do it in nice, warm, clear water, the best environment, with no extraneous studies or experiments. SeaLab II was in a dark, cold environment and a much larger operation. There were ten guys instead of four, with two week periods for three teams. There was a lot more of experiments, studies, equipment evaluations, underwater tasks, etcetera. SeaLab II was designed to test a lot of equipment, diver heating, communications, dolphin work, salvage, tools, studies, and all sorts of things. It was a little deeper, but only by 200 feet, which was not that much.

Of course, we had a little more time to design and build. We had twice the time frame. Instead of three months, we had six months. That was great, but the job was much larger and more complicated. One of the key things in SeaLab II was the role for which Panama City was responsible. Our group provided design concept drawings, sketches, written specifications and general guidance to the shipyard for all the designing and building they were assigned. We provided the specifications and technical support for the development and procurement of the personnel transfer system. We tested, evaluated and modified, as necessary, many of the

components that were to be installed in or on the habitat. We coordinated the efforts and interfaces between eight major activities involved directly in the operation.

SeaLab II differed in many respects from SeaLab I. The hull was designed for a 15 psi differential, since we felt we could control internal pressure during descent within those limits. It had bigger view ports. Our first ones were six inches, maybe. These were 18 inches, to better observe the surrounding sea floor. The hull was 12 feet in diameter, 57 seven feet long and three quarters of an inch thick.

We had learned a lot from SeaLab I. For instance, with the refrigerator, we put in an indoor switch that cut off the inside fan, to prevent the cold from being blown out when opened. We also made sure the temperature controller would work in the higher pressure environment. For the DH machine, we increased the power of the motor to handle the denser atmosphere, and we overdid that and had to back off some on that later. We didn't have an air space in this habitat, so we put sensitive things in pressure-tight containers, or we modified them to become non-pressure sensitive. We used rough service light bulbs and pressure tested them to twice the operating pressure. They were more rugged than a regular incandescent bulb. We did not use thermal circuit breakers but substituted magnetic/hydraulic circuit breakers because of the greater heat transfer rate in the hyperbaric helium-oxygen atmosphere. One major problem arose in the procurement of the dished heads for the hull. The steel workers were on a strike, and the only response we got was from Lukens Steel. They required six months of lead time. That was our entire schedule.

The design people tried to come up with other solutions, from flat plates to cones and others, but all were rejected because of stress analysis difficulties. As it turned out, the semi-elliptic dished head was the simplest thing we could use. Mal McKinnon, who was a lieutenant

commander at the time, asked, "Why don't we form them explosively?" The design people replied that they had never done that before. Mal reminded them that they had formed some heads for a previous project. The reply was, "Those were only three feet in diameter." He said, "Well, these are only twelve." He was a real optimist. Anyway, they decided to go along with it, and sure enough, they made up a big concrete mold and clamped a plate on it, set some shaped charges out in front of it, lowered it down to water, and blew it up. A wrinkled mass and partially formed head came up. Then, someone said, "Maybe we ought to evacuate the cavity before we try this again." They put a tap in the back of the form, pulled a vacuum on it and went, bang, bang, and they had two perfect heads. It worked very well.

INTERVIEWER: That was an innovation, something never been tried before?

MR. CULPEPPER: That was probably one of the reasons that Mal made admiral, and it was key to maintaining the schedule.

INTERVIEWER: What about the hull penetrations? You said that in SeaLab I, you decided to come in through the bottom.

MR. CULPEPPER: Yes. This time, we used packing glands, but we put all of them down low, so they were actually at or near the water line in the habitat. We used good packing glands. Those were rigidly inspected. That was not a problem.

One of the interesting things that happened was at the end of the 24 hour air pressure test, the habitat was vented too quickly and a large portion of the cork insulation, which had been plastered over for appearance, was blown off the hull. It didn't take too long to replace it, though. The pressure test was otherwise successful.

In July, the habitat was barged down to Long Beach Naval Shipyard for a final outfitting. We had it on the pier there and did all those kind of things. We had an interesting experience in

the shipyard. We had designed a diver way station so that divers out in the water, if they got in trouble, could pop up into a dry atmosphere, or gas bubble. It was sort of a do-it-yourself project, something that the divers could do after they were on the bottom.

INTERVIEWER: Did they assemble it?

MR. CULPEPPER: Well, they did not assemble it, but placed it, set it up, ballasted down, dewatered it, and all that. I was fortunate to have Bill Frost, who was a naval architect, and also the grandson of Robert Frost, the poet, working with me at that time. He was also into value engineering (VE). He used some of his VE and came up with a neat little design. He used three residential fuel oil tanks. I think they were 175 gallon fuel tanks, and they were about 24 by 36 inches in a cross section and about 48 inches long. The narrow sides were rounded, and the top and bottom were flat. Bill took two of those, set them up lengthwise and cut the tops out of them. He took the other one, cut the top end out of it, turned it upside down, placed it on top of and between the other two, and then welded the three together. He cut square holes in the sides of the upper one and put two Plexiglas windows in it for view ports. That was neat. They could move that thing to the bottom, and the divers could shovel in mud or dirt, or whatever was on the bottom, into the side tanks and then dewater the center tank. We had a set of drawings that we sent to the Long Beach metal shop, apparently by way of a scheduler. The leading man in the shop called me up. He wanted me to come over. He had some questions about the drawings; he couldn't understand them. I went over. He had some questions, which I thought were kind of dumb, but I tried to explain them to him. He said, "Well, you don't specify the thickness of the material. Would an eighth of an inch be all right?" I said, "Wait a minute. On the list of materials, it calls for an oil tank. You go buy three oil tanks and weld them together." He answered, "Oh, we don't do that around here. We build the darned thing." That took more time.

They did. We got some real experience in how some shipyards worked. You'd have a little welding job, maybe a thirty minute job or so. The welder's helper showed up, and he sat around for a couple of hours. We said, "Where is the welder?" He said, "I don't know, but I can't do anything until he gets here." I think he spent a half a day doing nothing. The welder finally got there. They did the job and were gone. We had a HOOKAH, or push-pull breathing rig, furnished by Westinghouse. We had a few problems with it. We had to reconfigure and rework it to get it installed in the habitat.

We got everything together and put the habitat in the water. That was the only time I went down with it, in 12 feet of water. I noticed one of the view ports was leaking. There was just a trickle of water inside. I think we pulled it up and reworked it some. But that wasn't a great concern because we would normally have an positive internal pressure differential and did not feel that it would be a problem.

INTERVIEWER: It was a whole different operation from the construction of SeaLab I?

MR. CULPEPPER: Yes.

INTERVIEWER: How much did it cost to build SeaLab II? Do you know?

MR. CULPEPPER: It cost about three million dollars for the entire operation, if I remember correctly. The habitat was subsequently moved down to La Jolla, to the Scripps Institute. Scripps had already run the water line, power and communications/electronics lines and other support systems. They had put in one three-quarter inch water line, which would not flow the required 10 gpm to operate the showers.

INTERVIEWER: That was like a mile long or so, wasn't it? How long was that hose?

MR. CULPEPPER: It was 3500 feet long, and it was plastic pipe.

INTERVIEWER: It was 3500 feet?

MR. CULPEPPER: Yes. It wasn't too far, to 200 feet of water out there. Anyway, I asked, "How did you decide to do that?" They answered, "Well, that's what we had," or whatever. I said, "We need more capacity than that," so they went out and laid another line. Some problems developed here and there, as would be expected in such an operation, with a number of activities and a tight schedule. What I was trying to do was coordinate those efforts to minimize the holdups.

There were eight activities involved that we, the Panama City group, coordinated with the others, as required. We didn't use interface drawings like they did on SeaLab III, but ours worked and theirs did not. Generally, where we had an interface between two activities, I would task one activity with both sides of that interface. In that way, when it all came together, everything fit. It went pretty smoothly.

We had a helium tube truck on site in the water on a Mike Boat, and Mal McKinnon was there. He said, "Bill, we're going to have to send this tube truck back whether we use the helium or not. We've had it too long. What do you think? We could just go ahead and put it in the habitat, and when we get ready to go down, we'll just be that much further ahead." I said, "Well, you can put it in there, but it will be gone before you get down with it." He asked, "What do you mean?" I said, "Well, we had a small water leak in one view port at 12 feet in Long Beach. It isn't going to hold helium on the surface." He said, "We've got nothing to lose. Let's try it anyway." I said sure. I went back out the next morning. I asked Mal, "Now, what's the pressure in the habitat?" He answered, "One atmosphere." But SeaLab II went down without incident.

One thing that happened in Long Beach that I thought would be of interest had to do with the PTC. Walt Mazzone worked on clocks. He made clocks as a hobby and had designed a Geneva mechanism for the escape winch on the PTC, something that would let it come up at a controlled rate from a weighted platform on the bottom of the PTC support. It could be operated

from inside the PTC in case they needed go to the surface without surface support, such as a crane to lift them. This thing was monstrous. It had about a three, three and a half, maybe four-foot long, two-inch diameter steel lever arm with a large steel counterweight at the upper end. The ratchet wheel was attached to the winch spool and was positioned at the lower end of the pivoted lever arm. It looked quiet impressive. The PTC was lowered to the bottom pier side for the initial test of the raising mechanism. To everyone's surprise, when the system was activated, the PTC rose rapidly, apparently out of control, splashing to the surface.

Well, Bill Frost and I got the drawings out, and we were in the ward room on the USS *Berkone*, the support ship. We had a half a dozen people looking over our shoulders, including the division heads, branch heads and people like that, trying to solve the problem for us. We finally said, "If you guys would go away, maybe we could solve the problem."

Well, they had used FORMICA, a laminated melamine plastic material, for the water-lubricated bearings in the mechanism. At this time, this material was used extensively in underwater applications, such as ship propeller bearings. I had had some experience with those in my mine countermeasures days.

Normally, the rough bearings were soaked in water for thirty days before the final machining. They had to be used immediately, or kept wet until used, or they would dry out and shrink. The inside and outside diameters would increase or decrease, causing excess radial clearance between the shaft journal, bearing and bearing housing. That was what had happened. They had originally machined up at the true dimension, but they had been sitting in the dry for weeks and had shrunk so much that everything had too much clearance. The ratchet wheel and lever arm didn't make contact. It just freewheeled. I had used Teflon bearings in some of my

underwater mine countermeasures equipment, so we managed to find some Teflon and had new bearings machined and installed. It worked fine.

INTERVIEWER: They weren't actually decompressing?

MR. CULPEPPER: No. They were under pressure.

INTERVIEWER: They sealed the hatch and it was then brought to the surface at a controlled rate?

MR. CULPEPPER: Yes. They heard, "This is an emergency. You don't have a surface support, but you want to get to the surface." This was a precaution. If the habitat became contaminated and nobody was manning the crane. It was a backup.

One of the other problems involved the deck chamber and the PTC. It was the first PTC/deck chamber complex built for the Navy. We had the chamber on the second deck of the ship. The PTC, of course, sat on top of it. The PTC was vertically oriented and had seats around the inside, circumferential seats, at two levels. Five guys could sit on each level. During the first test of the decompression complex, we found that there was no way to vent the pressure in the trunk between the PTC and the deck chamber. The two could not be separated. Walt Mazzone came up with the idea of using a syringe needle. There was a face seal O-ring in between the two chambers. They inserted the syringe through the O-ring and let it bleed down that way.

INTERVIEWER: This was actually at the site?

MR. CULPEPPER: No. This was on the surface support vessel at Long Beach.

INTERVIEWER: It had never been tested at Long Beach before?

MR. CULPEPPER: No. We had a lot of things like that happen, but we worked together and with all hands cooperating, most problems were solved without serious results.

After the habitat was on the bottom and manned, we had a problem with the television cameras. They were inside the habitat, and they worked fine for a day or two or three. I don't remember the exact time, but they would screw up. We'd take them out, bring them topside and check them out. There would be nothing wrong with them. We would put them back together, take them back down in the pressure cooker and put them back in. They'd work for two or three days, or whatever it was, and they'd screw up again. Finally, the third time this happened, the technician who was working on them happened to notice that when he opened the housing, there was a slight hissing sound. Then, we figured out what was happening. The helium was getting inside this watertight camera housing, which was good for 10,000 FSW, and it was detuning the camera. We rigged up some mounts on the outside, in the water, looking through the portholes, and they worked fine.

INTERVIEWER: It was a lessons learned through experience.

MR. CULPEPPER: We used electrowriters so that the aquanauts could write messages on the bottom unit and it would be transcribed on a topside unit. The helium speech unscramblers were not very good at that point in time, especially with Scott Carpenter. I just could not understand him at all. We pressure tested the electrowriters, and when we decompressed them, the capacitors, the oil filled capacitors blew up. They had absorbed helium. We found that we had to decompress them or replace the oil filled capacitors with dry capacitors. Then, we had no more problems with that.

But we found a lot of unique problems, particularly in the helium hyperbaric atmosphere. We did a lot of research in developing film coefficients for use in calculating heat loss for the habitat and subsequently, how much heat capacity would be needed to maintain a comfortable environment. We relied heavily on the services of a consultant at the University of Florida in this

effort, with Jim Fyfe successfully supporting the effort for us. Jim's theoretical calculated heat loss was 54,300 btu per hour. The average measured during the operation was 60,000 btu per hour.

INTERVIEWER: You were blazing new trails then.

MR. CULPEPPER: Yes. We also developed a relative humidity chart to use in that environment. Jim Fyfe did those. We found that the guys liked to keep the temperature around 85 or 87 degrees, to be comfortable because of the high heat transfer of the atmosphere.

INTERVIEWER: How long were you actually in California? Was it for the entire operation or you were coming back and forth?

MR. CULPEPPER: Well, I was there about half the time, back and forth during the design and fabrication at Hunter's Point. But some of our team members were there almost continuously. I was in Long Beach continuously during the final outfitting, and at San Diego during the operation. We were there for some three months. I did leave a little before the operation was completed. We went out in July, the first week in July, I believe, and stayed through August and September. We left around the first of October, and it didn't finish up for a week or two after that.

Bob Porter and I then went back out for the surfacing of the habitat because our team was responsible for the engineering evaluation. We planned a complete inspection of the habitat and all systems and equipment. During the raising, operation problems were encountered with maintaining an over pressure in the habitat, and partial flooding occurred. There were about six inches of seawater on the deck. Again, Bob Porter and I enjoyed cleaning up and conducting our inspection. I remember the skin on our feet peeling off from the lithium hydroxide in the water. The scrubber cans were down low near the deck.

INTERVIEWER: Now, what caused the flooding?

MR. CULPEPPER: It was caused by the inability to maintain an over pressure inside the habitat. It was not a big issue.

INTERVIEWER: Yes. That was 1965. Was it an immediate decision to go with SeaLab III or was there some delay?

MR. CULPEPPER: It was not immediate. During this time, the Office of Naval Research had sponsored SeaLab I and SeaLab II, but the Deep Submergence Systems Project Office took it over at SeaLab III. We finished that in 1965. I want to say that it was the next year that SeaLab III began.

The most astonishing thing happened when we had the first organizational meeting at Hunter's Point. We had a big meeting, and Commander Jack Tomsky, the project officer, made the statement that the people who were involved in SeaLab I and II would not be technically involved in SeaLab III. We ended up being tasked with the engineering evaluation after the fact. We were also to provide some equipment, such as a combination washer/dryer unit, an infrared oven, and a carbon monoxide burner.

INTERVIEWER: Was there a reason? Did they give a reason?

MR. CULPEPPER: No..

INTERVIEWER: Essentially, it was the same habitat, but it was modified into SeaLab III? It was the same as the habitat for SeaLab II?

MR. CULPEPPER: Yeah. They used the same hull, but they added a big room on each end underneath the hull. I think the one on the entry end was primarily like a dive locker. There were spaces and hangers for dive gear and the showers, and all that stuff, to make more room inside

the main hull. The other end contained a freezer and other storage space, plus the emergency exit.

One of the things that happened to SeaLab II was, with all the survey work they had done at the habitat bottom site, they had determined that the grade was three percent. We decided that leveling jacks would not be needed. But when the habitat was manned, they found that the bottom grade was near ten degrees. That was where they got the name, the 'Tiltin' Hilton.'

On SeaLab III, they wiped the bottom structure off and made an anchor, in effect, with the habitat articulated above, so no matter what attitude, the bottom was the habitat would hopefully float at level.

In Panama City, we sent out requests for quotes for a washer/dryer unit. Although we had not RFQ'd Sears, that was the only quote we received. We bought the Sears unit but found that it was too large to fit through the EOD chamber lock for pressure testing. We called Sears and ordered a technician to come out to disassemble the unit and then reassemble it inside the chamber. After a successful pressure test, the Sears procedure was reversed.

We also procured, modified, and tested an infrared oven, as well as designed and tested a carbon monoxide burner. This unit utilized a heated catalytic bed to convert carbon monoxide to carbon dioxide and was designed by Ray Bentz. The operation started out badly. In doing our engineering evaluation, we had everything instrumented. We had flow meters on all the gas lines and sensors on all the electrical systems, the motors and things of that nature.

While the habitat was pier side, in Long Beach, we were doing our final checkout, and in checking the motors, like the scrubber motor and DH pump, a total of six three phase motors,

we found that all but one was running backwards. The electrical system was monitored by a frequency meter to indicate the proper power phase connection. The meter indicated that the phasing was correct. But Bob, wanting to be sure, went up to the electrical shop and got another frequency meter, which was good, and brought it down to check it out. He determined that the installed meter was defective. We reversed two of the shore power leads and then, five motors were running right, and the DH pump motor was running backwards. We rewired the DH motor to make it run forward.

When we were at the site and they were doing the surface checkout after hooking up the power, they found that all motors were running backwards. Someone in the group noted that my team had made some changes to the electrical system in Long Beach, and I was in trouble for not reporting the fact. I informed them of what we had done at Long Beach and that the frequency meter was defective. The shipyard folks said that was not possible because they had built it in strict accordance with the drawings.

In answer to the question 'what do we do now?' I suggested to Ed Carpenter that if he went down to the shipboard power panel and reversed any two leads, everything would be fine. It was. The next morning at breakfast, I was told that I was right and a new meter had been obtained and installed in the habitat. But for what? It didn't make any difference at that point in time. Everything was hooked up and running correctly.

The next problem surfaced when we found that the heaters inside the habitat had not been turned on before the habitat was lowered. It was at 600 feet, in 45 degree water, with no heat. The next question was how long it would take to heat it up after we got inside and turned everything on. We went back to the beach and worked for several hours that night, calculating

how long it would take to heat it up. I don't remember the number now, but I remember it was quite a number of hours.

The next problem was that the habitat was leaking gas at a significant rate. There was an urgency to get someone into the habitat to try to stop the leaks. The night before they pressed the divers down, Berry Cannon and I had a room together. I didn't have a room at that time. He did. He had a double bunk. We had breakfast together and went out to the support vessel. I was the last guy to talk to him before he went into the chamber. I asked him if this would be his last dive and he answered no, he wanted to go to 1000 feet. I wished him good luck and we shook hands.

Berry and Bob Barth were on the first team. They were selected to go down first, open the habitat and check out all systems. That night, Wally Jenkins and I were ashore and had our engineering van manned and monitoring all the systems in the habitat. In order to try to stop the leakage of gas, Berry and Bob were lowered to the habitat but could not open the hatch and were returned to the surface chamber. There was no heat in the PTC, nor was there any surface supplied heat to the divers. At 600 feet in 45-degree water breathing helium, hypothermia was a real problem. The divers were very cold.

INTERVIEWER: Now, was that an oversight or did it just not have heat?

MR. CULPEPPER: It just wasn't there. We designed and fabricated PTC and diver heating systems for the MK II Dive System later on. Due to the concern over the loss of helium with only a limited supply, another attempt to occupy the habitat was made about one in the morning. On that dive, Bob said that he had gone off to look for a crowbar, or something to pry the hatch open. That was when Barry passed out. Bob went back to him, but was too weak to pull him

back to the PTC. Blackie Blackburn was the PTC operator. I talked to Blackie personally. He said that he went in the water and pulled Berry back into the PTC. I said, "Well, how was it?" He said, "It was cold. Going in that water was just like jumping into ice water." Berry was pronounced dead after returning to the surface.

INTERVIEWER: They had no hot water suits or anything? They had just wet suits? MR.

CULPEPPER: No. There was no heat from the surface. All of the heating systems were on the habitat.

INTERVIEWER: Now, what was the reason that they couldn't open the hatch? Was there a differential pressure on the inside?

MR. CULPEPPER: They had a four square foot entry hatch on the habitat. The hatch was counter weighted. It had a cable/pulley/counterweight system to offset the hatch weight, but a half a psi differential is 1200 pounds or so. Since they were supplying gas to prevent flooding, it was certainly possible that there could be internal over pressure. Things got worse after that. They were running out of helium and pumped air down to prevent flooding. The surface support also wasn't rigged to bring that thing back up. They spent the night re-rigging from the lowering mode to rigging up so that they could bring it to the surface. They brought it up the next day.

INTERVIEWER: It was negatively buoyed? They had to winch it to the surface?

MR. CULPEPPER: Yes. They could blow the variable ballast and maintain a small negative buoyancy. I was in a cloud during that time. Nobody would talk to me. Tomsy and Nicholson were both there, and I wanted to know why this thing happened. Wally Jenkins and I had gone out that morning. It was before daylight. We went down to the pier and got on the boat to go out. Mike Greenwood was on the boat, and he said, "Hey, guys. I'm sure you probably don't know,

but Berry is dead." That was the first we knew. They had probably called Mike during the night or something.

INTERVIEWER: Now, what was the atmosphere on the surface there? Was it chaotic?

MR. CULPEPPER: It was quiet.

INTERVIEWER: This was after or before when they were trying to get into the habitat?

MR. CULPEPPER: It was after. I wasn't there. I was ashore, asleep. I knew nothing about it.

We thought they were going to go down the next morning and open it up. Apparently, with the leaking they had, they decided to go sooner. It was either try it or scratch the project at that point.

INTERVIEWER: My understanding is that there was an empty canister in Berry Cannon's rig.

MR. CULPEPPER: Yeah.

INTERVIEWER: How could that have possibly happened? Have you thought about that?

MR. CULPEPPER: I never really believed it until fairly recently. Bob Barth and I were talking about the last SeaLab reunion. Somehow, we brought up P.A., or Paul, Wells' name. He said that he tried to get Paul to come to the reunion, but Paul wouldn't come. I said, "Well, does he believe he's responsible for Berry?" He said, "Well, sure he does." Up until that time, I had assumed that he had just died of hypothermia. I just didn't believe that could happen. I knew P.A. too well to feel like that he would let something like that happen. Apparently, it did happen.

INTERVIEWER: Now, I've heard some people even say that they thought that there could be a chance of sabotage.

MR. CULPEPPER: Yeah. I've heard that, but I figured that it was somebody trying to lay the blame somewhere else. I don't know. I just don't have any background or any information to

express an opinion about how it might have happened. I felt that with P.A. in charge, something like that would not have happened. I won't say that it was P.A.'s fault, other than the fact that he was in charge. I don't know that he was supposed to personally check the rigs or whether somebody else was assigned that responsibility and didn't do it or what.

INTERVIEWER: Now, at the point after Barry Cannon's death, was a decision made to cancel SeaLab III?

MR. CULPEPPER: I don't recall any decision being made. First of all, we had to go through Berry's personal belongings and itemize all that stuff. We then went to a memorial service in San Diego. Then, I went to the airport to get a flight back to Panama City. I called my good friend, Danny Roberts, because I couldn't get a plane. He called the manager out there and got me on a plane somehow. That got me back to Panama City. Shortly thereafter, we went to Berry's funeral. As soon as the funeral was over, my family and I took a week off and went down to a park near Ocala and spent a week and relaxed.

INTERVIEWER: Now, obviously, SeaLab III was a much more ambitious project than the other two?

MR. CULPEPPER: It cost thirty million dollars.

INTERVIEWER: I guess there were more people involved in the whole process, also?

MR. CULPEPPER: There were many, many more. I really don't know and am not able to say how many, but there were many folks. Just the Steering Task Group meeting was attended by large roomful of people. All the minutes were taken verbatim by a transcriber, and the minutes of the meeting were like a Sears catalog, with every statement that anybody made. The modus operandi was that all the activities involved were going to be inter-coordinated by a contractor

who sent people to Panama City, and they'd go through every task that we had. "Where are you? What's this? What's that?" They had the latest drawings, and they were supposed to be tying all this stuff together, particularly the interfaces, making sure the interfaces were going to work and all that. They had some good people involved. Dr. Craven, who was involved in the USS *Sturgeon* submarine disaster, was there.

INTERVIEWER: Was that John Craven?

MR. CULPEPPER: Yes. John Craven was there. He was involved. He had very capable people working for him. The problem, apparently, was in the shipyard. When they built SeaLab II, I had people there who monitored everything the shipyard did. When they saw anything that was not according to plan, they had it redone. On SeaLab III, they didn't do that. Now, as bad as it was leaking, my question is, did they pressure test it? We pressure tested SeaLab II. I don't know.

INTERVIEWER: Now, the penetration was on the top in SeaLab III? Is that correct?

MR. CULPEPPER: I think they had something on the top. Yes.

INTERVIEWER: Do you think that contributed to the rapid loss of helium?

MR. CULPEPPER: Well, I'm not sure it contributed, but it wasn't the primary problem. Bob Porter was involved in the inspection of the habitat afterward, and he told me that there were stuffing tubes in which the components were incorrectly assembled. There were some that had silicone rubber in them instead of the packing gland they were supposed to contain. There were some that didn't have any packing at all in them, and there was a report written containing that information. I managed to get a copy, even though distribution of the report was barred. Dave Haswell worked on the report and managed to get me a copy of it. I had it until one day when

Captain Bond was still in Panama City. In fact, he had an office in Building 49, where my group was. George came in and asked if he could borrow my copy of the SeaLab III report. He said, "There's some things in there I'd like to look at." I said, "Sure, Captain." That was the last I ever saw of it, and then, they planned to tow the habitat out to sea and scuttle it but apparently didn't have funding to do that.

We were allowed to go and take out some of the equipment that we had installed in it. Bob Porter, I believe, and I went out. It was sitting there in the shipyard, locked. We got it open and got our stuff and left, hearing later on that it was scrapped. Now, SeaLab III was a much longer project, obviously, than SeaLabs I or II.

INTERVIEWER: Was that because the attempt was in 1969?

MR. CULPEPPER: Yeah, but it was like three years. Like I said, there was a lot more money and people involved. But that's probably all that I can come up with. We did some things there that we hadn't done before, such as the carbon monoxide burner.

INTERVIEWER: Now, they didn't have those on submarines already? Is what you developed is what they use on subs now?

MR. CULPEPPER: I don't know, but what works on subs won't work in a helium environment at 600 feet.

INTERVIEWER: I see.

MR. CULPEPPER: You've got one atmosphere of air in the submarine. Ray Bentz designed that unit. I can't remember exactly the details of that design now. But some of that unique stuff that we had put in, we were able to go out and retrieve for posterity. But that's probably enough of SeaLab III.

INTERVIEWER: This was 1969.

MR. CULPEPPER: Yes. We developed a heater scrubber unit for the MK II Deep Dive System PTC.

INTERVIEWER: Now, was that a direct result of the SeaLab III attempt, in which the divers were so cold?

MR. CULPEPPER: Yeah. I'm sure it was because it was funded by PMS 395. Those units worked well and used lithium hydroxide for the scrubber. We had some newly developed electrical heating elements. They were thin, flexible, plastic, laminated heating surfaces that could form in a circular configuration inside the scrubber and would heat the air coming through. For the divers, we developed a hot water system in which we put a manifold on the outside of the PTC. It was surface supplied with hot water through a well insulated hose. There were quick disconnects for three diver umbilicals. We developed a helium speech unscrambler that was significantly better than most of those in use. The Marconi unscrambler was about the only one that was close to it. We never evaluated the two, one against the other, but ours worked well. One of the physicists at the Navy Base designed it. He was sort of a whiz. He held a lot of patents on things that he had invented. He used what they called a 'bucket brigade principle,' which just chopped little segments out of the speech and then put it back together. It was so good that you could actually understand the speech much better and even identify the person speaking by the sound of his voice. At one time, they had some problems with one of the Marconi units. We sent this guy and another electronic engineer out to the west coast on a weekend to fix it for them.

INTERVIEWER: Can you remember his name?

MR. CULPEPPER: He was Clell Dildy. He died four years ago. He was the kind of guy that just wouldn't take a mundane job. He wanted a challenging task or he wasn't going to fool with it, and he was really good his job. I gave a copy of the unscrambler design drawings to Taylor Diving and Salvage for its own use. Did you ever know Brian Barrett? He was an English exchange officer here at the Navy Base back during the time that Jim Bladh was his counterpart in England with the dive unit over there.

INTERVIEWER: I think I do.

MR. CULPEPPER: Yes. He was the project officer for the MK 14 when they first started.

INTERVIEWER: Yes. I do remember him.

MR. CULPEPPER: I was the funds manager for it. I ran into him over at the oceanology symposium a couple of weeks ago. He's now an American citizen and working in this country. We had the MK 14 push/pull system, on which Ray Bentz worked. We also had the surface-supplied MK 12 during the same time frame. Lieutenant Barry Ridgewell, a Canadian exchange officer, was the MK 12 project officer.

During SeaLab III, in 1967, they had accidentally dropped the PTC and had some long-term down time for repairs. I came back to Panama City and was assigned responsibility for preparing the design definition document for the OSF, or Ocean Simulation Facility. I got that started, both the design requirements document for it and got it through NAVFAC. Berry Cannon worked with me on that. He and I actually served on the selection board for the A&E architect with NAVFAC, which was unusual. They normally did not allow the customer to be involved in that process, but with the uniqueness of this project, they felt like we should be involved.

INTERVIEWER: Was that during the time when Jack Tomsy had said that SeaLab II,,

MR. CULPEPPER: Oh, yeah. They were already on the scene out there.

INTERVIEWER: In the meantime, then, you were then working on the OSF?

MR. CULPEPPER: Yes. That was in the April or May time frame that we did the design definition document. In June, we wrote the design requirements document. It was then that George Combs, a good friend and outstanding mechanical engineer, also an Auburn graduate, was being phased into the effort in order to continue with it when I went back out to SeaLab III.

INTERVIEWER: That was 1967, you said?

MR. CULPEPPER: Yes. Later that year, in September, maybe, SeaLab III started up again. I turned the OSF project over to George Combs. We had already picked the A&E for the OSF and we had gotten it off and running. George picked it up and took it through design, building construction, and chamber fabrication and installation. We established a design review committee not only to closely monitor the design process but also to involve all the naval activities that were involved in diving.

INTERVIEWER: Such as medical research?

MR. CULPEPPER: Yes, like MRI, the experimental diving unit, OOC, and the folks on the west coast, Submarine Development Group One. That was Captain Bill Searle. Walt Mazzone was out there, and Captain Bond was at Panama City. Then, we had Hunter's Point involved. We had the someone from the University of Pennsylvania, an electrical engineer consultant, there. Representatives from the David Taylor Model Basin, with a new 10,000 psi chamber, and the Marine Engineering Lab, with several lower rated chambers, were also members. We had gotten the University of Florida under contract to help in the heat transfer and thermal insulation

problem areas. We involved everybody we could think of because there was so much opposition within the diving Navy to locating the OSF in Panama City.

INTERVIEWER: Was there opposition to building the OSF?

MR. CULPEPPER: No. It was opposition to locating it in Panama City. It needed to be in San Diego, but we had Bob Sikes as our Congressman.

INTERVIEWER: That's interesting.

MR. CULPEPPER: When we had critical design review meetings, most of the Navy people didn't show up. They didn't want to be connected with it. George Combs and I took the results of the meeting and went to San Diego. We sat down with Walt Mazzone and discussed it with him. Then, we went up to Hunter's Point and discussed it with them. We went to the experimental diving unit. John Harder was CO there then. Conveniently, he was out looking for a hydrogen bomb in Spain. We got to talk to a civilian gentleman named Black. I.D. Black was the only guy to whom they let us speak. We went to OOC and did get an audience with Captain Searle, who agreed, "Yeah, if you guys can get it built, the Navy will probably use it, in time, but we don't think that's where it ought to be." Anyway, we managed to get some participation as the thing went on. That was an interesting time. NAVFAC just didn't do that sort of project. They didn't build research facilities, but we were fortunate enough to have a very astute project manager from NAVFAC by the name of John McNeely, who became very interested in the project. He read everything he could get about diving and saturation diving, and on and on and on. Had it not been for him, it would have probably been a miserable failure.

INTERVIEWER: Who was funding the planning stage of the OSF? Where was the funding coming from?

MR. CULPEPPER: I believe we may have had some funding from the director of Navy labs or SecNav. At that point in time, there wasn't a lot of planning. It was a military construction program. Congress was providing the money, and that became available as soon as we picked an architect and engineering contractor and developed a firm cost estimate. SecNav's guy was directly involved. We had all of those people on board, and we had our first meeting at Carderock. We went there primarily to get to their input and see all their chambers, and then, we went over to tour the Marine Engineering Lab in Annapolis, too. Our marching orders from the director of Navy labs were to go to the A & E contractor, sit down for a week and come up with a firm, fixed price for this project.

When I got the project, it was estimated at \$2.2 or \$2.5 million. Our public works people at the Navy Base had been sort of handling it at that point in time. Where they were getting the money, I don't know, but back then, it was pretty easy to come up with unappropriated funds from one source or another. Anyway, George Combs and I went up to the A & E, Sanders and Thomas, in Pottstown, Pennsylvania. We spent a week and came back with a price of \$10.4 million, and that was what started it.

INTERVIEWER: I wasn't aware of the resistance to the OSF. If it weren't for the OSF, I don't think the dive school would be here.

MR. CULPEPPER: I know, but that was the whole thrust. The effort was to bring all Navy diving to Panama City. That was Tom Odum's dream and it worked. Commander Charlie Hedgepath, as commanding officer of the Experimental Diving Unit, stated in a meeting that he would never move to Panama City. That was the kind of opposition we had. Like I said, we had Bob Sikes. He got the money appropriated and they came to Panama City.

Even after it was built, in place, and online, we had a meeting here. I don't now remember exactly the purpose of the meeting, but we had the meeting in the conference room on the third deck of Building 110. It had something to do with diving, and we had the model of the OSF out in the hall, outside the conference room. Captain Boller and I were standing there, looking at the model, and he said, "Bill, what would it take to move this to San Diego?" I said, "Captain, it would take a darn big barge." That was the end of that conversation.

Interestingly enough, although we had intended the OSF to be operated by Navy base civilian personnel, as soon as it became operational, the EDU was there to take it over.

Anyway, that was the OSF. During this time, Charlie Noble was developing the hydrospace lab at the Navy base that has served as a test facility for many dive system systems and components, including some that were earmarked for the OSF. When we first started pressure testing diving systems and components, we were very limited in facilities. We had to go to other facilities, such as those at Duke University.

Along with Ed Sharp, we developed the gas analysis lab and hired two chemical engineers, Al Purer and Glen Deason, from Amarillo, Texas, to increase our capabilities in that area. During this period, our group was involved in many efforts. We supported the MAKAI dive in Hawaii by providing consulting to the project engineer in all areas of design for the Aegir habitat. We provided diver communications and physiological monitoring systems, diver umbilicals, and diver hot water heating. We provided design, fabrication, and installation of diver communications, physiological monitoring, and heating systems for the ASRs USS *Ortolan* and USS *Pigeon*. I provided consulting and design review services to the University of New Hampshire in the design of their undersea habitat, EDELHAB. I also provided engineering

and operational support to the SeaBee commanding officer, Commander Frank Looney, during the initial phase of Tektite I in Lameshur Bay in the Virgin Islands. Wally Jenkins and I, in conjunction with Commander Ed Whittaker and Captain Bill Spaur, of the EDU, wrote Appendix G, Saturation Diving for Deep Diving Systems, to the *U.S. Navy Diving Manual* in 1972. Bill Spaur commented to me a year later, saying that no changes had been made in the first year. Then, we got involved in the MK 14 Mod I. We managed to get, in spite of resistance from higher management, the job of logistic support for 395.

INTERVIEWER: It's been a big project.

MR. CULPEPPER: Yeah. It's dying away now, but it was a long term, well funded effort.

INTERVIEWER: You retired from the Civil Service in 1978?

MR. CULPEPPER: Yes. At that time, I had been out of diving for about three years, I guess. I was transferred because Tom Odum and I were having problems, so I went into the Amphibious Warfare Division. I worked on COTS, or Containers Over The Shore, a project for evaluating the use of heavy lift construction cranes to offload containerized cargo at sea for transport into a beach head to support amphibious landings. This effort included the evaluation of crawler cranes with lift capacities of 200 to 300 tons. We tested them in various configurations, including tilted left or right at angles up to six degrees and instrumented with many strain gages, accelerometers, potentiometers, position sensors, even inertial platforms, and high frequency data analysis and recording systems. When I retired from NCSC, the COTS Project Manager in Washington, D.C., had me hired for three years to continue with the project. We negotiated, and I left the Navy base on Friday and got on a plane Sunday, going to work on Monday. I worked with EG&G for about two years until the COTS project was completed. I worked there until

Columbia Research came looking for somebody to take over the engineering group there, and I worked there for about nine years. During that period, we supported the MK14 Mod 0, MK14 Mod 1, SEAL Delivery Vehicle overhauls, and a number of other diving support tasks. After having difficulties in communicating and working with a new manager, I began looking for other employment.

Fortunately, Lockheed-Martin came along, wanting to open an office in Panama City. They were going to compete for the Navy base test and evaluation support contract. They offered me the opportunity to manage the office for them. They were not successful in winning the contract but had some delivery orders in place, which supported three to five employees. I had three years of work with them before things ran out. During that time, we supported the conventional dive system by maintaining the recordable evidence files, and preparing the integrated test plan and test procedures. I became involved in an effort to provide colder water test capability for the Ocean Simulation Facility. PMS 395 wanted to perform manned tests at a temperature of about 28 degrees.

After a few months of effort, we came up with a ten million dollar price tag, which was what the OSF cost in the beginning, and 395 decided to give it up. As a result, the effort was canceled and Barry Miller called me and said, "Bill, I need to get my money back." I said, "Well, how long do I have to shut it down?" He answered, "How about a week?" I said, "That would be nice." I called my boss, George Lewis, in San Diego, and told him. He said, "What are you going to do next week?" I said, "I'm going to get my resume up to date." That wasn't a problem.

Then, I went to Analysis & Technology, which had the Navy's Diving and Marine Engineering Contract. They said, "Come on down." I said, "Well, I've got two weeks of leave I can take off. I was able to take a week of it before they called me and told me to come to work." There, I was involved in a number of interesting and challenging projects, including the design of certain subsystems for a proposed underwater ship husbandry work boat, like an electro-hydraulic system drive for underwater hydraulic tools and the design of a hydraulically-driven diver umbilical winch. Also included was a lightweight diver air supply rack, including system piping and control console. The work boat effort was dropped after the first year, but the air storage rack design was picked by up OOC and funded to develop a new flyaway dive system. Marty Sheehan was the Navy project manager. He felt that he could maintain better control and minimize costs by contracting the effort to Analysis & Technology. Because of that, the Flyaway Dive System, FADS III, went through critical design review in one year, at a cost of just under one million dollars. After the completion of the FADS III design, the decision was made to develop a mixed gas system to be designated the Flyaway Mixed Gas System, FMGS. This system was designed, fabricated and approved for service use. Have you ever seen that system?

INTERVIEWER: Yes. I have.

MR. CULPEPPER: It's neat. It has storage racks that have nine composite cylinders with air and helium at 5,000 psi and oxygen at 3,000. An air rack has 8700 cubic feet of usable air in it and weighs about 3400 pounds. It's all aluminum and rigged for crane or fork truck handling. The nine cylinders are interconnected, using Synflex HP hoses. The primary bank has four cylinders, the secondary at three, and the third bank, two. Should the situation require, the

number of cylinders in each bank can be varied. For further flexibility, the control console is connected to the storage racks by fifty-foot HP hoses.

INTERVIEWER: Now, OOC developed those for remote areas?

MR. CULPEPPER: Well, so far, only three mixed gas systems have been built. One system has been used by MDSU 2 for recovery efforts on the GRAPPLE and on the leased WOTAN barge in the USS *Monitor* recovery effort. The other two are installed on the YDTs at the Deep Sea Dive School. The system is so flexible that Analysis & Technology's Dale Colemere spent two years writing the failure modes, effects and criticality analysis, which fills two three and a half inch binders. We designed the control consoles, the whole nine yards, and they're all portable. We did the shake and bake tests at the National Aeronautics and Space Administration test facility at Huntsville, Alabama. The shake test opened a few tubing joints, but they were corrected on the spot. The most nervous test was when they dropped the air rack, charged to 5,000 psi, 18 inches onto the concrete floor. I was, of course, standing behind a post and too concerned. We had gotten Bobby Hughes, at the Navy base, to do a finite element analysis on the structure, and I had to go back in and beef it up a little bit. It didn't even dent. Well, that was my swan song, I guess, because it was the last significant dive project I had.

INTERVIEWER: You've been involved in an awful lot of things. You've seen an awful lot.

MR. CULPEPPER: Yes. I have been very fortunate to have been in the right places at the right times and as the good projects came along.

INTERVIEWER: Is there one particular thing that you think is the most significant achievement in the last fifty years in diving?

MR. CULPEPPER: SeaLab.

INTERVIEWER: SeaLab?

MR. CULPEPPER: It was where saturation diving started.

INTERVIEWER: Thinking back on your career in undersea technology, if all the barriers had been removed and you had been given absolute authority to do anything you had wanted, would you have changed anything?

MR. CULPEPPER: I would have changed a few symbolic things, I guess, but nothing major. I was, more or less, a hands-on working engineer. Now, I had a brief tour of three years during which I had the ocean engineering division out there. There, again, we were doing all of the saturation diving development work for the base, primarily PMS 395, at that time. I would not have been eliminated from SeaLab III, hopefully, if I could have saved Berry Cannon's life. Hopefully, the project would have been run differently. The habitat wouldn't have leaked.

INTERVIEWER: What would you have done differently with SeaLab III?

MR. CULPEPPER: I would have had people out there on the job to monitor the shipyard's work and make sure that things were done correctly because we had a lot of experience from SeaLab II. We knew the shipyard workers were not experienced in doing that kind of work. One of the things, as an example, was with one of the people in the design division. I had sketched out the scrubber/dehumidifier unit, and I had 12 lithium hydroxide carbon dioxide canisters. They were on the bottom, at floor level, and it was an updraft system. I had the filters above, which used activated charcoal as a multi-purpose filter for hydroxide dust, odors, and other atmospheric contaminants. I had very carefully scaled the volume available and had specified the volume of charcoal to be included. Above the charcoal was the DH heat exchanger. The guy doing the shop drawings to fit this into the habitat was a short little guy. He said, "There's not enough room."

I said, "Sure, there is. I've got it sketched out and scaled." He complained that he was having trouble getting that much in. He asked, "Why do you need so much charcoal?" I said, "Well, I put the carbon dioxide canisters in there. I then put in the DH core. What was left, I filled up with charcoal." He asked why. I said, "Well, I really don't know how much charcoal is going to be required for forty-some days of operation with ten guys in there." I asked, "Do you know?" He said no. I said, "Well, that's how much we are going to put in there." But they do most things by the book. They don't think. Well, they think, but they're just not used to doing research and development-type work. As it turned out, apparently, the charcoal filter worked pretty well. I don't know whether I had too much or too little, but I don't think that I had too little. I did have some literature on charcoal filters for restaurants, but that's totally different. You have cigarette smoke, grease, and all kinds of stuff in a restaurant. But I got some feel for a human quantity.

INTERVIEWER: You were blazing a new frontier.

MR. CULPEPPER: Exactly. It was fun. It was fun, looking back. When I was there, it wasn't so much fun.

INTERVIEWER: For the first half of the century, the U.S. Navy really was a world leader in diving. Since that time, many Navy divers had been leaders in the commercial diving field. Currently, neither of these facts seem to be true. Do you have any thoughts on that?

MR. CULPEPPER: I don't know. From my experience, one of the problems that we had back then, in the days of SeaLab, developing saturation diving, was that the Navy could never really come up with a solid mission requirement. Therefore, after SeaLab III, there was little effort or interest for a number of years. Commercial folks in this country have far exceeded anything the Navy has done on a volume basis, anyway. A while back, I went to an ADC symposium. It was

probably three years ago, and I was amazed to hear that they were routinely working at 1200 to 1300 feet. I didn't know that. I knew it was possible. The oil companies have missions at those depths, but the Navy doesn't.

INTERVIEWER: Now, the Navy's saturation capability is very limited right now, very limited.

MR. CULPEPPER: Yes.

INTERVIEWER: Is this a mistake, do you think?

MR. CULPEPPER: I don't know.

INTERVIEWER: There's actually talk about leasing a commercial system for the *Monitor*.

MR. CULPEPPER: Yes.

INTERVIEWER: Are we missing out?

MR. CULPEPPER: I think we are. I think we ought to have a limited-depth capability in saturation diving, to 600, 800, even a 1000 feet, or something like that. I don't think we need to go to the extreme, but it's something that, if we needed it, could be accomplished in a relatively short period of time, I think. We know the technology. It's just a matter of equipment.

INTERVIEWER: What do you think we should be looking for in the future?

MR. CULPEPPER: I really can't answer that. I have not been involved in any of the things that are going on now. I know there's some effort, as far as a rescue capability. I think that's important. I have trouble putting a value on it because I don't know what the future undersea scenarios will be. There have been so many unsuccessful things tried in the past, like rescue systems, the *Ortolan* and the *Pigeon* and deep sea rescue vehicles. The deep dive systems, MK 1 and MK 2, were never much utilized for lack of need. The point is, how many submarine accidents do you expect to have? There doesn't seem to be much possibility of developing a

viable and affordable rescue system for use in the deep ocean. Therefore, I think we should evaluate the need and viability of rescue systems for shallower depths, to maybe 1000 feet.

INTERVIEWER: Except that in recent years, I mean the total warfare has become much more important.

MR. CULPEPPER: Well, that's true. Now, you're looking at a different class of submarines, the smaller, shallow water boats. But it is for somebody else to determine what degree of capability we need.

INTERVIEWER: Recently, I've been reading a lot of books on the submarine disasters in the early 1900s, like the *S-51* and the *S-4*. Of course, until then, it was just an accepted risk.

MR. CULPEPPER: Yes.

INTERVIEWER: The idea of having a way of escaping was just not important.

MR. CULPEPPER: Again, McCann came along.

INTERVIEWER: Mumsen also helped. Of course, the *Kirsk* demonstrated that there is a need.

MR. CULPEPPER: Yes.

INTERVIEWER: Well, you've had a wonderful career to reflect on. That's for sure.

MR. CULPEPPER: The interesting thing about my career is the fact that it's been so widely ranging. I've worked on dive systems. I've worked on ships, mine and torpedo countermeasures, and big 200 and 300 ton cranes. I helped break a 300 ton crane one time. It only took three months and \$80,000 worth of parts to fix it. We put cranes on ships and offloaded cargo. We spent 42 days and nights in Green Cove Springs, testing a crane. Anne and I celebrated our 25th wedding anniversary in Green Cove Springs. She took off from work, flew down there, and we had dinner with seven other guys for our anniversary. That was a bear.

INTERVIEWER: Well, thank you for sharing your experiences.

MR. CULPEPPER: Well, you're certainly welcome.

U.S. NAVAL SERVICE OF WILLIAM R. LEIBOLD, Sr.

The summer of 1940 was coming to an end and my impending return to high school studies was not something I looked forward to. Following completion of the eleventh grade, I had no sense of real accomplishment and completion of my senior year would not, in my opinion, have been a challenge.

My interest in submarines led me to the Naval Recruiting Office in downtown Los Angeles, CA. I was given a written test and advised that parental permission was required in that I was not yet eighteen. My parents opposed my leaving school to enlist but I was able to convince my father that it was the route I wanted and he gave his permission. About three months elapsed before I was notified to report for further tests and a physical and this was followed by my enlistment on 30 November 1940.

Recruit training was completed at the Naval Training Station, San Diego. While on one of the few "liberties" given while in "Boot Training" I went to the fleet landing to watch the "old salts" coming ashore. A strange little boat made the pier and discharged a group of sailors, the cox'n saw me eyeing his boat and invited me to ride out to his submarine. His sub was the Dolphin (D1); I spent the weekend on board and was even more convinced that submarine duty was for me.

I completed boot training in February 1941 and received orders to ComMineBatFor in Pearl Harbor. Transportation to Pearl was via the USS Relief, a hospital ship. A large draft of recruits was being transported and was kept busy in the deck divisions, chipping and painting as they rolled and retched across the Pacific. Arriving in Pearl, the Relief berthed at 1010 dock where the recruits were assembled. There were a number of ancient ships at berths nearby and the group I was in was marched to them. A chief then began calling out that he needed so many men for the various ships. When he called out "I need three men for Pruitt", three of us standing together stepped forward and were directed to our new home, USS Pruitt (DM22), last of the WWI four stack destroyers. She had been converted to a light minelayer and was undergoing upkeep at the shipyard. We were directed to place our gear (hammock, mattress, sea bag) on deck until we were assigned to a berthing space. A petty officer took me in tow and put me on "fire watch" for a shipyard welder. The welder completed his job and left, not knowing any better, I continued standing watch until a petty officer came by and asked "what are you doing here kid"? I informed him that I was the fire watch, when he stopped laughing he introduced himself, Fergus, GM2c. He then saw to it that I got some chow as the evening meal had already been served and got me squared away with a bunk. The next morning, we were introduced to the executive officer who advised us,

amongst other things, that we would be allowed to wear dungarees, while the Pruitt was in the shipyard. Dungarees were available in the ship's canteen and we could pay for them on the next payday. At this time, dungarees were only authorized for engineers and side cleaners.

I was assigned to the deck force and promptly started submitting special request chits for assignment to submarine school, After my second or third request, my division officer told me to knock it off, I had to have a year at sea and be Seaman 1c to be eligible. At that time, advancement to Seaman 2c from Apprentice Seaman was automatic after four months service. I completed the training course and practical factors for Seaman 1c in short order and spent \$8.50 of my monthly pay of \$29.40 (after insurance & medical deductions) for a Knight's Modem Seamanship. I spent much of my free time with that book and passed the seaman exam as soon as I was eligible. This was quite a pay boost to \$54. per month! The Navy was expanding, consequently, advancement opportunities were increasing and required time in rate was being decreased. Many of the old timers were not pleased seeing youngsters pass an examination for advancement on their first try and then actually being advanced regardless of vacancies.

One has to understand the era and circumstances: Our country was emerging from many years of depression, the Navy was expanding both in men and ships, preparing for war following years of limited funding and advancement opportunities. In Pruitt the crew was primarily composed of "old timers" who had kept their ship going during those austere times, it was understandably difficult for many to accept the rapid changes taking place. It was easy for me, I didn't know any better. The Bureau of Navigation (later BuPers) published a small booklet of "Circular Letters" (later notices/instructions) periodically. Information contained therein was not generally made available to enlisted personnel but our Yeoman showed me a letter calling for volunteers for submarine duty and I promptly submitted a request chit for submarine school. After several chits and no action, I was ordered to report to the Executive Officer who wanted to know where I got off putting in all the chits. I told him that I was requesting submarine school in accordance with the Circular Letter calling for volunteers. He informed me that I had no business reading circular letters; his policy was not to train men and then transfer them to something like submarines and I was not to put any more chits in. Bah Humbug!

I decided to strike for Quartermaster and spoke to the Chief Signalman about getting into the bridge gang. He was encouraging and told me that if I did a good job, he would let me put a course in for third class after shipping over on my second cruise! This seemed to be too far off so I spoke with the Chief Bosun's Mate who told me he would put me up for third class as soon as I was eligible. I promptly went to work on a course for cox'n.

Pruitt was a good training platform and I became a competent seaman while serving in her. This was the "old Navy" indeed. The anchor windlass was steam driven but, we broke the anchor out with capstan bars and "Swedish Steam" from six deck hands on a quarterly basis, just in case. We also hoisted the whaleboat manually periodically. Our refrigeration consisted of an icebox on the main deck, above #2 fireroom and when the ice melted, which did not take long, so went our "fresh" stores. I was always intrigued with part of the ships armament of six cutlasses that were carried by the officers during our Annual Military Inspection; the blades were meant for business and large brass knuckle guards were fitted on each cutlass.

We operated out of Pearl Harbor laying practice mine fields off Lahaina, Maui and .general operations such as underway refueling/replenishment and gunnery practice. Quarters for muster and inspection was held on weekdays followed by calisthenics', Captains personnel inspection was held on Saturday morning when in port followed by liberty for the non-duty sections commencing at 1300 and expiring at 0700 the following Monday. I can only recall two married men below CPO and liberty parties were not large.

December 7, 1941 brought an abrupt change to our daily routine. Pruitt was at Berth 18 in .the Shipyard, undergoing overhaul. The duty section was on board with the remaining crew berthed at the receiving station barracks. All ammunition/fuel etc had been removed from the ship. A shipmate and I had just returned to the barracks after breakfast and were discussing what we would do on this sunny Sunday when I thought I heard an explosion. I went over to the window (we were on the second deck) and looked out just in time to see a plane, at low level, passing by. It had a large red "meatball" on the fuselage! I yelled out "it's the Japs" and headed for the stairway with several shipmates. We double timed it back to our ship where the duty chief told us that the duty section could handle damage control and directed my group of four to go to the Pennsylvania (BB38) where they needed men. Pensy was in the main dry dock with the destroyers Cassin and Downes. As we crossed the brow, strafing was taking place and the OOD directed us to take cover in the Marine's compartment off the quarterdeck. I was sent to a 5"25cal gun on the starboard side where the gun captain put me in the ammo train. We fired many rounds, there was a hit just aft of the gun I was on and a shipmate from Pruitt was killed. The two destroyers ahead of us took hits and were both total losses. It was a busy morning and as the regular crew had largely returned to Pensy, men such as myself were .released to return to our ships about 1300. I had been hit with a small piece of shrapnel in my right hand, it was removed by our Chief Pharmacists Mate and I kept it as a souvenir but lost it somewhere along the way, possibly on Tang.

Back on Pruitt, we went into a two-section status and started loading ammo and supplies while the yard birds worked to put us back together. We were given instructions in a password system that had been instituted. I had the 20-24 watch and when relieved, two shipmates and I headed for the barracks, it was starting to drizzle and we could hear someone walking ahead of us. Suddenly, "Halt, who goes there" rang in the darkness, the three of us froze but the person ahead kept walking. A shot rang out and the guy ahead of us stopped walking. A marine was patrolling the area and after he checked us out, we all went over to the guy who had been shot, he was dead, a casualty of war. One of my shipmates was a very black mess attendant named Lonnie Joe Nelson, when the shot was fired he grabbed my arm and exclaimed, "is you dere boy, is you dere boy"? Later he told me that he didn't know who had been shot but thought it had been one of us. Lonnie Joe was a few shades lighter when we reached the RecSta that was under construction. We mustered in at what later became the Navy Exchange. Groups of men were gathered under signs with the name of their ship, mostly battleships, It was rumored that the water supply had been contaminated so if you were thirsty you were given half a cup of coca cola.

As soon as Pruitt was ready for sea, we were put on offshore patrol, then the entire division went to work laying minefields. I was still pursuing submarine duty and had lined up at swap with a man on the Argonaut. My exec finally gave in with the provision that he would approve the swap when we returned from an upcoming operation. This operation took us to the Aleutians for the Attu/Kiska occupation. Following this, we tangled with a very severe storm. Pruitt suffered considerable damage including the parting of all stays to the 97' wooden foremast. Without support, the mast was really unstable and looked as though it would come down. I hauled lines up the mast and secured them. My good shipmate "Chick" Triplett, GMlc was below feeding the lines to me. It was cold, everything was coated with ice, and the ship was rolling heavily so working was difficult. After we got the mast secured we both went below to try to get warm and a messenger (Pruitt had no loudspeaker system) told us we were to report to the captain on the bridge. Now what had we done to get into trouble this time! We went right up and the captain and exec were waiting for us by the flag bag. The storm had either abated or the ship had reached the safe semi-circle of what I suspect was a typhoon. The captain told us to stand at ease and said, "you men may very well have saved the ship!" He looked at me and said "Leibold, as of now you are advanced to Bosun's Mate First Class," he turned to Chick and advanced him to Chief Gunners Mate. The captain then stated that he would look into recommending us for a commission, then looked at me winked and said, "Leibold, you can have your choice of duty!" Chick and I were fair-haired boys for the rest of that trip.

We went into Dutch Harbor for repairs, then on to San Francisco. Upon arrival, I was told to stay on board until the captain returned from a meeting. That evening, I was summoned to the quarterdeck where the captain told me that I could pack my bag, I would have orders to submarine duty by the next morning. The orders came in that night by dispatch, I still have a copy of the dispatch that read in part: "Transfer W.R. Leibold BM 1 C to Commander Submarine Force Pacific Administration Mare Island Calif for assignment to submarine duty." My life on Pruitt had come to an end and from what I could gather, Pruitt was to be inspected to determine her fitness for continued service. The storm had taken a toll on that fine old ship. So, on 8 July 1943, I was finally on my way to submarine duty. I reported in at SubAd, Mare Island and was promptly given a job as "Master At Arms" and told that inasmuch as I had been at sea for some time, I would have a tour ashore! This was not in my plans! I snooped around the shipyard and found the Tang being readied for commissioning; this was going to be my boat one way or another!

I was given leave and went to visit my parents and especially the girl I had gone to school with, Grace Fiskin. I had proposed to her while I was still on Pruitt but we had no firm plans. We were married in North Hollywood, CA and enjoyed a short honeymoon in Laguna Beach, CA. I returned to Mare Island and Grace soon followed. We lived in a hotel (we could not afford) then moved in with another couple in Navy housing for a short while. A shipmate at SubAd, Bob Barbee, GMlc who was waiting for assignment was also in need of housing as he and his bride were in a rooming house. We teamed up and started hitting the Navy housing office twice a day. Finally, the lady in charge at the office notified us to come in. She raked us over the coals for bugging her so consistently, we figured that we would never get housing when she softened up and said, "if you two promise never to come in here again, I have a three bedroom unit you can share." We had a home! It was not furnished and we had no furniture but our brides went to Sears and bought bedroom sets and Bob and I bought a used table and chairs and we set up housekeeping. Grace and I had acquired a 1938 Ford coupe and the four of us had some good times together going to San Francisco for nightlife.

On occasion, I would make a guard mail trip to submarines in the Bay Area and on one trip to the Grayback (SS208) the Captain kidded me about the soft job I had. I told him it was only temporary, that I would be assigned to a submarine soon. He replied that he would take a Bosun's mate on Grayback. I thanked him and said that I was going to a new boat, the Tang, under construction at Mare Island. An officer nearby, taking all this in asked if I had orders to Tang and I replied "no sir, but I am going to serve on her." He then introduced himself: Lt. Frazee, prospective executive officer of Tang! I've forgotten how I wiggled out of that one but about a week later, I was directed to report to the Tang office

and when I arrived LT. Frazee introduced me to LCDR O'Kane, the prospective commanding officer. After a brief "quiz" session, O'Kane stated that he too had served in Pruitt while it was still DD347 and that he would take me on Tang!

Grace had gone to work doing clerical work at the shipyard administration and expected me to be ashore for a while. I told her that I had been drafted to submarine duty and would be leaving shortly. Bob got orders to Tilefish and planned to take his wife, Gena, to their home in Texas. This worked out for us in that Grace did not have a driver license and they drove her to Los Angeles.

Tang and company headed west in January 1944, we operated out of Pearl and Midway making five successful patrols. In July 1944, I was advanced to CBM. Unfortunately, at approximately 0230, 25 October 1943, during a surface attack in the Formosa Straits, our last torpedo ran erratic, circled and hit Tang, quickly sinking her. Of nine men on the bridge, three, including me, managed to stay afloat for approximately eight hours. One officer LT Savadkin, in the flooded conning tower, made a free ascent and survived. Thirteen men attempted escapes from the forward torpedo room starting about four hours after the boat was on the bottom, five men survived. Of the nine survivors, four are alive today (3/03). 78 fine men were lost in Tang. Even though it was very dark, the erratic torpedo could be seen, porpoising and curving back on the port side, maneuvering to avoid failed and the torpedo struck near the maneuvering room/after torpedo room. On impact, the stern started to drop slowly and I could see the water covering the after deck, suddenly Tang went down by the stern and I went down for quite a distance, I felt a bump or explosion, then started up to the surface where the bow was out of the water, at an acute angle, I tried to reach it but the current was too strong and I slowly drifted away. I heard voices, Jones and Rector, but they also drifted away. I recall first tossing my binoculars, then got my jacket and shoes off. I took my trousers off and after tying the legs, tried to inflate them for flotation but no success so I tossed them. I stayed afloat by treading water and floating for some time and suddenly became aware of something splashing and sputtering nearby. It was Floyd Caverly, RTlc and we stayed together figuring we would head for islands off the china coast at daybreak when we could see them.

Tang had wreaked havoc before going down; the Japanese were picking up survivors from their own sunken ships and I am sure were surprised at finding us. Caverly and I were picked up at the same time by a pulling boat whose Cox'n kept saying "Deutch-ka." Caverly thought the Cox'n figured we were Germans and blurted out "Heil Hitler." As the boat returned to the ship, another man was spotted and it turned out to be our Skipper who was hanging on to what appeared to be a wooden door. I screwed up by saying "good morning Captain, do you want a ride" as we helped him aboard. The Cox'n must *i* have

recognized "Captain" as he had the Skipper come to the stem and sit on a thwart. Caverly and I remained in the bow. When we got alongside what appeared to be like our destroyer escort type ship, the boat was hoisted to the main deck level where we disembarked. Caverly noticed one of the nip sailors had a wristwatch and took his arm to see what time it was, wham! He learned the hard way but knew it was just past 1030. We were promptly bound and made to sit on the port side of the main deck, soon thereafter, LT Savadkin joined us and then Flanagan, Trukke, DaSilva, Narowanski and Decker joined us. We learned later that another man, Chief Pharmacist Mate Larson was also picked up but started convulsing and lost consciousness when the boat came alongside, he was never seen again. I was between the skipper and Hayes Trukke, TM2c who had come to Tang just before this patrol. Following hours in the water, Trukke's excessively long straw-like hair was covering his face. The skipper nudged me and asked who was next to me and I told him "Trukke" to which he exclaimed "was he on my boat?!"

The nip ship (#34 painted on bow) had a number of survivors from the ships we had sunk, some were burned and bandaged and they rightly figured we were responsible of their misery and proceeded to spread the wealth. We were on the ship for three days, confined in their "hot tub" room that was very small and uncomfortable. On the third day we entered Takao, the southern port on Formosa where hoods were placed over our heads and we were loaded into a truck. We spent the night in what appeared to be a warehouse, a very uncomfortable night with our hands tightly bound and our arms pulled above our heads. During the night, we were interrogated, given some water and worked over. The next morning, the hoods were put back on our heads and we were paraded through town, this must have been a real sight, in my case, I had what was left of blue and white striped under shorts and a shirt on. My shipmates were similarly dressed. I could see a little through the hood and there appeared to be quite a crowd surrounding us. Our treatment indicated we were not the most popular kids on the block.

We ended up at a railroad station and were put on a train. The hoods were removed and each of us was given a window seat with a guard sitting alongside. The train ride was actually pleasant, we saw the countryside but every time we pulled into a station, we could see people on the platforms getting food & drinks, none for us. We reached our destination late in the afternoon that turned out to be Kiirun and were bussed to a nip army installation where we were put in a cell that we called the "Kiirun Clink." This place was out of the dark ages, our cell was a large room about two feet above the adjacent passageway. The bars were hard wood about 6-8 inches in diameter, the entrance was small requiring a person to crawl into the cell, a hole in one wall, about .3 'x4' provided access to the head which was a slit in the deck with running water several feet below. The ceiling was high, about ten feet, and there was a barred window at the top of one wall that appeared to be plastered. We were all in the one cell and soon after our arrival nine bundles were pushed through an opening in the bars with cups of hot tea. The bundles appeared to be

wrapped in some sort of leaf and each contained rice and a pickled vegetable. This was the first food We had since capture. Our stay lasted three days and we were fed three times daily.

On the third day, we were loaded onto a bus, each with his own armed guard, we were not bound or blindfolded. The bus was propelled by a charcoal fired boiler of sorts mounted on the rear end and soon after leaving it stalled. Several guards got off the bus, leaving their rifles leaning on their empty seat to push the bus, when it started, the driver failed to stop and the guards ended up chasing it down the road while the remaining guards laughed. When the bus finally came to a halt, the pushers came back aboard and got a good laugh about leaving their rifles with their prisoners. Our destination was the Port where our officers were each put aboard a destroyer, the enlisted aboard a cruiser. The ships got underway soon after we boarded. We (enlisted) were put in a hold with two guards. The hold was loaded with what turned out to be sacks of cane sugar and we were on top of them. It was apparent that we were making high speed. From time to time, nip sailors would enter the hold and after punching a hole in a sack, they would appropriate sugar into little bags. This trip lasted about four days and we arrived in Kobe, Japan on a rainy, cold morning. We were taken ashore at what appeared to be a naval training station and all nine of us were lined up for inspection by a nip admiral. He asked me in excellent English, as I shivered in the cold, if I was frightened and I replied, "No. I am cold." He then said "of course stupid, no shoes" and I figured the old boy would see to it that we were issued some clothing, that didn't happen!

Our next adventure was a train ride; we had a private coach this time, each with his own guard and an officer in charge. We were not bound or blindfold, it was a long ride and we arrived at what we later learned was Ofuna station. It was a cold, rainy night and we were marched down a dark muddy road for some distance to our new home, "Ofuna." Upon arrival, we were allowed to take a bath, were given some worn out clothing and each of us were put in an individual cell. Caverly and I were singled out to follow a guard to the galley where a familiar looking man put a wooden bucket of food, a pot of tea and bowls/cups on the deck before us. No words were spoken until our guard told us to pick the items up and we returned to our building. The guard instructed mostly by hand signals to put the food, which appeared to be a mixture of rice and vegetables, into the bowls, then pour the tea and place a cup and bowl on the deck outside each cell. The cell floor was about one foot above the passageway deck. When this was done, we were directed back to our cells, the guard then proceeded to open each door and the occupant was allowed to take the food and eat. Following our meal, we were allowed to bed down for the night.

Each cell was about 5'x6' and had a tatami mat on the deck. A glass port allowed the guard, who patrolled the passageway, to keep a check on the occupant. We were provided with two blankets.

In the morning, we were fed again and then an American prisoner gave us a rundown on .camp routine in the presence of a guard. The prisoner was Knutson, RM1c of USS Grenadier SS210. We were then herded out of the building to another part of the camp where we were told we would be given a lesson in Japanese. A slight built prisoner was brought out and after a lot of shouting by the nip in charge, the man was beaten senseless. We all thought that he had been killed. We were returned to our cells in what we learned was a building called "Eku." Later we learned that the man that had been so badly beaten was LCDR John Fitzgerald, the Skipper of Grenadier. There were three people from Grenadier at Ofuna when we arrived and they were all transferred to another camp soon after our arrival.

Ofuna consisted of one building that housed the C.O., guards, interrogation rooms and galley, it was "L" shaped and connected to "Eku" where new arrivals were incarcerated. Three additional buildings were in the compound, "niku," "sanku" and a one room structure, "yanku." The entire facility was enclosed with a high wooden fence, eku was separated from the rest of the facility by a high fence.

We were informed early on, that we were not "prisoners of war" rather, we were "captured enemy" and therefore, not covered by the Geneva Convention governing Prisoners of War. Initially, we were kept in solitary confinement and interrogated frequently. The interrogators were always in civilian clothes, spoke English very well and had been educated in the U.S. Although a guard was always present during interrogation, I was never mistreated during the sessions but sure got whacked afterwards.

On Christmas day 1944, several guards came to Eku, opened our cell doors and gave each of us a Red Cross food package. The box was about 12"x12"x6" and contained tins of corned beef, pate', powdered milk, chocolate bars, etc. as well as two packs of cigarettes. There was also a small folding can opener. We were ordered not to open or use any of the contents as we were going outside to celebrate our Christmas with other prisoners and, to leave the packages in our cell. We were taken outside and the gate leading to the other buildings was opened allowing the other prisoners into our compound. This is when we learned that the Grenadier survivors were gone and that the man that had been so badly beaten on our first day in Of una had been John Fitzgerald. I also met the familiar face from the galley on our first night. He was Major Gregory Boyington who I had read about in either a Life or Look magazine during our final patrol. There was a full-page photo of him in the article and this is why he was familiar to me.

We found that all of the prisoners were either flyers or submarine men. There were three people from the British submarine Stratagem, all the rest were flyers. We also learned that in the eyes of the nips, we were criminals, for entering their Empire skies and waters. Following the "social hour" we were returned to our cells and found our packages near empty or gone altogether. Mine was gone. We all did a lot of shouting

and beating on our cell doors, the guard was concerned about the racket we were making and finally showed up with a basket of hot sweet potatoes. He gave two potatoes to each of us.

As time went by, more prisoners were brought in, all flyers captured by the nip navy. Ofuna was run by the UN and supported from the Yokuska Naval Base. As eku filled with the new arrivals, Tang men were released from solitary to do chores in and around eku. Floyd Caverly (AKA "Friar Tuck")was singled out to do some work for the "kongo- cho" who was equivalent to a Chief Pharmacists Mate. A tall, muscular man who spoke English fairly well and appeared to pull a lot of weight with the "quiz kids" and officers from Y okuska. His name was Kitamura. After a short time, Kitamura wanted another man to do work for him and Friar Tuck suggested me and I got the job. Friar and I did odd maintenance jobs around the camp. One of the flyers brought in was badly burned . and had been bandaged, I was given the impossible task of washing his bandages, both original and subsequent bandaging. Mter washing and salvaging what I could, I would hang them on a line to dry. The flyer, a B-29 pilot by the name of Hunt was kept in a cell in eku. He deteriorated to a point where Kitamura and the guards would not go into his cell due to the stench. O'Kane interceded on Hunts behalf with one of the quiz kids and we were allowed to provide care for him but he died. We carried his remains to yanku, the small building reserved for the dead and Kitamura (a self styled carpenter) made a wooden coffin. Late one night, Hunt was buried across the road from the camp in an area reserved for such things.

Some of the guards would flaunt items from the Red Cross food packages so; we knew there were more in the camp. Friar and I were cleaning the passageway in sanku when we discovered what appeared to be a locked storeroom at the far end of the building. There was no guard in sight so we forced the sliding door off its track and got a peek at what appeared to be stacks of Red Cross packages when a guard appeared at the far end of the passageway. We quickly staged a fight, I hit Friar and he fell against the door, by then the guard was there, broke up our "fight" and raised heck about us knocking the door loose. We hastily got the door back on its track and the guard made sure we finished our work and left the building.

Friar and I were in adjacent cells and were able to communicate when the guard was down the passageway. We felt certain that we now knew the location of the food packages. But how to get to them? Eku was built about 18" above ground and after examining the deck under the tatami mat we agreed that by lifting the floorboards, we could go out under the building, make our way to sanku and go in through the window. The floorboards were nailed down but there was enough space between boards to get ones fingers in and grip the board. Our plan was to loosen the boards and nails, then pull the nails and cut them

off with a pair of side cutters that Friar had "borrowed" from Kitamura's toolbox. Friar did his boards first while I kept watch for the guard, the following night, I did mine while Friar kept a lookout. By inserting the shortened nails in the nail holes, the boards appeared to be nailed down if the tatami was lifted. We now had a means to leave and reenter our cell but we had to be careful that the right guard was on watch.

On our first trip, all went well until we got to sanku, the window had wooden bars but we were able to pull a couple loose. Once inside, we found the Red Cross boxes, they were large and bound with metal straps that we could not budge. It appeared that each large box contained four of the smaller packages. We left, put the bars back in place and got back to our cells, it was well past midnight. The side cutters were needed again if we were to get into those boxes. A few nights later, we made another try, this time with the side cutters. We took two small boxes and switched the large box to the bottom of the stack with unopened boxes on top. The boxes were kept under our cells and we tapped them at night. I found out years later that other prisoners were also getting into the storeroom.

In early April 1945, it all came to a head when all the prisoners were assembled and the Camp Commander (the Mummy) said there were Red Cross food packages missing and he wanted to know who had taken them. We were all worked over but none of the prisoners admitted anything. That night the nip CPO's worked the guards over and I guess they finally figured it was impossible for the prisoners to have gotten to the packages.

Soon after this, all Tang enlisted men, some flyers including Greg Boyington were taken to the POW Camp Omori, near Yokohama. This camp was run by the army and had about 600 prisoners. There were 21 in our group and we were again locked up as a group. We were kept in a room at one end of a long barracks type building, completely fenced. A guard was posted in the room and another just outside the door. We were now "tokobetsu hoyo" or "special prisoners" and were kept in the room about a month when the nip top sergeant told us that we would go on work detail and be given 2/3 of a prisoner's ration of food. This is when we learned that we had been getting 1/2 of what the prisoners got. Most of us had no shoes and pointed this out; the sergeant said he would take care of this. The next morning, there were several pairs of shoes outside the door, loaned to us by prisoners who stayed in camp. We worked outside the camp in bombed out areas clearing wreckage and also dug caves.

We had a guard that we called "Gimpy" who was a civilian that had been badly wounded while in the army. He spoke English and made no bones about his distaste for the war. One day he was talking with an older nip woman, as we worked, she left and then returned, gave him something and he called us all together, handed the item to Boyington with instructions to divide it. The item was a "mochi" something

like a donut; there were 19 of us that day and Greg managed to get 19 pieces cut. The next day, two old ladies showed up carrying a tray of candied carrots for us. Gimpy told us they were concerned over our appearance; we did not look like the paws who wore better clothing and appeared healthy. When we returned to Omori, Gimpy marched us to the commandants building, he went in and returned with the commandant and top sergeant. There was a lot of discussion and we ended up being marched to the bathhouse where we were allowed to get cleaned up, the first time since our arrival at Omori.

Air raids were increasing and that is the only time we were left unguarded, the guards would go to a shelter and we were able to watch the fireworks that were impressive. In June, a group of prisoners, including Tang officers, was brought to Omori and locked up with us. The room we occupied was now full. Additional prisoners were brought in and locked up in a room adjacent to ours. These were all flyers, recently captured; we were able to communicate through the wall, when the guard was goofing off.

I think it was August 9, 1945, we were digging a cave into the side of a hill near Yokohama, loudspeakers could be heard and about mid-day and from the way the guards acted, something was up. The interpreter told us to bring all tools out of the cave and unstring the lights. I had come out with some tools and was told to sit down and was given a cup of tea by the interpreter. My right foot was in bad shape after a guard had redesigned it a couple of weeks before and the interpreter told me that soon I would get medical treatment. in a hospital Our group was formed up and started the march back to Omori; as we marched a couple of truckloads of prisoners passed us and shouted "the wars over." When we got back to Omori, the guards put us in our room and left us, without a guard. There was a lot of shouting in the camp and some of the prisoners came to our building and told us the war was over but cautioned us to remain in our room and they would stand guard outside the building. Some of the guards were drinking and could pose a problem for us. One drunken nip soldier did try to get into our space but was permanently put out of his misery by top Sergeant Ogura.

Most of the nips left the camp leaving the commandant and Sgt. Ogura. They stayed in their quarters and the prisoners got organized. CDR O'Kane was the senior officer, Maj. Boyington became the Provost Marshall. I was put in charge of a barracks with 103 men, It wasn't long before our planes; Navy and Air Force, were flying over Omori dropping all kinds of goodies. The B29s would drop 55 gal drums, lashed together in pairs, attached to small chutes. I got khaki shirt and trousers and a pair of shoes as did the other Tang people.

At the end of August, a landing party came to Omori under the command of CDR Stassen. He told us that they were there to make arrangements for our evacuation that would take place in the next couple of days.

After looking the place over, CDR Stassen told us to get any belongings we had, he was starting evacuation immediately.

Someone put a tag on me that was stamped "non-ambulatory" and I was taken to a Navy hospital ship (Benevolence) anchored in the Bay. After initial treatment, I went to an LSD (Ozark) also anchored to await air transportation. I ended up at the Naval Hospital, Oakland for a short period, then to Long Beach Naval Hospital where I remained for several months.

I returned to duty and was assigned to the *NROTC* Unit at UCLA. While there, I was advanced to Warrant Bosn. Although the duty was great, it was not for me and I requested a change and was ordered to Mare Island for duty on USS Pelias ASI4, the accommodation ship for ComSubGrp PacResFlt. Grace and I moved to Vallejo, now with our young son Bill. One afternoon, I received dispatch orders to "proceed immediately" to Tokyo, Japan for duty in connection with the War Crimes Trials. I was not enthused over this but the next day Grace drove me down to Alameda Naval Air Station where I got a flight to Japan.

In Japan, I was assigned to the Legal Section, SCAP (Supreme Commander Allied Powers). They had most of the Of una gang in Sugamo Prison and I was out there to provide testimony and assist the lawyers in Of una cases. They required live witnesses for death penalty cases. I did not want to be out there and it appeared that everything was taking too long. I got a ham call back to O'Kane to apprise him of the situation, In a few days, O'Kane showed up and raised a good bit of hell. Things started to move and after some of the trials were completed, I figured it was time for me to leave. I made my departure call on the Colonel in charge of the legal section and he promptly informed me that he had not authorized my leaving. O'Kane was with me and he told the Colonel that his authorization was not required, CornNavFe had endorsed my orders and made travel arrangements. Soon after that O'Kane returned to the States, where he was the Chief Staff Officer for ComSubGrp, PacResFlt, effectively my boss.

In 1948 I received orders to USS Nereus AS 17, home ported in San Diego. We packed up and moved to Chula Vista. Our daughter Ericka arrived the following year. At that time Warrant Officers had their own quarters and Mess, I recall that there were eleven Warrants on board and we led a good life. Nereus and Sperry AS 12 were in two point moors adjacent to the Coast Guard Air Station and each tended a squadron of submarines. So as not to settle down on coffee grounds, each tender would get underway for three days monthly to conduct drills, gunnery practice etc.

The LDO program was just being instituted and I took the exam for it. Just before being notified that I had been selected for Ensign, I was selected for promotion to Chief Warrant Officer. I had been a Warrant for six years and was not sure about "stepping down" to Ensign as opposed to being a CWO. My skipper and Exec (Karl Wheland and R.E.M. Ward) convinced me that I had a far greater future by accepting a commission as Ensign. In 1951 I was promoted to Ensign and received orders to the Naval Station, Tongue Point, Astoria, OR. I reported in and we were assigned very nice quarters on the base. My job (a LT billet) was Security and Ordnance Officer. The Station was originally commissioned as a Naval Air Station and bordered the Columbia River. It was now utilized to support the Columbia River Group, PacResFlt. While my job was challenging and I rattled a few cages while there, I felt it was a dead end. Most of the senior officers were on their twilight tours and it showed. I called the submarine detailer in BuPers and requested assignment to Diving School. I received my orders and after six months at Tongue Point, my family and I were on our way to Washington D.C. I completed a six-month course at the Deep Sea Diving in School in October 1952 and was ordered to USS Florikan ASR9 in San Diego. We again settled in Chula Vista and I had various jobs on Florikan. Operations, Communications, Navigator and Diving Officer. While serving in Florikan, I was promoted to LTJG. We did a good deal of recovery work during missile tests off the CA coast as well as the usual WestPac deployments.

Following my tour in Florikan, I received orders to USS Volador SS490 also home ported in San Diego. Again more WestPac deployment and interesting special ops. I was primarily on Volador to qualify (Officer) in submarines and spent a lot of time working on this in addition to my primary duties. I was promoted to LT while on Volador. After Volador I received orders to the Submarine Escape Training Tank, Pearl Harbor where I served as OinC. After a short stay in Navy Housing, Grace and I rented a new home in Pearl City, we were the only "round eyes" in the neighborhood and enjoyed living there.

Shortly after my arrival, we started conversion from training in the S.E.A. (Momsen Lung) to the Buoyant ascent method of submarine escape. The Tank at New London, CT was farther along in this new procedure so, in company with Master Diver Milo Holecek and Diver Bob Sheats I made a trip there to learn from their experiences; it was a worthwhile trip. In addition to submarine escape training, we provided diving service to the Submarine Base, conducted Diver 2nd Class and SCUBA training for PacFlt and provided treatment for many civilian SCUBA divers in need of recompression. ComSubPac headquarters was located across the street and we were called upon frequently, to provide tours and demonstrations for visiting dignitaries.

In 1958, after two years at the Tank, I received orders to USS Coucal ASR8 as Executive Officer where I served in this capacity for one year, then fleeted up to command. This worked out well for my family in

that Coucal was home ported in Pearl and a move was not required. During my tenure, Coucal provided services to submarines, diver and submarine rescue training and of course, a couple of WestPac deployments. All hands worked hard in this ship and it was awarded the coveted "E. During a deployment to WestPac, Coucal was assigned to work with the Japanese Maritime Self Defense Force and their new submarine "Oyashio." Basically, we were on detached duty and spent most .of the deployment operating with the nips. We carried two nip officers on board, one a doctor and the other a line officer, the latter (LCDR Fuji) had been in their Navy during WWII and we got to know one another very well. The trial skipper of Oyashio (Capt. Hashimoto) was also an ex-naval officer in the IJN and had been the skipper of the I-58 when it sunk our cruiser "Indianapolis." These officers made it a priority that we see the Japan that "tourists" did not see and we went into several out of the way ports where we were given royal treatment. One excursion took us to Tokushima where our ball team was invited to play a game of softball. We were all shocked when we arrived at a large stadium and were introduced to our opponents. We were to play the high school national champion girls team and they beat our pants off. This was quite an affair, complete with TV coverage and local dignitaries.

In Pearl, Coucal was given the task of rigging and towing the decommissioned submarine "Tinosa" as a submerged target for aircraft ops. Given the nickname "Asonit" a manifold was installed topside so the hull could be submerged and suspended from four salvage pontoons. While towing her in rough weather south of Kauai, pad eyes welded to the hull with suspension chains attached, pulled free and Asonit made her last dive in some 2000 fathoms. I reported the loss to ComSubPac by dispatch and fearing the worst returned to Pearl. Upon arrival, I learned that the boss was mighty pleased with our loss, as he was not too enthused with being the custodian of a target hull.

Our son Jim arrived while I served in Coucal and rounded our family out.

In June 1960, I received orders to the Bureau of Naval Personnel in Washington, D.C. My new job would be in Functional Training where I administered Diver, Explosive Ordnance Disposal, Underwater Demolition and Underwater Swimmers training. Grace and I bought a new home in Alexandria, not far from Mount Vernon and we enjoyed living there. During my time in BuPers, President Kennedy directed the Navy to institute a "clandestine capability" and put a time deadline on establishment. I inherited this job

! and establishment of the SEAL (sea, air, land) Teams was initiated. Getting money reprogrammed and people for this was quite an undertaking. Most of the initial people had UDT backgrounds. Another project was authorization for a metal insignia to replace the embroidered diving helmet then authorized

for divers. The Supervisor of Salvage, Bill Searle, was energetically pushing the concept and I made the presentation to the Uniform Board. All went well and our divers finally had a pin type diving insignia.

After two years at BuPers, I received orders to command of USS Greenlet ASRI0 home ported at Pearl Harbor. We left our home in the hands of a property management company and headed west. The incoming OinC, Experimental Diving Unit/Deep Sea Diving School, Charlie Hedgpeth rented the home. Upon arrival in Pearl, many old friends including my Squadron Commander, to be, greeted us. He informed me that they were holding Greenlet up on getting underway so that I could ride her while she stood by a submarine making a deep dive. Great, I had not planned on this but was assured that my family would be well taken care of, and they were. Grace and I rented a home in Aiea Heights and enjoyed living there.

Greenlet like her sister ships left something to be desired in crew comforts etc. Soon after taking command, I started a "rehab" program. Arrangements were made with the Subase repair officer to allow Greenlet men to use the shops at night and they manufactured bunk lockers to replace all such items in Greenlet's berthing compartments. The spaces were completely refurbished and a recreation room/library was provided. Destroyers were being modernized in the shipyard and many goodies could be "appropriated" from them. Greenlet was fitted with the old six dog watertight doors and some of the topside doors leaked badly. Again, our shipfitters came to the rescue alld installed quick-acting doors from the destroyers. Our bridge was in need of modernization; we cannibalized part of a destroyer bridge structure and rebuilt ours. The bridge wings were extended out to the sides, thus giving the conning officer full visibility on either side. This alteration necessitated relocation of the port/starboard running lights; I was a little hesitant to do this but had already made so many unauthorized alterations, one more wouldn't hurt. Our final bridge structure now sported tinted glass windows forward, a radar repeater, rudder angle indicator etc. I know the crew was very proud of their "updated" ship.

On a deployment to WestPac, our first port of call was Sasebo, Japan where we went alongside the USS Ajax, a repair ship that carried a Flag Officer. This turned out to be a submarine officer (RADM Williams) who I knew from my days on Nereus. I made the usual call and the Admiral invited me to lunch, during which he mentioned that being familiar with ASRs, Greenlet appeared somewhat different. I told him that a good deal of work had been accomplished to improve the ship and invited him to look her over. I was surprised when he responded that he would inspect Greenlet right after lunch. He looked the ship over thoroughly and when he walked into my cabin, he exclaimed, "my God, you live better than I do!" The cabin was paneled with teakwood veneer, carpeted and nicely furnished. When we arrived on the bridge, Adm. Williams looked everything over very closely and said, "there has been a lot of recent

work done here, is all this authorized?" I could only answer truthfully, "Yes sir, the commanding officer authorized every bit of this work." He just nodded and I escorted him to the brow where he thanked me and left. That evening my exec and 1 a LT (George Riefler & Bob James) were ashore at the "O" club; Adm. Williams was also there and my officers decided to have a drink delivered to ' his table from the Greenlet. In response, the Adm. Sent a cocktail napkin to them inscribed as follows: "I have sent the following message to ComSubPac; I inspected your Greenlet today, what a magnificent little ship." I breathed a little easier when I learned of the message; J. W. Williams was not one to fool with.

Like Coucal, Greenlet operated out of Pearl providing services to submarines, conducting diver training, submarine rescue exercises and six-month deployments to WestPac. The submarine Rescue Chamber had a max working depth of 850' and a test depth of 1300'. Seldom was the chamber operated at depths greater than 300' and my concern was; what if a boat is down in say, 1000'? Prior to deployment to WestPac, I called on ComSubPac, Adm Clarey, who I had known for some time and held in high esteem; I explained my concerns and told him that I would like to lay a four point moor and operate the chamber in 1000' in Sagami Wan soon after our arrival in Japan. On arrival in Yokosuka, I explained the planned exercise to the Flotilla CDR and got the green light. In Greenlet, many calculations and preparations had been made, including testing the chamber to 1350'. We were assigned an area in Sagami Wan and proceeded there on a miserable rainy, January day. Laying the moor went well but the spuds were barely watching, while holding all the weight to the anchors. We centered in the moor and went to work lowering the false seat to the bottom. Initial soundings indicated we had 1000' of water but the actual seat was made at 942'. Lowering the false seat required close attention and was accomplished without incident. The chamber went over the side manned by CPO Davidson, GMI Smallwood and Ltjg James. A couple of "glitches" occurred that resulted in the issuance of alterations based on our recommendations.

Following the bell run, I sent a message to all concerned and naturally expected to hear something in return but only silence followed. CDR "Bo" Coppedge who had commanded USS Tang SS563 was on duty at the CNO and, noting the silence, originated a message from CNO congratulating the officers and men of Greenlet for their accomplishment; this was followed by several messages down the chain of command. Upon our return to port and checking in with the boss, he stated that he did not know whether to order a board of inquiry or pat me on the back for a job well done, His concern was that we had exceeded the working depth prescribed for the Rescue Chamber. I pointed out that I had told him personally of our planned operation and asked the question: "If one of our submarines was on the bottom in 1000', what would you order me to do?" Putting your boss on the spot is not the smart thing to do, but then, I never was a "rocket scientist!" On return to Pearl, ComSubPac backed me up on the operation

during my debriefing over the objections of his chief of staff (Capt. Walt Small) who had been "needling" throughout my presentation.

Greenlet was in WestPac when I received orders to the Experimental Diving Unit in Washington, D.C. My old friend, LCDR Lyn Clark, a survivor of Grenadier, relieved me in Naha, Okinawa and I was soon on my way back to Pearl. Grace had taken care of shipping our household goods and car and we enjoyed a short vacation at the Kahala Hilton with Jim and Ericka. Bill had previously returned to the mainland after graduating from high school. We had two cars, so Grace drove one and I drove the other across country. We did the usual house hunting and rented a place in Alexandria. I reported in to *NEDU* where my boss was Charlie Hedgepeth, also my tenant. About six months after reporting to *NEDU*, I was promoted to Commander and then received orders to relieve Charley Hedgepeth as OinC of *NEDU* and *DSDS* in early 1966. The Hedgepeth family left Washington and Grace, and I, with our children, moved back to our own house. *DSDS* was under BuPers, the OinC had additional duty to Buships as OinC of *NEDU* and BuMed had an active interest in both activities. This was a poor command structure and was resolved by CDR Gene Mitchell being ordered in as OinC, *NEDU*. *DSDS* was designated a Command and I was ordered to that post. The two activities continued to share the same building and some facilities. The pressure facilities in both facilities were old and tired and defects were apparent in the school facilities. Unable to get the BuPers people to recognize the severity of the situation, I finally sent a CASREP, effectively shutting the school down. This created havoc and the Chief Of BuPers directed me to meet him at the school for his personal inspection, the old boy was really mad over my message. I showed him pressure lines etc. that were ready to rupture due to years of deterioration, explained how we could have fatal casualties etc. He got the picture and cooled down considerably; we ended up getting a complete overhaul of our pressure facilities.

Late in 1968 Capt. Nicholson summoned me for an interview/briefing at his home on a Sunday morning. The briefing covered a classified project that involved divers/submarine operations being developed on the west coast by the Deep Submergence Systems Project and administered by the projects Technical Office at the Submarine Base, San Diego. I had orders to *DSSPTO* so we sold our home and Grace and children headed for San Diego where she purchased a new home in Del Mar and got the kids started in school. I remained in Washington until December when LCDR Billy Delanoy arrived to relieve me. Grace came back for the change of command and then, we drove out to California.

The SeaLab III project was being pursued by *DSSPFO*, the OinC, Capt. Walt Mazzone was well versed in all aspects thereof and I was not, thus it was decided that I would relieve when the project was completed.

In the meantime, I would acquaint myself with other DSSPTO activities in Long Beach and San Francisco.

The SeaLab III habitat was placed on the bottom in 600' off San Clemente Island, I had just arrived there by air and was promptly advised that an accident had occurred. Upon boarding the support vessel, I learned that two divers, CBOSN Bob Barth and Barry Cannon, a civilian participant, were in the PTC and that the habitat was flooding. Bob had brought Barry, who was unconscious, back to the PTC and communicated the problem to topside. A lot of discussion was going on among the senior officers, none of whom were line officers. They wanted to put additional divers down but CDR Jack Tomsy was reluctant to do this. Jack and I conferred on the subject and it was decided not to put more divers down but to get Bob and Barry to the surface as quickly as possible. I received dispatch orders to collect all evidence and put it in safe keeping and stand by to be a member of a Board of Investigation headed by Capt. Chase who was coming in from the east coast. The death of Barry Cannon, caused by an empty co2 canister in his diving gear, was essentially the basis for bringing the project to a halt. The underlying classified work could go forward with hardware and procedures thus far developed. Upon completion of the investigation, I relieved Capt. Mazzone. DSSPTO was absorbed by Commander Submarine Development Group One and the finest and most dedicated group of divers, the Navy had ever assembled, began dissolving.

By this time I was nearing retirement, our son Bill had just completed four years in the Navy on USS Haddock SSN621 and the two of us took on opening a new service station in Del Mar. Bill was the first to recognize that this was not for us and went off to diving school, then on to work for Taylor Diving. I kept the station for a short time then sold out. I then managed an automotive service/parts dealership for about ten years. During this period, Grace and I had a home built on Palomar Mountain in 1975 and retired to it in 1981.

SPAUR INTERVIEW

UNDERSEA & HYPERBARIC MEDICAL SOCIETY

**ORAL HISTORY OF THE MAJOR PARTICIPANTS
IN U.S. NAVY UNDERSEA TECHNICAL DEVELOPMENTS**

**INTERVIEW OF
WILLIAM H. SPAUR**

Monday, October 27, 2003

PROCEEDINGS

INTERVIEWER: When and where were you born?

DR. SPAUR: I was born in Wilkinsburg, which is a suburb of Pittsburgh, in 1934.

INTERVIEWER: Where did you go to school?

DR. SPAUR: From the first to the fifth grade, I was delightfully educated at an all-eight grades, one-room, one-teacher school out in the sticks near Zion, Illinois. Junior high school and high school were in Euclid, Ohio. I went to undergraduate school at Miami University of Ohio, and I got an M.D. from Ohio State.

INTERVIEWER: What influenced you to choose the Navy as a career?

DR. SPAUR: The draft was the influence. I've always liked the water. I lived on Lake Erie and always had small boats. I actually began diving there, probably in about 1952, when my father bought me a US Divers single stage Aqua Lung. He melted lead and made molds for a weight belt. I put on a sweat shirt, the tank, and the weight belt and waded into murky and cold Lake Erie. The Aqua Lung came with a six-page booklet that stated that the diver should always breath out on the way up and not dive deeper than 120 feet on the first dive.

When I was finished high school, the Korean War was going on and the military was drafting men out of college. Initially there was no college deferment. Ohio National Guard units were sent to the war. I spent the summer as a deck hand on an iron ore carrier on the Great Lakes, the second best job I ever had. So when I arrived at Miami University in the fall, I joined the Naval ROTC unit to protect myself from the draft.

I did three semesters in that chickenshit outfit. I quit the NROTC when college students were drafted only from the lower one-third of the class and because I was then a pre-medical

student. If I had stayed in and taken all the naval science courses, I wouldn't have been able to get all of my pre-medical requisites done.

When I finished undergraduate school, I would have been drafted into the Army, because my school deferment ended. So I went to medical school.

In 1960, four years later, as I approached graduation from Ohio State College of Medicine, I was again draft bait. There was a doctors' draft, everybody who got an M.D. was drafted, even some of the guys, I think, who had been in the Korean War as enlisted men. If one got an M.D., one had to serve two years in the military. I didn't want to go into the Army, and so in my senior year, I joined the Navy Senior Navy Medical Program to assure that when I went into the service, I could go into the Navy. That way I could do things around the water instead of being drafted into the Army. We even got ensign's pay the senior year of medical school. That was how I got into the Navy.

INTERVIEWER: After you finished your medical school, you did an internship, I guess, in a Navy hospital?

DR. SPAUR: I did. I did an internship at the Naval Hospital in Philadelphia. A friend of mine, Tom Balding, and I were the only graduating students asking for Navy internships. We decided we liked San Diego, but if they gave us our second choice, we would go to Oakland. We bought ragtop sports cars for our car trip out west. I bought a white MGA, and he bought a black Triumph. We prepared to cross the United States on Route 66 in our ragtop sports cars. We both got orders to Philadelphia.

INTERVIEWER: When you finished your internship, I imagine you were ready for some kind of Navy assignment. I guess that you also did a residency in internal medicine.

DR. SPAUR: Yes, I did. When I finished my internship at the Philadelphia Naval Hospital, all doctors had to go to sea or serve with the Marines after their internships. I saw the opportunity to go to diving school and submarine school. Back then, when you were recruited to submarine school, the detailers only talked about billets as submarine squadron medical officers and diving billets.

When I was in Philadelphia, I belonged to the Philadelphia Sea Horses. I used to dive every other weekend. I was doing a lot of diving. I was pleased and most excited to go to diving school and submarine school to follow.

One day when we were in diving school, the detailer came in and said, "Well, 27 of the 30 of you are going to SSBNs." We all looked at each others' puzzled faces. One of the guys raised his hand and plaintively said, "Sir, what's an SSBN?" We didn't know. Nearly all of us went to submarine billets.

INTERVIEWER: Didn't you go to New London first?

DR. SPAUR: Yes, after Deep Sea Diving and Salvage School, we went to New London for submarine school, regular officers' submarine school. Ten or eleven of us went to nuclear power school following submarine school. I didn't wish to go to nuclear power school, but I did get interviewed by Admiral Rickover, so I have my story to tell.

I had the opportunity when I finished submarine school to choose temporary duty in Key West. I was there for three months as the Squadron Medical Officer for Submarine Squadron 12. I relieved Warner Dewey and was then relieved by Julio Rivera. Warner had just published an article about decompression sickness in *The New England Journal of Medicine*, which was really nice. Walt Bergman was the executive officer of the ASR *Penguin*. I dived two or three days a

week off the *Penguin*, usually in a four-point moor, and every weekend I went diving on the reefs with the chief corpsmen. I had a wonderful time in Key West.

INTERVIEWER: Did you interact with the Underwater Swimmer School?

DR. SPAUR: Charlie Aquadro had just left the Underwater Swimmer School and Micky Hoffer had arrived. Micky Hoffer was a wonderful competitive swimmer from our submarine school class. He was from New York, not yet tamed, and a source of great fun for me in submarine school. The medical officers took the same classes as regular submarine officers. For instance, we had 18 hours of lecture on lead batteries. We would be grinding through these lectures and Micky would raise his hand in the back of the room. A lieutenant commander or lieutenant, being very serious about coming to the submarine school and lecturing, would say, "Yes, doctor? You have a question?" Micky would respond, "Why the fuck do we have to learn this?"

INTERVIEWER: That sounds like him.

DR. SPAUR: The diving school and the submarine school really didn't know how to handle medical officers. The schools tried to treat them as if the medical officers respected Navy authority, but the medical officers just did not understand. The drafted medical officers that came into the Navy at that time were adults. They were 26 or 28 or more years old. Some had had residency training. Anyway, they were adults and had never been in the service and they just didn't respond to being yelled at. They just looked puzzled.

INTERVIEWER: I was a commander at dive school. I used to swab down everything. I remember swabbing down and one of the enlisted guys came and said, "Commander, you're not supposed to swab." I said, "I'm going to behave just like everybody else and swab down."

DR. SPAUR: Micky Hoffer had a wonderful story. We were in New London in the wintertime, but we didn't wear the heavy wool coats. We just ran between classes in our dress blues. Micky

Hoffer was running from one class to another with his gray gloves on. Remember, at that time we only *carried* the gray gloves. Unless you had on a great coat or a raincoat, you didn't actually put them on. Micky was running from one class to another and this voice behind him said, "Lieutenant, Lieutenant, stop." He turned around and there was this Captain behind him. He just turned around and started going again. The Captain shouted, "You, Lieutenant, stop!" Micky turned around and said, "Yes, sir." The Captain said, "Come back here." Micky went back. The Captain said, "You have your gloves on." Micky said yes. The Captain asked, "Why do you have your gloves on?" Micky stuck up his fingers and wiggled them. Then, he said slowly with that small, condescending, doctor's voice used for disturbed patients, "Because it's cold, sir?" The Captain was getting redder and redder and redder in the face. That was Micky.

INTERVIEWER: He was like Walt Mazonne when he was at New London. It was a hot day and Walt was driving around in his convertible with no cover on. He got reported.

Finishing up at sub school, you had to write a thesis on something. Did you pick an interesting topic to write about? What did you do?

DR. SPAUR: I did not. We were supposed to take a big exam. It was about an inch thick. We also were supposed to write a paper about something. I did neither. I never, ever got dolphins, which saved me from a lot of bad jobs.

INTERVIEWER: Oh, sure. At that time, beginning your diving career, was there anybody who was an influence on you? Perhaps someone said, "Diving was a great thing for me and medicine."

DR. SPAUR: I think what I remember most was being at Key West, operating off of the *Penguin*. They just treated me like I was really something special. Whenever I came aboard, they said, "Squadron Medical Officer arriving." Walt Bergman would come and take me to the

wardroom, and we would have coffee and cigars. The *Penguin* would put to sea and place four-point moors. Operations were always exciting to me. Captain Ralph Fawcett was the SUBLANT Medical Officer. I liked him a lot and had great respect for him. It was all was fun.

INTERVIEWER: In diver training, did you see any part that was especially difficult, or even down at Key West?

DR. SPAUR: The Deep Sea Diving and Salvage School training was extremely well presented. I can't remember who the lecturers were. But diving school was a very good course. I enjoyed it a lot. We learned on the Mark V, of course.

When I went through diving school, SCUBA was just being introduced. Many of the senior diving enlisted men really couldn't swim. On our runs, we would, at the prodding of the chiefs, sing, "Hard hat, si, SCUBA, no! Hard hat, si, SCUBA, no!" as we ran around. The senior divers were not trained to dive by themselves with SCUBA. They were accustomed to running those big underwater machines, the Mark V.

INTERVIEWER: When I went through dive school, which was about 1963 or 1964, that attitude still prevailed. I liked Mark V diving.

DR. SPAUR: Oh, it was great fun. We trained in the Anacostia River, which I knew would be black and have zero visibility. But I forgot that it was going to be black inside the helmet too. There was three or four feet of soft mud on the bottom and it did not support, just squished and mired. It was fun.

INTERVIEWER: Do you think your diving career has had any effect on your later life?

DR. SPAUR: Oh, sure. I've always liked diving and I like marine biology. I like boating and the whole water thing. I continue to dive. I dive here on the canal on my neighbors' boats when they

get something stuck in their props or need zinc changes. I search for glasses and tools dropped. I don't do any recreational diving anymore, but I certainly did for most of my life.

INTERVIEWER: Do you keep up with diving literature or any diving magazines or journals?

DR. SPAUR: In the commercial field, I get the Association of Diving Contractors' *Underwater*. I read it carefully because there are many Navy men and civilians that I knew who are still in the diving business. Fred Ackley, the current president of the Association of Diving Contractors, was at EDU when I was there. The past president, Jack Reedy, was our EDU Chief hospital corpsman. He organized and ran all the medical department dives for me.

INTERVIEWER: In your diving career, what were the most memorable experiences that you can recall right now?

DR. SPAUR: I think the most fun diving was in the Florida Keys. I had gone to the Keys twice to dive while I was in medical school. Then I dived with Submarine Squadron Twelve, then returned to do equipment evaluations while at EDU. It was spectacular. Back then, the Keys were wildly full of fish and the reefs were healthy. There was a grouper in every hole, you know. Divers were so unusual when I first went there that boats would come by and people aboard would say, "Look, look, there are divers. There are divers. We want to go see the divers."

INTERVIEWER: There was no one incident or experience in diving that stands out in your mind?

DR. SPAUR: Well, the greatest experience of my life was being the Senior Medical Officer of the Experimental Diving Unit. I had that job for ten years. That was a big hunk of my 30 years in the Navy, especially since about six of the other years were in residency, fellowship or other training programs. That was the best job I ever had. I just loved it. The second best job was being a deck hand on an iron ore carrier on the Great Lakes. I only did that four months.

INTERVIEWER: At that time, there was an emphasis on research, mostly harder research. What did you experiment on? Did you get the kind of support you needed from the Navy to do the research?

DR. SPAUR: Oh, absolutely. The Experimental Diving Unit is an engineering command, part of the Naval Sea Systems Command. We were problem solvers, tasked to improve equipment and diving procedures and quite adequately budgeted. We were a small group, but I thought we worked wonderfully well. We had very distinct problems to solve, like how could the breathing resistance on this underwater breathing apparatus be improved? What oxygen partial pressure should be provided? How deep and how long to limit the dive? How much cold could the divers tolerate? How could the divers be kept warm? What decompression procedures would be safe? It was, as Chris Lambertsen called it, 'limit physiology'. We all were married to the underwater breathing apparatus and the diving chambers. The medical officers and psychologists were married to the engineers and divers. The great challenge was to develop instrumentation to measure the physiology of the divers and the function of equipment under water, then to make the humans and life support apparatus work well together. Then we wrote it in the Navy Diving Manual, the bible of diving.

INTERVIEWER: That leads me to my next question. How much of what you did there was investigator-originated, or how much came down to you from the Bureau and said, "We need an answer to this?"

DR. SPAUR: Almost nothing came from the Bureau of Medicine and Surgery. The Bureau tasked the Naval Medical Research Institute. Our task was to support operational diving and the Supervisor of Diving and Salvage at the Naval Sea Systems Command. There was always equipment that needed improvement or replacement. There were diving procedures,

decompression tables and treatment procedures that needed revision or replacement. Major projects such as the generation of new decompression tables can only be attempted every twenty years or so because the dive series is so expensive, requires great numbers of dive subjects and might require a year or more of work. Even then, such an attempt might fail.

On all underwater breathing apparatus, we tried to perform physiologic testing with divers performing maximum work underwater, in cold water, at the maximum operational depth.

Even a simple study, for example finding the correct over-bottom pressure to supply the second stage regulator of a surface-supplied underwater breathing apparatus, might require months of engineering breathing machine studies and numerous dives with instrumented subjects. Then the results would be applied to equipment selection, diving procedures, depth limits, and other related concerns.

When EDU finished these experiments, we would then write it into the Navy Diving Manual. The work that we did had to stand for decades. Large experiments couldn't be repeated for a long time. I rewrote great portions of the Navy Diving Manual during the ten years that I was there. We made tremendous advances, and I felt like everything we did was building a structure that had to last. Our recommendations had to last at least until somebody had another three million dollars and thirty dive subjects and a year to do the work again.

INTERVIEWER: Well, the diving manual, the U.S. Navy Diving Manual, is certainly par excellence around the world for everybody, not just in the U.S.

DR. SPAUR: Well, the Navy Experimental Diving Unit is the only organization that had the enormous funds and the huge number of subjects to do adequate experimentation.

INTERVIEWER: Were there any life-threatening or dangerous experiences that you can recall while you were diving?

DR. SPAUR: No. I'm pretty phlegmatic. If I was in some dangerous position, I probably fell asleep or daydreamed. I think that if my life had been threatened, I was too dull-witted to understand that I was in trouble. We did a lot of the exercise experiments underwater in which the end point was terrifying, choking dyspnea. That was awful to experience. You always knew that if you could climb out, it was going to end in awhile. I don't remember ever worrying too much about whether I was going to lose my life.

INTERVIEWER: Which physicians or others served as role models, but you already answered that, in essence.

DR. SPAUR: Well, I should say that while I was at the Experimental Diving Unit, I had a constant rotation of absolute geniuses, physicians and psychologists who were far, far smarter than I.

INTERVIEWER: Were they two-year assignments?

DR. SPAUR: Some officers were there for only two years, then transferred to other diving assignments. When I first got to EDU, Ed Flynn was there. He was certainly the best physiologist in diving medicine in the Navy at the time. John Alexander, a fellow pulmonologist, continued as a civilian to have diving interests. Jim Summit, whom I replaced, was a great administrator and writer. Brandon Wright came from the University of Pennsylvania program. Ed Thalmann started at EDU after his civilian internship. So, Ed has been studying diving since 1972. Then came Bill Braithewaite, who was an electronics genius. He did all our chamber thru-hull instrumentation and electrical balance of the ground currents. He wired the communications and the helium unscramblers. Where do you find physicians who know how to do chamber electrical grounding and troubleshoot the electronics of helium unscramblers? Only at the Experimental Diving Unit. Tom Berghage, Rob Carter and David Styer championed human

engineering of diving equipment. Claude Piantadosi was at EDU before moving to Duke. Larry Raymond came from NMRI to be a diver on the 1600 foot dive and subsequently penned the most beautiful diving physiology papers.

INTERVIEWER: I'm going to make a broad jump in thought. Is there a specialized area or areas in Navy diving that you think needs more emphasis on research?

DR. SPAUR: I think that I've been out of the diving research business too long to answer that question. It's been 23 years since I left the Experimental Diving Unit

INTERVIEWER: What about submarine rescue? Do you think that there is a role for divers, or do you think that is best left to DSRVs?

DR. SPAUR: I don't think I'm very knowledgeable about submarine rescue. When I was on the USS *Ethan Allen*, the SSBN-608, I had two divers and myself. I thought that we served a function in shallow water had a cable gotten around the propeller or some similar situation. We could have gone out, either with the submarine surfaced and gone over the side or possibly have gone out underwater had we been absolutely stopped. I don't know if that has ever happened. Certainly that could happen, with all of the nets and trawls that are around in the ocean.

I worked all the years at the Experimental Diving Unit for the 'projects,' as they were called, which were highly secure operations at the time but have now been fairly well published. Much of the work I did was sponsored by the projects, which was diving out of submarines.

INTERVIEWER: You mentioned that you were at the EDU for ten years?

DR. SPAUR: Yes.

INTERVIEWER: That's an unusual length of time for a Navy officer to be assigned to one billet.

DR. SPAUR: Yes, but medical officers frequently spend nearly their entire careers at one hospital. They just move up from interns to residents to staff.

INTERVIEWER: But EDU is not a medical facility.

DR. SPAUR: Ed Thalmann was there maybe eight years or so, but I don't know. Marie was there for many years.

INTERVIEWER: I think it's smart of the Navy, when they find somebody who is doing a good job at a facility, to leave them there.

DR. SPAUR: Well, I think that the detailers didn't know what to do with me.

INTERVIEWER: In regard to diving research, what brought you the most satisfaction in the work that you did?

DR. SPAUR: I worked on a number of things that I made headway on and some that I didn't. When I first got there in 1970, it was not too long after Bob Bornmann and Bob Workman had published their papers on using the sixty-foot treatment tables. I was determined to change the routine of treatment table selection so that treatment activities would use the sixty-foot oxygen tables. The Diving Manual in use in 1970 invited the selection of the air tables just as much as the 60-foot oxygen tables.

I rewrote all that, and Tom Berghage made choice diagrams similar to logic or computer programming. We introduced those into the Manual. I tried all the time to get treatment really confined to sixty feet on oxygen. I was never successful in that because the submarine escape people always wanted 165 feet for the towers. That 165-foot treatment always remained. No matter what I wrote or what we taught, if you went over to diving school, they were still talking about going to 165 feet. That continued. In 1976, we began work on a saturation treatment method at 60 feet. My motto was that every diver who was going to die in the treatment chamber, should die at 60 feet not at 165 feet. At 165 feet attendants were in trouble, it was

difficult to breathe, and nobody knew what they were doing. Ed Thalmann completed those studies to make Treatment Table 7.

INTERVIEWER: Sure, it's accepted now.

DR. SPAUR: There was another project that I started working on soon after I got there. We had gone with John Rollins to Farmborough, England, and looked at aviation and diving equipment. Because the Royal Navy was small and had a small research program, they had to marry industry and Navy research. They couldn't afford to have separate programs.

While I was at the EDU, I always tried to make it so that the engineers and the medical officers were working on the same things in tandem. I introduced the medical experimental protocols and every department signed off on them. There was no engineering project that the medical department and the engineering departments, the SEALs, the EODs, the commanding officer and the rest of the people didn't sign off on. With every single experiment we did after that, whether it was in engineering, medicine, physiology, equipment testing or decompression tables, everybody was responsible for it. There were about six of us, I guess, as department heads. I thought that worked very well because it made the engineers responsible for the equipment that we were using. We were responsible so that the engineers didn't hurt anybody. We all took responsibility. Using that organization, I was able to push away people who said, "You should have a human research committee." Human Use Committees are an outside group of people that really don't have any responsibility, trying to approve what they don't understand and have no responsibility for. I said, "No, we have our group. Everybody is responsible." I thought it worked very well.

INTERVIEWER: Speaking of equipment, I understood that the Navy EDU had responsibility for looking at diving equipment after a major diving accident. Did you assess the safety of equipment or equipment failure? Did the EDU have that responsibility?

DR. SPAUR: I think so, though I cannot recall being involved in it. I think that the engineers did that. We tested a lot of equipment and found many commercial helmets lacking in their ability to ventilate. Some SCUBA regulators had higher resistance than the better SCUBA regulators. Some of our own Navy underwater breathing apparatus, like the Jack Brown mask, was by any standards, terrible. It was still in use. Even when I left after ten years, I think it still may have been.

INTERVIEWER: Did you have any regrets or disappointments in your career in undersea activities, as you look back on it?

DR. SPAUR: Well, yes, I regret that I couldn't stay in it after I finished at the Experimental Diving Unit. I had to go back into hospitals and see patients for the rest of my eight years in the Navy. I would've loved to have some diving responsibility.

INTERVIEWER: I'm sure. It didn't seem very smart for the Navy to do that. The first priority for the Navy physicians is hospital and patient care. Operational people are second.

DR. SPAUR: Seeing patients in the hospital never rewarded me very much. As a pulmonologist in internal medicine, one came to the office in the morning, opened the door and there was a waiting room full of patients. I would work all day caring for them. The next day, I would open the clinic door and find an equal number to take care of. There was no getting ahead. I felt good about helping them out, but anybody could have done that. In clinical practice, the whole world is sick people. It used to be depressing. I felt sorry twice over for sick people. First, I felt bad because they were sick and second, because I was their doctor.

INTERVIEWER: I am sure that you gave very good care. Did you do that at Bethesda or Portsmouth or somewhere else?

DR. SPAUR: After I did my temporary three-month duty in Key West diving with the *Penguin*, I went to the SSBN *Ethan Allen*, 608, out of New London. The *Ethan Allen* made patrols out of Holyloch, Scotland. I made three patrols. At the end of the second patrol, I had on paper actually finished my obligation to the Navy. I had signed up for submarine school and was required to stay two years longer after my completion of submarine school. But BuPers extended that.

I thought that I'd lost about ten points of my IQ each patrol. I didn't have all that much to start with. I was never really that smart. I still owed time, so I was thinking, "How am I going to get out of this?" The only way to get out of it was to take a Navy residency. I applied for a Navy residency and went to Bethesda, the National Naval Medical Center, for internal medicine. The internal medicine residency was from 1964 to 1967.

In 1967, the hospital at Da Nang was really hot. All doctors who finished their residencies were off to Da Nang, where the rounds aimed over the hospital at the airfield were falling short. I didn't agree with the Vietnam War, and I didn't want to go to Vietnam. I thought I might act badly in combat in a war that I did not want.

INTERVIEWER: I agree.

DR. SPAUR: I felt the whole war was horrible, just horrible.

INTERVIEWER: The surprise I had was that Bob Workman was my boss, and Bob was very much against the war. I was, too.

DR. SPAUR: Well, it was sort of unspoken at the Naval Hospital. You just didn't talk about it most of the time. It was just awful. It went on and on. While I was working at Bethesda and St. Albans, we had hospital corpsmen coming out of corps school to perform their first three or six

months at the hospital and then go off to Vietnam. In weeks, some came back legless. They were people I knew, and that was just heartbreaking. Anyway, when I finished my internal medicine residency, instead of being available for combat, I took a pulmonary fellowship in chest disease at St. Albans Naval Hospital and then stayed on the staff for two years.

I applied through Captain Ben Hastings for a diving billet. I had always been asking for a diving billet. While I was on the submarines, I asked for a diving billet but couldn't get one. The diving detailer at that time was Captain Shulte. I went to see him and I said, "Can I have a diving billet?" and he rocked back in his chair, laughing, and said, "Ha, ha, ha, ha, ha! Of course you can have a diving billet, Bill. Ha, ha, ha, ha!" Then, I went back to New London and got a letter that read, no. He was such a strange man.

INTERVIEWER: I think he went to Ohio State University and was there for a couple of years and died.

DR. SPAUR: Yes, he did. He had a chamber at Ohio State for occupational and industrial medicine. I never saw him there. But that is my alma mater.

INTERVIEWER: Let me take another tack here. In diving research over the years, what would you single out as the most important contributing factor to successful diving operations?

DR. SPAUR: I think the most important, longest-standing project that I did single handedly, at least initially, was the unlimited duration saturation excursion tables for helium/oxygen saturation diving. Bob Bornmann had calculated the saturation excursion tables using the M-Value mathematical formula for SeaLab III. These were tested as calculated at EDU in a large series of dives that was free of excursion related decompression sickness. But nobody knew the limits. The tables had been calculated using M-values, which were standard at that time for calculating non-saturation diving. Before I started on the unlimited duration saturation excursion

diving tables, I looked at all the dives recorded at EDU, England and elsewhere. There were many, many cases in which the excursions upward were way beyond the limits of the SeaLab tables that had been calculated using M-values. For instance, with the tables as they existed, the diver was prohibited from ascending more than 33 feet above the saturation depth. I was doing a dive at the Royal Navy Experimental Diving Unit, RNPL. It was late at night. The divers were at 1,000 feet. We had been there for three or four days. The chief on the watch said in his best British accent, "Permission to make up, sir." I asked, "Make up what?" The chamber had lost depth. The Diving Officer said, "No. Let's see if we can find the leak and the reason we are going up." We had gone up 80 feet, and they thought nothing of it, whereas in the U.S. Navy, there was the rule that if you were at saturation depth, you couldn't go up 33 feet because something terrible would happen to you. Many other dives recorded had great excursions upward before beginning a slower decompression.

EDU had attempted to develop four-hour bottom time decompression tables for 450 and 650 feet depth soon after I arrived. The objective was to descend for four hours of working bottom time, then come up a distance with only a few stops to start a saturation decompression. The calculations were done by Ken Bondy or Dick Buckles at NMRI using M-values. We had some very bad decompression sickness and abandoned the attempt, but there was evidence that some kind of similar approach was possible. I wrote protocols to test the limits, not of how deep to make an excursion from saturation depth, but if the diver went deeper, how long could he stay there and return to the saturation depth. The theory was that if one saturated at some depth, there had to be a distance that one could ascend and then start saturation decompression without getting decompression sickness. That was essentially all it was. I started there. But most of my comrades in diving research had spent so much time using M-values and learning how to

calculate them, which was extremely tedious before computers, that they believed that the equations represented tissues of the human body. It was an odd phenomena. By the time somebody finished learning how to do M-values, they believed that what they were doing was physiology, instead of some math. Myself, being ignorant of mathematics, and knowing that patients did not respond according to equations, I did not share their love of M-values.

Bob Bornmann even took it upon himself to come from his command, and I don't remember where he was at the time, but it didn't have anything to do with Naval Sea Systems Command, and talk to Captain Huntley Boyd, my boss. He told Huntley Boyd that I was taking the wrong approach to testing these tables and that what we should be doing was extending his tables.

Ed Flynn was also wrapped up in M-values and wanted to do some excursions which would aid in adjusting M-values. I disregarded all that. We would not use any theoretical calculations but just start and see what could be done. It worked. We were very successful in constructing upward excursions from 1,000 feet and shallower..

We published the studies in the *Undersea Medical Society Journal* and the Navy Diving Manual. Now, the limits have been adjusted by further experience and studies. The Unlimited Duration Tables for Saturation Diving absolutely changed the way saturation diving was done everywhere.

INTERVIEWER: Recently, I spent some time with Bryan Barrett and his interview brings to mind the question about interaction with the British. Did you feel that it was beneficial to the U.S. Navy to have that kind of interaction?

DR. SPAUR: Oh, yes. In fact, when I started the unlimited duration excursion tables, Peter Barnard was doing 33-foot jump saturation decompressions which certainly pointed the way for

us. I thought it was absolutely essential that we be well acquainted with everybody else and have an exchange with the Royal Navy. Julian Malec and I still exchange letters. You see Bryan Barrett often. I always went to the meetings in England, and they came to us. I thought it was useful, as well as the work that the Swedish and French were doing at the time. The scientific community, if it is open, is much better. One of the moves that I fear now is the attitude that the US should limit publication. We will suffer.

When I first came to the Experimental Diving Unit, there were three or four different kinds of reports, some of which, like a commercial helmet evaluation, had limited distribution. I stopped that. Since this is taxpayer money, everything we do will be in an Experimental Diving Unit report. Everything we do will have an unlimited distribution, and be open to the public. Everything we do will be set as closely to a scientific paper as we can make it and reviewed and signed off on by everybody. But when I visited the Experimental Diving Unit about three years ago, I noticed they had an enormous vault in the library. I wonder what has happened since I left.

INTERVIEWER: The Royal Navy is no longer assigning exchange officers. Over the years, physicians who were assigned to NMRI were really outstanding researchers. I think the U.S. Navy benefited.

INTERVIEWER: Do you see a future for diving research in the U.S. Navy? Do you feel that we've reached, not necessarily a dead-end, but like the oxygen association curve, there is only so much more left to do.

DR. SPAUR: I worked a long time with underwater breathing apparatus for combat swimmers. We were developing ways to use the oxygen-add rebreathers, reducing the breathing resistance, extending the carbon dioxide scrubbing capability, and doing simple things like human factors. For instance, the oxygen valve button and the diluent valve buttons on a rig were the same on the

initial specifications. I think Rob Carter was our psychologist at the time. He worked out that one should feel pointed to the gloved thumb, and the other one should feel like a hole in a circle.

How do you figure out mixes, diving procedures, decompression tables and breathing apparatus for combat swimmers operating for long periods in the water at variable depths. It is terribly complicated. Protection against cold is difficult. Those operations will always be problematic.

INTERVIEWER: Do you think the Navy has made a mistake in limiting diving research and even diving to shallower diving? They are not into deep saturation diving. Do you think that is a mistake?

DR. SPAUR: I don't know. Actually, I don't know what the mission is at the present time, so it's hard for me to talk about that. I don't know what our operational platforms and capabilities are now, but the U.S. Navy is the biggest experimental group. No one else can match the Experimental Diving Unit facilities, the number of divers, and the brain power of the diving medical officers and engineers. I think the Navy should always be looking at all aspects of underwater work, whether it is deep or shallow, helium or nitrogen. The equipment always will be advancing as technology advances. When I came to EDU, there were no oxygen partial pressure sensors. Arterial blood-gas studies were still being introduced into medical practice.

INTERVIEWER: You are actually one of the first people with whom I've talked who has been involved in diving research and is still very positive about what the Navy can do in the future and it's nice to hear that. Some of the people with whom I've spoken feel it's kind of a dead-end now.

DR. SPAUR: Oh, wow.

INTERVIEWER: They think there's no real future.

DR. SPAUR: I don't understand that, because supporting combat swimmers, and the procedures for locking out of submarines, and traveling underwater must be used more now than ever before. Deep saturation-excursion diving out of submarines sitting on the bottom, is an incredible capability that opens up the whole sea floor, at least down to 1200 feet or so. The Navy and commercial interests must have the capability to put divers out at every depth possible.

I don't know of any advances in the capability to put divers deeper than 1200 to 1500 feet and have them able to work. I was a subject on a 1400-foot dive. It was like having the flu for the weeks that we were deep. When I finished that 1400-foot dive, I had these deep lines across my fingernails that people develop after they have been terribly ill. They gradually grow out over time.

Several years later, EDU made an 1800-foot dive. The divers did not feel well nor think well. Everybody has tremendous weight loss on deep dives. Lots of good physiology to study there.

INTERVIEWER: You noticed that in your own fingernails?

DR. SPAUR: Oh, yes. It took weeks and weeks to recover from that.

INTERVIEWER: Once on the surface, you still felt as if you were recovering from some major illness.

DR. SPAUR: Oh, yes, I felt that way for weeks and weeks. I had never built models. I never had the patience to sit down and build model airplanes or anything like that. I could never sit still that long. After the 1400-foot dive, I just wanted to sit, so I went out and bought a model tugboat to build. I was back at EDU after resting a week and I met Ike Euteneier. Ike asked, "Do you know what I did, Dr. Spaur? I just went out and bought a model airplane. I'm building a model

airplane. It's the first one I've ever built in my life." I said, "Ike, I'm building a model boat. It's the first one I've ever built in my life."

I just didn't want to do anything. I weighed 155 pounds before the dive. I was down to 145 pounds after it. The other divers were similar. On that dive, I think we were thinking fairly well, but on the 1800-foot dive, which was the last deep dive we did at the Experimental Diving Unit when I was there, the divers were not thinking well at all.

We had a SEAL chief by the name of Boxy Holmes who was in the chamber. We had very good helium unscramblers. We had very good communication. Boxy had the gas sampling line that sampled a mask to come out to the mass spectrometer. He had a female end in his right hand and the male end in his left hand. We said, "Boxy, fasten those two lines together so we can begin to get samples." He'd look at one. Then, he'd look at the other, and we'd say, "Boxy, put the female end in your right hand and the male end in your left hand together. Put those two together." He'd look at one, and he'd look at the other, but he wouldn't make the connection.

I have re-read Larry Raymond's physiology publications. Larry came from NMRI to be a subject on a 1600-foot dive that we did at Taylor Diving and Salvage in New Orleans. What beautiful papers. I was afraid we had dropped him and drowned him too often, but he was still brilliant after the dive.

INTERVIEWER: You don't really think that using hydrogen as part of the mix was any answer to that?

DR. SPAUR: I don't know. I am aware of those attempts, but I do not know if the procedures were practical for commercial diving.

INTERVIEWER: DeLauze closed down their research facility.

DR. SPAUR: Robert Stenuit's book about his and Henri DeLeauze's treasure diving is up there on my shelf. He had funny stories to tell about that.

INTERVIEWER: He has a very interesting home. Have you been to his home?

DR. SPAUR: Yes, it's the house with the big windows overlooking the harbor in Marseilles.

INTERVIEWER: It also has the big fish tank that you see when you walk in.

DR. SPAUR: It was a nice visit.

INTERVIEWER: Is there anything else you want to add?

DR. SPAUR: I worked on trying to use the sixty-foot tables. I worked on getting the engineer's side of the house, the medical officers and the psychologists to work together.

In fact, when I reported to the Experimental Diving Unit in 1970, Steve Reimers, who is just a wonderful hyperbaric engineer, was there. He was finishing his breathing machine. That was the first really good breathing machine. Steve started the studies of all the underwater breathing apparatus at depths exactly where they would be used. We had noise and sound measurements in those machines so that we knew what the helmet noise levels were. Noise was a big problem with the Mark V and the initial Mark XII.

We set standards for testing. I, along with my medical officers, set a standard that every apparatus should be tested as though the diver could do severe exercise at three liters of oxygen consumption. For long-term canister breakthroughs, we should use a standard of 1.5 liters of carbon dioxide production a minute. For every breathing machine study, helmet study and regulator study and everything that the engineering side of the house did, one medical officer was assigned to keep track of that study and be knowledgeable so that we could follow what physiology standards we should test to. Then, we would test it with human divers in the water using the same kinds of instrumentation. It really worked out well.

INTERVIEWER: Carl Edmonds and his group in Australia have a breathing machine that they used to use to test a lot of their equipment. They worked on it for a long period of time. Was John Harter at EDU during any of the time you were there?

DR. SPAUR: Yes.

INTERVIEWER: Did you ever dive with him?

DR. SPAUR: Yes, John Harter was at the Experimental Diving Unit, but not long after I arrived..

INTERVIEWER: He went down to Taylor.

DR. SPAUR: He had a good wooden sailboat. It might have been the *Mason* or something, but I can't remember what the name was.

INTERVIEWER: It was the *Nickerson*.

DR. SPAUR: Yes. That's right.

INTERVIEWER: It's kind of sad that the Navy sent the guy off to skipper a Navy tug, when he had this great capability as a diving engineering officer. Eventually, he left the Navy.

DR. SPAUR: I cannot remember all the things that John did. We had just brilliant engineers, Navy and civilian.

INTERVIEWER: Well, it seems to me you had a fruitful career in the Navy to look back on and feel very accomplished about.

DR. SPAUR: Yes. Of my thirty years in the Navy, I had about 15 years that had some diving responsibilities and ten years of doing underwater diving research at the Experimental Diving Unit, which was fantastic.

INTERVIEWER: You were lucky that you were never saddled with administrative assignments.

DR. SPAUR: Well, I was administratively incompetent, had no knack for it. When I was at EDU, someone said, "You know, you should become Atlantic Fleet Submarine Medical Officer next." I responded, "Look here. Look here at this shirt. I don't have dolphins. I can't do that job."

When I was at the Portsmouth Naval Hospital we were deployed with the M-MART teams in preparation for Desert Storm. I went to the Mediterranean Sea and Kenya and Diego Garcia with marines. I invaded a quiet little town in Norway with amphibious assault craft and tracked vehicles, tearing up their lovely seaside parks. Every physician had an operational assignment. As we got closer and closer to Desert Storm, we spent more than half of our time practicing for it. At that time, though, we didn't know who the enemy was, or where we were going to invade. We were going to invade somebody, though. The medical corps admiral in charge of Atlantic combat medical support called me in and said, "Would you like to be the head of these combat medical teams in the Atlantic Fleet? You get along with the line officers, don't you?" I said, "Oh, no sir! I get along with the engineers. I don't get along with the line officers."

INTERVIEWER: Did he believe you?

DR. SPAUR: Oh, yes. I didn't have to do that assignment. I was hard to place. In the Navy, when the music stopped, I always sat down between the chairs. That was the way I kept a good job, really. When I was at St. Albans Naval Hospital as a pulmonary fellow, I observed the head of internal medicine. I thought, "I'm not smart enough to do that job. I'm not a good enough internist to be the head of an internal medicine department. How do I keep out of the job if I'm not smart enough?" When I failed the oral part of Internal Medicine Boards, part two, I never took them again. That assured that I would never be a department head.

Then, to keep out of submarines, I never did the written examination to qualify for dolphins.

And so, that is a review of the spotty career of a man sitting between the chairs.

INTERVIEWER: Well, if you have nothing else, I guess we can close it up.

DR. SPAUR: That's good.

(Whereupon, the INTERVIEW was concluded.)

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UNDERSEA & HYPERBARIC MEDICAL SOCIETY

INTERVIEW OF ROBERT "BOB" BARTH

Kensington, Maryland

April 2003

P R O C E E D I N G S

MR. BARTH: My name is Bob Barth. I'm a retired chief warrant boson, but I've been out of the Navy for a good number of years, thirty to be exact.

INTERVIEWER: How far away from the sea were you born?

MR. BARTH: I was born a mile and a half away.

INTERVIEWER: Where was that?

MR. BARTH: I was born in the Philippine Islands, in the capital, Manila. My father was a U.S. Army officer stationed there. He was one of the early Philippine scouts stationed in the Philippines. He had been there ten or twelve years before I was born, and I lived there until the Pearl Harbor days. I got out just before Pearl Harbor was attacked. I came back to the States. My parents, my mother and my stepfather, by that time, had stayed there. They got captured. I lived with my father, the retired Army officer, during the war.

INTERVIEWER: When were you born?

MR. BARTH: I was born on August 28, 1930.

INTERVIEWER: Your parents separated and your mom stayed behind?

MR. BARTH: My parents separated in the late thirties. They divorced in about 1937 or 1938. My mother was the manager of the Hamilton Brown Shoe Store in downtown Manila until just before Pearl Harbor was attacked. I got out because they were taking kids out.

INTERVIEWER: They were taking the dependents out.

MR. BARTH: I got out and came back to the States.

INTERVIEWER: How old were you when you left Manila?

MR. BARTH: I was eleven.

INTERVIEWER: What are your memories of Manila, when you were very young?

MR. BARTH: Oh, going to school and places I hung out are memories. We lived right near the 'Army-Navy Club,' as it was called in Manila. If anybody is familiar with Manila some years ago, the American Embassy was just south of a group of buildings called the 'Army-Navy Club,'

and I hung out there as a kid. It had a swimming pool. You don't talk about what other kids remember. I remember being a child in those days. I remember things we did. I certainly don't remember every single day of it, but some things.

INTERVIEWER: Did you go to that all-American school, or an English speaking school?

MR. BARTH: Sometimes, I did. Other times, I didn't. We moved around a little bit and lived in the country and in the city. Schools were probably mixed. They had English-speaking schools, of course, and they had two that handled me.

INTERVIEWER: Do you remember any teachers or anybody who had an influence on you?

MR. BARTH: Not a one. I don't remember any of my teachers from high school.

INTERVIEWER: Well, you just preempted one of my other questions then. What can I tell you? Never having been in the Philippines, I'm asking some of these questions. They're interesting for me, as I'm sure they will be for other people who listened to your whole history interview. Was there a feeling that there was something amiss because people were leaving? Was there was a conscious effort to somehow dodge a bullet that might be coming?

MR. BARTH: You know, nowadays, we watch the evening news every evening and find out what's going on in the world. In the late 1930s and early forties, we depended solely on maybe an occasional radio transmission. But everybody who lived in Manila, and I remember this by people talking about it years afterward, knew the war was coming, without a doubt. There was a two-year, or maybe a three-year period, and perhaps it was even greater than that, that we expected the war with Japan. We just didn't know where it was going to start. There was a mass exodus of people who could leave, wanted to leave or were told to leave. The Philippine Islands belonged to us back in those days and there were a lot of American companies there. The same amount of representatives from a company or a group of companies today were people who lived in Manila. They were companies like Colgate Palmolive and the people that made 7-Up and Pepsi-Cola. My stepfather, who wasn't my stepfather at the time but was after the war, was a manager at International Harvester, for example. Yes, we knew. I won't say, 'we,' as though I am

including myself, because I was an eleven-year old kid. But it was common knowledge that the war was about to happen.

INTERVIEWER: Do you remember any circumstances surrounding your evacuation, like what it was like, what it felt like, or what happened?

MR. BARTH: No. Being an Army brat, I was able to get a ride back on an Army transport. They arranged that somehow. I wasn't involved with that. I said goodbye to my mom. She gave me five dollars, and I went aboard the Army transport, but there were a lot of civilians, a lot of military dependents and a lot of kids my age. I happened to be by myself, but there were friends on the ship who looked after me. I bunked in a room with their kids and came back to San Francisco via, I think, Wake and Honolulu. I came into Manila and was met by my dad.

INTERVIEWER: Was that in San Francisco?

MR. BARTH: Yes. That was in San Francisco.

INTERVIEWER: You managed to arrive in San Francisco before the attack Pearl Harbor took place?

MR. BARTH: Yes, by about three weeks. It was something like that.

INTERVIEWER: Your dad was stationed in San Francisco?

MR. BARTH: No. He was there to pick me up. He had just been called back by the Army. He had retired once from the Army. My pop joined the Army in something like 1909 or 1910, or something like that.

INTERVIEWER: He was a World War I veteran?

MR. BARTH: Yes. He did forty years in the Army, I guess, but they had called him back in because World War II about to happen. He came and got me and then, we went off to some new assignment to which he was going. I don't remember quite where it was now, but I spent the war with him in various locations because he was back in the Army. During the last year or two of World War II, I was living in San Francisco. He was a troop ship commander. He would ride troop ships over and back and be responsible for the soldiers. He was gone and I lived with my

stepmother. We lived in a marina district. I went to Marina Junior High School down there, which is now called something else, but I was there when the war ended, as a matter of fact, in San Francisco.

INTERVIEWER: You don't recall any teachers?

MR. BARTH: I don't remember teachers, no. I don't remember names. I have a face of my shop teacher in my head. I remember him because he had a part-time job in the shipyard. Kaiser was across the way over there, in Sausalito or wherever it was. He had an evening job and was doing some work with a piece of steel and cut the fins of his thumbs off. He came back and told us, "This is what will happen if you're skylarking while you're working heavy equipment," and I remember that.

INTERVIEWER: I figured you might. You went to high school in that area, I assume, also?

MR. BARTH: It was called 'junior high.' Then, the prisoners who were held by the Japanese, American civilians, in the final years of the war, were held in a university campus outside of Manila called Los Banas, and that was where several thousand of them were kept. I think they did two years there, the last two years. The American Army parachuted in one Sunday morning, a whole flock of these guys, out of airplanes with some trucks, 'Amtracks' they called them, I believe, and got all the Americans. They had to fight their way out of the camp. They took them down to Mindenow, eventually. Because there was still a lot of fighting going on in the Philippines, they put all of them on the transport ship, which brought them back to the States. That was just before the war ended, but I couldn't tell you exactly when it was. I was living in San Francisco, so I met the transport ship. My mother and my future stepfather were on it. I stayed with them at the Palace Hotel in San Francisco for a few days, as a matter of fact. They went back east and I joined them in December of 1945 in Chicago. Chicago was the corporate headquarters for International Harvester.

INTERVIEWER: I'm glad to hear your mother survived.

MR. BARTH: She did pretty well. She held off until 1974, I think, when we lost her.

INTERVIEWER: I was just going to ask whether your mother was interned at Santo Tomas and then Los Banos.

MR. BARTH: She was at Santo Tomas first, if you're familiar with it. They all went to Santo Tomas first, and I think they were in there for the first year and a half, of the three and a half-year internment. The last part was at Los Banos, but it could be the reverse. They're not around anymore to be asked that question and I'm sorry that I didn't learn more about what they did, really. As a kid, you have a tendency to not even talk about things like that. Now, they're all dead and I have no idea what three-quarters of the things that I can remember, stories that they told, but not day to day, month to month type --

INTERVIEWER: Your mother never talked about the rescue?

MR. BARTH: Yes, she did. She talked about it. I was talking about it last night. The subject got onto that. Perhaps you're familiar with the old World War II after barracks. There was a long barracks with people on both sides of the barracks. Everybody had a little cubicle. Her cubicle was right at the end of one, near the door. Airplanes had been flying over the camp for quite some time, going from here to there.

As a matter of fact, one of the pilots was shot down and it crashed near the camp. The Filipinos sneaked him into camp and the Catholic priest, as a priest, kept him in a safe area and hid him until the war ended. The Japanese didn't know that he had been a pilot. But the morning that all these airplanes were flying over and there was a lot of parachuting going on, there was a lot of fighting going on in the camp, and my mom said that the door flew open and a Japanese soldier ran through the door. She was under her bunk by that time with her footlocker pulled over because she was afraid of ricocheted bullets or shrapnel or whatever might get her.

The Japanese soldier opened the door and ran about 15 or 20 feet inside the door. They always talked about the American soldiers, the ones who looked like they were seven feet tall and well fed, because all the men in the camp were fairly run down. The American soldier ran through the door and shot the Japanese soldier. He was sprawled out on the floor. The whole

barracks was full of women, and they were all screaming and hollering. The soldier stood there and told them to shut up. Then, he said, "I'm looking for Mrs. So and So and her daughter, Mary," we'll call her. They said, "She's in the other barracks, the next one over. Why are you looking for them?" He responded, "I'm her son. I volunteered for this mission. I came to get my mom and my sister," and he did and he got out. That's one story my mom told me that I've always remembered that because I think it's a neat story.

INTERVIEWER: Oh, yes. It is a neat story.

MR. BARTH: They fought their way out of the jungle and all that junk that goes with it and eventually made their way to Mindenow, I think. I'm not sure.

INTERVIEWER: At what age did you enter the Navy?

MR. BARTH: I was seventeen.

INTERVIEWER: My father went in at seventeen, also. Did you join in San Francisco?

MR. BARTH: No. I was living with the man who became my stepfather. He had come out of camp in the Philippines and gone back to Chicago with International Harvester and I went to live with him. We lived in Chicago, or at least I did, from December of 1945 until around July of 1946. I went to Lane Technical High School in the north end of Chicago. By then, he had received his new assignment and was going to be South Africa. We went and got on a Robin Line ship in New York, C-2. You didn't have steamers or airplanes flying around a lot in those days, and we went to Durban, South Africa through Cape Town, Port Elizabeth, and East London. I was living in Durban when I turned 17. I was the only American kid in town, except for a gal about my age, and I was 15 or 16. When I turned 17, I was able then to leave Durban on my own. I came in on their visa as a 15 or 16 year old and was unable to leave. I didn't like it there. I was an American but hadn't lived in the United States for very long, maybe only four years. I was anxious to get back and become an American again. When I turned 17, I arranged with the American Consulate in Durban to prepare the paperwork, unbeknownst to my parents, so that I could leave. Durban was a big seaport. When I turned 17, I skipped school and went

down to the waterfront and found an American ship that would let me work my way back to the States. I went aboard that ship and signed on. I went back home that night and told my parents what I had done, and needless to say, they weren't too pleased about it. But I signed on board this merchant ship. We had to go all around the ocean first. It got me back to States at the end of the year, in November, and I joined the Navy then. I joined the Navy in Chicago.

INTERVIEWER: Can you describe what Durban looked like in those days? You said you didn't like it. What was it about it that you didn't like? Was it simply because you wanted to be more acclimated to America?

MR. BARTH: No. I was in high school ---- and I was the only American kid in high school. I didn't get along too well with people and the guys, in particular. The girls thought I was different. They didn't go to school with an American very often. I went to school and did more fighting in school than I did studying just because one kid or another didn't like my existence, or my being there, but that's beside the point. I just wanted to get back home. I couldn't leave without working my way home.

INTERVIEWER: What was it like, working on a merchant vessel at the ripe old age of 17?

MR. BARTH: It was different.

INTERVIEWER: That's why I asked you.

MR. BARTH: It was different. It was just on a voyage. We went all the way up the east coast of Africa and went from Durban to several other seaports that are no longer the same countries. They have different names now. We went all the way up to India, came back down around and as a matter of fact, went over to Brazil. We stopped at Racifi in Brazil and then went on back to the states. As a matter of fact, we came here, to Baltimore, or close to here.

INTERVIEWER: You came into Baltimore?

MR. BARTH: Yes.

INTERVIEWER: You then went back to Chicago?

MR. BARTH: I went to Chicago because that was where we had lived before we left and the only people I knew in this new life were there, not my pop out on the west coast. My dad was in San Francisco. I went back to Chicago and went to the same apartment complex that we lived in before I left and saw those people. They kind of looked after me. I met the Navy recruiter, who eventually recruited me into the Navy. I lived in the same apartment complex and joined the Navy. I went to Boot Camp in Great Lakes.

INTERVIEWER: Was the Navy attractive to people because it wasn't the Army, or was there something else about the Navy?

MR. BARTH: Oh, no. I just thought sailors had a heck of a lot more fun. I remember that when the war was over and I was living in San Francisco, I went downtown and celebrated with everybody on V-J Day. I remember a sailor. He had a hat on the back of his head with a girl under each arm. I said, "That's for me."

INTERVIEWER: They should have made him the poster boy, right?

MR. BARTH: Yes. I always liked things involving the water and the ocean and things like that. Even as a kid, I was interested in what went on under the water and things like that. I was certainly not going to find that in the Army. I had been born in an Army hospital and raised on Army posts. I had really a good knowledge of Army posts and was pretty sure that that was not what I wanted to do.

INTERVIEWER: When you entered the Navy, what did you intend to do with it, or did you have any immediate plans?

MR. BARTH: I had no idea. What seventeen-year-old knows what he wants to do?

INTERVIEWER: Very few.

MR. BARTH: Yes, very few.

INTERVIEWER: What do you recall about boot camp? What was your first experience like with the real Navy?

MR. BARTH: It was cold.

MR. BARTH: I mean, the Great Lakes in the winter aren't warm. That's what I remember about it.

INTERVIEWER: What was boot camp like in those days? What did they put you through?

MR. BARTH: That was 54 years ago.

INTERVIEWER: I know.

MR. BARTH: I don't remember a lot about it. I got out of boot camp and they called the place where you went to the Navy, the boot camp area was 'Outgoing OGU,' or outgoing unit, and you waited for your orders. My first orders, along with 29 other guys, was to Port Wynemi to be a Seabee, and I hadn't joined the Navy to be a Seabee.

INTERVIEWER: That was something that you selected.

MR. BARTH: No.

INTERVIEWER: That was something you were just simply given?

MR. BARTH: Yes. I joined the Navy to ride a great big thing with white numbers on the front of it, but I was a construction electrician school candidate and for a month or so and was in construction. Those were the guys that climbed telephone poles. I found myself with those little funny spikes on my shoes, climbing poles, and I liked that even less than living in Durban, South Africa. I complained, complained and complained. They finally said, "If you want to go to sea, go to sea." They put me on an aircraft carrier.

INTERVIEWER: Which one was that?

MR. BARTH: It was the USS *Boxer*, CV21, in San Diego, where I stayed for the next four years.

INTERVIEWER: Which four years were they? Do you remember?

MR. BARTH: 1948, 1949, 1950 and 1951.

INTERVIEWER: What was the *Boxer* doing while you were on board?

MR. BARTH: It was flying a lot of airplanes. We had the Korean War come out two years after I got on board. I did two or three tours there, on the carrier. Then, I had visions of becoming a civilian again, so I got out briefly and then came back in.

INTERVIEWER: What were you doing on board the carrier?

MR. BARTH: I was a signalman. I was a signalman striker and made third class. But they had phased out the signalman rate at that time and all signalmen were quartermasters. Quartermaster signalmen were quartermasters, also, but the 'job code number,' as I think they called it, was different. You could tell if a quartermaster was a quartermaster or a signalman quartermaster, but that was what I was, a signalman.

INTERVIEWER: Did you get out briefly because you were disillusioned with what the Navy was supposed to be?

MR. BARTH: Oh, yes. What 21-year-old doesn't spent four years in the Navy and doesn't think about getting out. It wasn't until you got out and realized you were going to starve to death because you don't know anything but what the Navy taught you. You said, "Hey, it wasn't such a bad place after all." I came back in. The Navy always looked good to a guy on leave because he went home off the ship and got thirty days leave. He got a handful of money and while he was there, they sent him another check, which was another handful of money. He got up at ten in the morning. He stayed up until four in the morning. He didn't have a responsibility because he was just on leave. The outside looked like a darned neat place until you got out and had to get up early in the morning and go to work. I found out right quickly that the outside world was not for me. I didn't have a hometown to go to, so I ran around with a guy who was from Coffeerville, Kansas. That's a little town down in the southeast corner of Kansas. I had gone on leave to his house. You know, like anything in the Navy, when your ship came in for an overhaul or some time off after a long cruise, everybody took off and went on leave. Well, my parents at the time were either living in Nairobi or Singapore. It depends on what part of that four-year period we're talking about. We didn't have 747 service then, so I went back to Coffeerville with him. I met this lady, fell in love, which was easy to do on a thirty-day leave, by the way, when you had a pocketful of money. I got out in '80 and married her, stayed there a while, and didn't like it and then got back into the Navy. Eventually, I got divorced and stayed in the Navy until I retired.

INTERVIEWER: When you went back in, you obviously weren't sent back to your carrier.

MR. BARTH: No.

INTERVIEWER: Where did you go?

MR. BARTH: I was sent to the Fargo building in Boston, which was a receiving station. I waited for an assignment. I was assigned to new construction. The USS *North Hampton* was a cruiser. It was a CLC. It was a unique ship. They only made one of them. It was a technical command ship. The president could embark on it if he needed to. It was put in commission in Boston at the Charlestown Naval Shipyard.

INTERVIEWER: Did you use your electrician's background in that work?

MR. BARTH: No. I wasn't a electrician. I was a quartermaster.

INTERVIEWER: I thought you had some electric background?

MR. BARTH: No, no. I was a seaman by that time. I was still a quartermaster. I worked there for a while and was then assigned to another ship, a DER, the real hoy DER 397 out of Charleston. They put her in commission and I had been fighting to go to submarine school for some time. Finally, I got a set of orders for sub school. I went to sub school in the early part of 1955.

INTERVIEWER: What was attractive about subs? Why did you decide to go after that?

MR. BARTH: I was on a cruiser and in Boston. There was a submarine in there one day. It was in Boston, I believe. There was only a small bridge on a fleet boat. A guy off the ship started jiggling me, which means that you give J in semi-four and want to send semi-four. I responded and we started sending semi-four back and forth. I didn't get to talk to many people, but semi-four was something I wanted to practice. We talked, periodically, for the next day or two, and I said that I'd never been on board a submarine. He invited me over and I had lunch on that submarine, where they actually let you sit down and you were served. They put a pitcher of cold milk on the table. I never had somebody put a pitcher of cold milk on the table on big ships. You got a bowl full of milk when you went through the chow line. I said, "This is great." Then, they went to sea and I wrote him, "That's it. I want to go to submarine school." I did, eventually.

INTERVIEWER: They sent you to submarine school in 1955?

MR. BARTH: I went to sub school in 1955

INTERVIEWER: Was that in New London?

MR. BARTH: It was in New London.

INTERVIEWER: What was it like?

MR. BARTH: It was like any other Navy school. It was time consuming. I had to try to stay awake. It was interesting because sub school wasn't your typical place, where you sat in class all day. You got out and did things. It was interesting. I don't recall a lot about it, but I went through the escape training tank in New London. I was fascinated with the work that they did there. There's only one training tank left in the world and it's not used anymore with water, but they had a tank with a 120 foot tall column of water, 18 feet across, and I was fascinated with that and watching those guys work. Eventually, some years later, I was eligible for shore duty. I had gone to diving school a couple of times already, so I put in for shore duty at the training tank and got it. I was stationed there when I got involved with saturation.

INTERVIEWER: Not very many people can say they've been up to the training tank at sub school. What was it like, doing it for the first time?

MR. BARTH: It could have probably been very alarming if you were not a water person. A lot of guys have put their heads underwater and done strange things and in particular, held their breath. I didn't have a fear of the water. The only sport I ever did in high school was swimming. I didn't play football or baseball much. I was fascinated by watching those guys work and couldn't wait to get there and learn to do the things that I had seen them do. You went through a learning curve because there was a lot of breath holding that took place at the tank, and I did learn. I got there in January of 1960. I mastered the details of having to be an instructor and that was where I worked for the next four years.

INTERVIEWER: Before you got to the tank, however, I assume they sent you out on a sub after school?

MR. BARTH: I was assigned to a submarine in Key West and then, that squadron left town and I was assigned to a second submarine and then, I went to the tank. I rode two submarines in Key West.

INTERVIEWER: Which two were they?

MR. BARTH: One was the USS *Guavina*. That was AG or AOSS 362 and then, I don't remember. I think they were getting transferred to Charleston or something and I transferred over to the USS *Quillback*, 424. From the *Quillback*, I went to the tank.

INTERVIEWER: What role did you play on board the subs?

MR. BARTH: I was a quartermaster.

INTERVIEWER: The tank was a break, wasn't it? It was something outside the quartermaster world?

MR. BARTH: Oh, yes. I had gone to diving school earlier. I had gone to diving school back in 1949. I later went to this one school in Key West in 1958.

INTERVIEWER: Were these efforts on your part to add to your skills?

MR. BARTH: It was something I wanted to do because the Navy was full of neat things to do. All you had to do was pick one out and try to get to go to it. You could sit around and let BUPERS dictate your whole Navy career or you could branch off and go do things. The only way to get things out of the Navy is to just try them all. I tried as many as I could.

INTERVIEWER: There you go. You said the diving school was in Key West?

MR. BARTH: The Navy School of Underwater Swimmers was. It was a SCUBA school, you know. For years, divers who went to dive school learned with the old Mark V hard hat shallow water mask and so forth, but there wasn't a lot of SCUBA.

INTERVIEWER: It was fairly new then, wasn't it?

MR. BARTH: It was fairly new and was not well accepted by the Navy divers, to be quite honest. Talk to a guy who's been around a heck of a lot longer than I have and he could vividly

remember how they were sent this 'newfangled' stuff, as we called it, and they never used it. They would just stick it up in storage. The conventional Navy divers, in those days, were used to breathing through hoses. The thought of just carrying a limited supply on their backs was foreign. They had no communication, in some cases, and didn't always have shallow water stuff. SCUBA gear wasn't popular, but it became, over the years, the most popular tool the military diver had, but it took a while.

INTERVIEWER: What was your impression of it when you first tried it?

MR. BARTH: Well, actually, I was fascinated with it because it enabled people to go out on their own, and I had actually gone out SCUBA diving. I had been a second class diver for a number of years, so I went out with Navy guys who had their own SCUBA equipment. I learned to like it. I thought it was great. You sure had the mobility. Underwater in the Florida Keys is interesting. I just put in for it. The *Guavina*, at the time I was on it, was a tanker submarine, and it worked with seaplanes, like the old P5M flying boat, the one with the gold wings and two piston driven air engines on the wing. We occasionally had to do things underwater that I took that chore on, as far as fueling the seaplanes and so forth went. I could go to school. I put in for swim school, and I got it.

INTERVIEWER: Swim school and diving school were different?

MR. BARTH: In swim school, we were only taught SCUBA.

INTERVIEWER: I see. Diving school could still be considered the hard hat years?

MR. BARTH: Yes. It was.

INTERVIEWER: You did that, as well?

MR. BARTH: I had done that before. I had done that in Pearl Harbor in 1949.

INTERVIEWER: Again, was it because it was something that you wanted to do?

MR. BARTH: Yes. Everything that I ever did in the Navy, as I recall, was because I wanted to. I wasn't shanghaied to do anything. There might have been a few guys out there who wanted to get rid of me, but they never really tried too hard.

INTERVIEWER: What was interesting about the tank? You said you found the work that they were doing there interesting.

MR. BARTH: Well, you were looking at a column of water that was 120 feet deep. It was 92 degrees in temperature and as clear as any swimming pool. You were doing training with submarine school candidates or submariners who were back for re-qualification. It was just breath holding. Most of it was breath holding and I just thought it was just swimming around the pool, diving down, holding your breath to forty, fifty, sixty, or 120 feet. I just thought that would be a neat thing to learn how to do, so I put in for it.

INTERVIEWER: How did they teach you to do that well? What were you told to do?

MR. BARTH: They stressed repetition. You saw other people doing it, so you knew that it was possible, and you wanted to do what they were doing. You were somewhat fascinated by a guy who could take a breath of air, kick off and post down to the bottom of the training tank. He might have taken his shoes off before he left and thrown them in the water and watched those shoes go down to the bottom. Then, as they hit the bottom, he took a breath of air and dove down and picked up his shoes very carefully and not in a big hurry. You were holding your breath on the surface at 100, 120 feet. Then, he put his shoes back on and tied them and he made sure that they were just right. They'd do that as a demonstration. They'd come back up a couple of minutes later. I said, "Man, I want to do something like that."

INTERVIEWER: How long did it take to do that?

MR. BARTH: Oh, you probably had the ability within the first year. Your lung capacity had to be improved. You had to be able to pull in a lot more air. You had to be able to blow out a lot more air. Your residual capacity and total capacity grew. You held your breath for, say, six hours a day, taking breaths, holding them, and taking breaths and holding them. If you lifted weights for six hours a day, you can imagine how muscle-bound you'd be. Your lungs developed that kind of ability. Then, you knew that when your lungs were hollering for you to take a breath, you

didn't need to. You could hold it a little bit longer. Those things, you wanted to learn. Have you ever seen somebody do something that you wanted to be able to do?

INTERVIEWER: Oh, yes. While you were doing this, you encountered some Navy people who were working on deep submersion.

MR. BARTH: It wasn't called 'deep submersion.' We didn't even have a name for it. It was Dr. George Bond, who has been dead now for some years, a Navy doctor. He was an old country doctor from around Bat Cave, North Carolina, who came into the Navy after years of practice there. Dr. Bond worked at the Submarine Medical Center, at the submarine school. The role of the doctors at the medical center was to assist us. We had to have a doctor on the scene. Dr. Bond was one of these doctors. Dr. Charlie Aquadro was there, along some others, and they all worked the Submarine Medical Center.

I met Dr. Bond, but I had met him a few years before when he and a fellow, a chief engineman by the name of Cyril Tuckfield, were working together. That was during the development of the buoyant ascent jacket. It's different now, but the way you got out of a submarine in the old days was to put a jacket on. You inflated it, got out of the submarine and went to the surface, exhaling all the way. It was called 'buoyant ascent.' Dr. Bond and Cyril Tuckfield had done buoyant ascent off the USS *Archer Fish* in 1958, I think it was. I had gone to swim school with one of the guys involved with that. I had met Dr. Bond then, and I went to the tank. Of course, I met him again. He had been embarked on a program called 'Genesis.' Genesis was an idea that he and Jacques Cousteau formulated in 1957. They were at a Boston Sea Rovers conference and put together everything they had. It still happens every year. He met Cousteau and they became good friends. Cousteau had his conch shell program, Habitat in the Mediterranean, back in the late fifties, and early sixties. Cousteau did not know a lot of things about the physiology involved in 'saturation diving,' as we call it today. We had the knowledge that we could dive with helium. We had been diving with helium for years, but just on a dive basis, in which you go and come up some time later and decompress.

Bond was interested in finding out what. Of course, he was prompted and motivated by Cousteau's questions. They agreed that they would exchange that information. Bond went back to the Submarine Medical Center and embarked on his studies to see if we could do that with people. He started with animals, but eventually got to people. From 1957 to the early part of 1962, we used nothing but animals. I was there and helped just because I was interested.

Bond was a unique guy. He always had ideas, and there wasn't a guy who worked with him who didn't feel that any idea he had was worth getting into. I got involved with him, but not up on the hill at the Submarine Medical Center. We had an old chamber down at the training tank, which was on the waterfront in New London. He brought a bunch of goats down. We could get goats easily because we kept them on the other end of the base. We had a storage area for explosives. It was grassy and we kept goats there to keep the grass down. The respiratory system of a goat, I am told, is somewhat similar to the respiratory system of a human, or at least close enough to conduct studies on them so that you got some useful data relevant to human beings. We saturated goats.

By that time, it had been about five years since they had started. All the data that they collected, all the way up from guinea pigs, mice or whatever they used in the lab, had proven that it looked like a viable thing to put people under pressure, breathing helium for long periods of time. That was what saturation was all about. They thought it would work.

Then, I worked with him on the goats for a while. He got permission from the Navy after showing the Navy all the data. He said, "Look, I've got five years of this stuff and it looks good." He had to convince everybody that it worked.

INTERVIEWER: Up to that point in time, you were volunteering for something, weren't you?

MR. BARTH: Yes. I was still at the training tank. I could have just been released from the tank to go TAD somewhere. Two other doctors and I went down and were put in the chamber. We were in there a week, I think, but there was no pressure. We flew the chamber and pulled the

vacuum and brought it back down to the pressure equivalent to the earth's surface, or sea level pressure.

INTERVIEWER: Now, which chamber is it that you are talking about?

MR. BARTH: It was the helium and oxygen chamber, but it was just an old one in Bethesda, at the Naval Hospital. He didn't want to have to be burdened for days on end with decompression if we had a problem with people in helium and oxygen. If we had a problem, we could open the door and walk out. You couldn't do that with diving. You had to take decompression.

We did the first one in November of 1962 in Bethesda. It was three of us in a chamber. We stayed there a week, and there was no pressure but helium and oxygen. It worked fine. Then, we got permission. Bond showed them the data, got permission to go to the next phase, which was Genesis something or other. I don't remember. It was Genesis C or D or whatever. We went to the Navy Experimental Diving Unit (EDU), which, at that time, was at the gun factory in Washington, where the school was. Two corpsmen and I did a one hundred footer.

INTERVIEWER: Only this time, it was in the water?

MR. BARTH: Well, there was water in the chambers at the EDU. It had a small chamber below it, into which we could put water. But that wasn't what our purpose was. They were physiological studies to find out if you or I could live in a helium atmosphere under pressure. We did it for a couple of weeks, I think.

INTERVIEWER: Why did you think it was worth pursuing? If you could live in a helium-oxygen atmosphere, then what? If the answer is yes, where did you go from there? Where did Dr. Bond want to go with that?

MR. BARTH: We didn't have a goal, necessarily. We were taking each step, one at a time. You didn't go to the Navy and get approval to get all the way to the end of it. You got approval to go one step at a time and that was what we did. We were trying to convince ourselves and the powers that be that we, in fact, could put people in a chamber, take them to depths and leave them there. That eventually led to saturation diving, as we know it today. Why do we have

saturation? We can take people today and put them in an environment, a saturation system. We can put them in a bell or in a habitat, like SeaLab, at the bottom of the sea, where they can stay. We know that. We proved it in the chamber runs that you can breathe helium for long periods of time. Breathing helium at the bottom of the ocean is no different, but you're at the bottom of the ocean. You stay there. Where could we breathe before we had saturation? We were limited to the 300 to 400 foot range. Granted, there were times when we, at the EDU, for example, and some other research facility, would go down to 400 and 500-foot range, but we didn't do much saturation. We made an excursion run and ran down to some particular depth. Let's say it was the 400-foot range, for a nice round number.

At the 400-foot dive, it required a 350-foot dive, as I recall, for an hour. It required several hours of decompression. How long could we have kept that up, and how much useful time could we get on the bottom? Now, I can turn right around and put a man in a saturated mode out of a bell or out of a SeaLab, put it on the bottom, and leave him there for a three months at depths in excess of 2,000 feet. That's our capability today. We increased our depth capabilities to around the 2200 or 2300 foot range and are able to stay there, whereas before, we could never get to 2000 feet. The only guys who ever went to 2000 feet stayed there. We never saw them again.

INTERVIEWER: Genesis was designed to establish the capability?

MR. BARTH: It was designed to do the physiological studies. We did the first and second ones at the EDU and a final one at the submarine base in New London, where he was, the officer in charge, Bond, was a the Submarine Medical Officer.

We did what was scheduled with a three-week, 200-foot dive. One of the guys from the second Genesis, one of the guys from the first Genesis, a doctor and a hospital corpsman and I did it. I think it was close to three weeks at 200 feet. When that was over, we had shown the Navy we could, in fact, put men under pressure and leave them there. Then, we went into the SeaLab mode after that.

INTERVIEWER: Before you move on to SeaLab, I think that it's important for historians, who want to understand what people were like, to know a bit more about personality and appearance and all the rest, because the whole picture is better than half the picture. Can you describe Dr. Bond? What did he look like? What were his mannerisms?

MR. BARTH: He was a big guy. He was friendly. He had the kind of face and the personality to which you just took. There wasn't a guy who didn't love him. If he said, "Let's go to the moon," they'd have been fighting to get in line to go with him. He would do anything that you asked him, or he would ask you to do something that he could do himself and generally, you had to fight him for the chance to do it because he'd be in the water doing something.

We were at the training tank together. It was him and I and other guys. By the way, it was not just Bond and Barth who would do the demonstrations. We would come in the evening and the submarine officer's class would bring their wives down. We would show them all these neat tricks. I would cover for Bond on the tricks he'd do. There'd always be somebody in the water who would help the other guy.

INTERVIEWER: What sort of tricks would you do?

MR. BARTH: Well, Bond did a very fast free ascent. In a free ascent, you used the volume of air in your lungs as a buoyancy factor and exhaled as you came up. You kept safe by exhaling so that you didn't embolize, but you kept enough air in your lungs to keep that upward momentum. Bond did that.

We used to take a bucket down with us, and we had a little blister stuck on the side of the tank down below, at the 85-foot level or 100-foot level. We would empty the water out of the bucket and put the bucket over our heads and use it as a buoyancy factor. He'd step out in the water and do a buoy ascent with a bucket.

We'd also take a pair of Levi's pants, or whatever, and put them over our swim trunks. We'd swim down to the 100-foot level and take our pants off and tie them in a knot like they taught you, to hold you afloat while you were at sea. We'd put our heads up inside the pants,

which were full of air, and do them free. We just did foolish junk like that. We also made bottom drops, going down to the bottom and so forth.

INTERVIEWER: Now, to the ordinary person, that might not seem to be fun, right? Why was it fun for you?

MR. BARTH: I don't know. That's a tough question. I was a water baby. I just liked the water. Gosh, you wouldn't be an instructor in the training tank unless you really liked the water and got to do those things. You had no business being in there if you didn't like the water. People who are scared of airplanes don't become pilots. It was just something neat to do and that was all, really.

INTERVIEWER: Was it not until the first SeaLab began that you were actually officially attached to a project and working it full time? It seems that up to that point in time, through the various stages of Genesis, you had a full-time job at the tank.

MR. BARTH: Yes.

INTERVIEWER: Occasionally, you got permission to do these diversions?

MR. BARTH: Then, we'd get TAD from the tank. We were still TAD, but by that time, my tour was at the training tank and I knew I was destined to get into the SeaLab program. But the program was just somebody's idea that was tolerated by a few in the naval hierarchy. Few people knew about it. I went back to a submarine in Key West and Bond kept pulling me off to go up to TAD, where we were, at the time, building SeaLab I in Panama City. That annoyed the heck out of my commanding and executive officers on the submarine because I was a chief quartermaster at that time. He said, "I've got a chief quartermaster and he never rides in the boat."

We did SeaLab I in 1964. Everyone who was in the SeaLab program was TAD from our respective commands. It wasn't until January of 1965, prior to SeaLab II, that we were pulled in as a permanent entity. That was in January of 1965. We stayed that way until the end of the program.

INTERVIEWER: What role did you play in SeaLab I? What were the tasks that Dr. Bond assigned you?

MR. BARTH: By that time, I had three saturation dives in chambers to my credit. It was really physiological information data, not credit. They had a lot on me, so I was selected to be one of the four guys who were going to be in SeaLab I. One of the others was a guy who had done two of the Genesis programs with me.

INTERVIEWER: Do you recall his name?

MR. BARTH: Yes. He was 'Tiger' Manning, or Saunders Manning. He was chief and then the senior chief corpsman. He lives in Georgia right now but is generally home in Missouri. When we both got out of the Navy, he and I worked together at Taylor Diving and Salvage in Belle Chase, Louisiana, some years later. Tiger and I and two other guys were on SeaLab I. We built it, tested it, took it to Bermuda, put it on the bottom in 193 feet of water and lived in it for eleven days. It was scheduled to be longer than that, but it was during the summer.

INTERVIEWER: Was that because of a hurricane?

MR. BARTH: It was because of a hurricane.

INTERVIEWER: You're inside Sealab I. Look around. Tell me what you see.

MR. BARTH: I see a round tube, similar to one you might find if you lived in an air-streamed trailer and were camping. I don't even remember the length of the doggoned thing now. It's big and comfortable, for four guys. The bottom of the ocean has the water as clear as the water in a swimming pool. The water temperature is in the eighties. We have four portholes, two on each side and, of course, the entranceway on any habitat is through the bottom. You don't have doors. You open it up. You have to go out the bottom. It's the equivalent of taking a glass, an empty glass, and holding it, trapping that air. That's what a habitat does. We lived in it and were free to come and go as we wanted. We could turn the lights out in it and read a book from the light coming through the portholes.

INTERVIEWER: Was it coming through the water?

MR. BARTH: It was coming through the water from 200 feet up, or thereabouts. We had good times. Probably the best project, out of everything I did, was SeaLab I. We weren't fully recognized as a group by the Navy. They thought we were a bunch of blockheads who eventually were going to do something incorrectly and kill ourselves. They didn't want to be any part of that. They were always hiding behind trees until we were successful enough. Then, they came out like termites. But they left us alone and we did just about whatever Dr. Bond wanted us to do. We drew blood. We put other body fluids in bottles and sent them up to him. We did all the tasks and were then allowed to go outside and play.

INTERVIEWER: Was the hatch constantly closed?

MR. BARTH: No. It was constantly open. We had a hole in the floor. Actually, it wasn't just a hole in the floor. It was a hole in the floor, but it had a tube that came up.

INTERVIEWER: The tube was hollow.

MR. BARTH: We had a lot of rise and fall in terms of the water level, so that tube went outside and extended below the habitat itself, which was a cylinder. It came up about, I don't know, three feet or so. It had a ladder going up and down. The hole was just about three feet squared or maybe a little more. When you were ready to go outside, you could look into it. It was a hole full of water. We'd just put on our gear and go outside.

INTERVIEWER: Once you were in the habitat and came up through the opening in the floor and were up above that level, it was a regular environment in which you could change your clothes? You could shower.

MR. BARTH: Exactly. It was no different than going camping in a motor home or trailer or whatever. It was just a haven, really. It trapped the air that was in it. We scrubbed the bad out of the air, the carbon dioxide (CO₂). We added oxygen, as it was needed. It was a helium-oxygen mixture. We would add oxygen when we needed it and scrubbed CO₂ when we needed to do that. It was warm outside and very comfortable. We couldn't cook in it, though. We ate out of

cans. We had a refrigerator, but it broke. We kept our shoes in it, actually but never used it. We just ate out of cans. It was great. I'd do it again today, if we could do it.

INTERVIEWER: What about sanitary facilities? What kind of a toilet did you have?

MR. BARTH: Have you ever been aboard a boat?

INTERVIEWER: Yes. It's the same as just a flush head.

MR. BARTH: You sit down, do your business and then pump it. That was all we did. It went outside to a penetration below the toilet, just like on a boat. It went out and off the side of the boat. We just had a hole in the side of the habitat, but we had a pipe stuck in it. I think it was a non-collapsible hose. When we got to the bottom, we screwed it on there, just like you would a fire hose on a fire hydrant. We then laid it out on the bottom somewhere. The environmentalists would have a field day with that now, maybe, but that was the way we did it.

INTERVIEWER: You were all still breathing this mixed gas that was mostly helium? You were speaking 'helium speak?' You were all talking the same way? Did you all have trouble understanding each other?

MR. BARTH: Yes, with some words, maybe. The deeper you get, you know, the more pronounced that helium distortion becomes. Two hundred feet is not bad. We didn't get into lengthy conversations about Einstein's theory of relative humidity or something. We avoided some of the stuff. We found some words that we just didn't use at all. Swear words were always very intelligible. We could understand them anytime, so we swore a lot.

INTERVIEWER: That's the one thing helium can't defeat. You were down for, you said, eleven days?

MR. BARTH: Yes.

INTERVIEWER: You didn't want to come back?

MR. BARTH: Well, no. We raised all kinds of stink about that. We had one guy topside who was a little scared of everything that went on. We kept saying, "Send him home." But they were right. It was very rough and our decompression was based on bringing the habitat up very slowly

and staying in it. It got so rough that we couldn't stay in the habitat. When you're going up and down a dozen feet, you can't maintain proper decompression. You're looking at about one foot every twenty minutes. Decompression from saturation diving is one day for every hundred feet, so we had two days of decompression. We had a hard time maintaining the constant ascent and keeping it exactly like it should have been. We had a small chamber that hung outside. It was just a single lock recompression chamber. We didn't have bells in those days. We didn't have anything around for doing that, so we took a one-lock recompression chamber with the door at one end. We hung it and built a framework on it with weigh. We had that hanging outside, full of air, all the time. As a safety precaution, if something happened inside and we were in a contaminated atmosphere, we could go up inside it.

We went over there and the four of us got into the thing and shut the hatch. They brought it up on deck, maintaining the last 85 or 90 feet that we had to go, and hooked up air to it. We went off helium and onto air and decompressed. They picked the thing up from the level that we got in and I think it was about ninety feet. I'm not sure. We were on a four-legged structure called Argos Island. It was on the Plantagin Bank. It was a Navy listening station. They put us on deck, laid us on our sides, and we decompressed inside of that for the next day.

INTERVIEWER: How big was this container?

MR. BARTH: It was not big.

INTERVIEWER: You got to know those guys fairly well?

MR. BARTH: Yes, a lot more than that.

INTERVIEWER: I assume that since Genesis had established that it was possible, in terms of body chemistry, Dr. Bond wanted to know more. I assume that he wanted to know more about whether you could engage in some sort of activity on the bottom and not only about body chemistry, fluids and all the rest.

MR. BARTH: Yes.

INTERVIEWER: Can you talk about some of your excursions outside the lab and what he wanted you to do?

MR. BARTH: Well, we did things like that before. We didn't just sit in chambers before. During the Genesis experiments, we had programs and projects that we did. To answer the questions that he had about what you could and couldn't do, we'd work hard and get the heart rate up, for example, and see what it was. Everything that we did, although I don't have the medical term, was normal.

When we finally got to the bottom, we could get in the water and go outside. We still had work that we did. We had the physiological stuff, at least, proven. You had to go through it, many years afterward, to get it all ironed out and refined and make sure that you got everything done that you needed to. We had a lot of time to just go outside and go scouting around. They gave us things to do.

INTERVIEWER: Give me an example.

MR. BARTH: We were alongside a four-legged structure. They called them 'jackets' in the industry. Argos Island was a four-legged structure. It was 193 or 194 feet of water deep and had four legs sitting on the bottom. We went out and did work on the legs. We inspected them. We looked at the wells. We did this and that. Not all of the tasks really required us, but we were a great help in completing them. They gave us different tasks to do. We had a lot of cables that came off Argos Island and went over the side of the bank and listened to things underwater. We'd inspect the cables. We were told to scout a certain area. We could organize a sortie from the habitat to 200 yards in that direction, pick up a rock and move it ten feet, put it down and go on back, or something like that. We just did anything that needed to be done. We could go out and do whatever we wanted to do. We would swim around in a radius of about two hundred yards away.

INTERVIEWER: When Dr. Bond was putting this together, since you were as close to being in at the beginning as virtually anyone, were the goals he established solely his own?

MR. BARTH: Oh, yes.

INTERVIEWER: Were other people asking him to do certain select things in order to prove the system, or perhaps sustain the funding, or establish future goals?

MR. BARTH: All of that was happening. He had a staff of people. He had his 'shrinks,' as I like to call them. He had the people who still had physiological questions that they wanted to answer. We were constantly drawing blood. We never did stop drawing blood. You learn a lot from blood, evidently. We learned what it was like to give a couple of gallons of blood over a period of time. There was always something. He had a lot of medical people there.

The psychological aspect of it was something that they looked into, the effects of isolation. The National Aeronautics and Space Administration (NASA) was so interested in the isolation idea that they later put Scott Carpenter down to work with us. Scott would have been on SeaLab I, but he broke his arm and some other things in an accident in Bermuda and didn't get to go. He was on SeaLab II.

Every day, we had something assigned to us, but we had a lot of leisure time, too, and we'd go outside and hold our breaths. The three of us were training tank instructors, capable of diving to pretty good depths, like 120 or 130 feet of water, and hold our breaths. We were pretty good. Bond was interested in that, you know. Hyperventilate. How long could we go outside and hold our breaths? He'd keep a record of it. He did that during Genesis, SeaLab II and a portion of SeaLab III.

INTERVIEWER: I think we mentioned you and one other person on SeaLab I, but we didn't mention your other two colleagues. Who were they?

MR. BARTH: One was a doctor by the name of Bob Thompson. He was a submarine medical officer who didn't have a great deal of experience in diving. He'd been trained as a diver, was available at the time and had good credentials, so he was a bottom subject. The other guy was Lester Anderson, who was a staff member at the EDU when we did one of the Genesis runs. He

was a good fellow, good friend and a good worker and was interested in what he had to do.

Bond pulled him in to do SeaLab I. None of the people were strangers to the sea.

INTERVIEWER: Were there any other people involved with helping to shape the program, other than those who were directly related to the medical or diving aspects?

MR. BARTH: Oh, sure. There were a lot of guys off in the shadows. You know, all we did was sit in chambers, and those guys were constantly standing watch topside, 24 hours a day, and the guys for whom we gave blood, and those for whom we looked at the Rorschach ink blots. The Submarine Medical Center had a lot of doctors there. Every one of them had something that he wanted to try to do. There were a lot of people, a lot of guys working a whole lot harder than we were.

INTERVIEWER: Did Dr. Bond feel that SeaLab I was a success, based on the goals he had set for himself?

MR. BARTH: I'm sure he did. What did we do that wasn't successful? In everything we did, we proved that we could do it and believe me, there were a lot of skeptics during the very beginning who didn't think we would. We never hurt anybody. We were capable of doing just about anything we wanted to do. It was quite successful.

INTERVIEWER: Who were some of the most difficult skeptics to convince?

MR. BARTH: I still have to work with some of those guys. No, I don't. They're all retired. I'm the only one still working from those days. It was the Navy, in general. I think that you've been around the Navy long enough to understand that when you have something new and different like that, not everybody is going to jump up and wish you a 'fare thee well' and shake your hand and say, "Good luck." They're going to say, "Hey, you shouldn't be doing that." I had a lot of that from friends I knew. They would say, "You don't want to get involved in anything."

When you work at something long enough, you understand what it is you're doing, and the fear doesn't even enter into the picture. But there are always people out there that you have to convince. They don't want to jeopardize their Navy careers by killing a guy or two, whatever the

case may be. That's always a factor. You have to convince them. That was why it took so long to convince them that we could go from laboratory animals to goats, from goats to people, and then put people in the water, in the chamber, with no pressure. We had to convince them to let us put people in the chamber at a hundred feet. We had to convince them to put people in the chamber at 200 feet and then, in the water in a habitat. It took some doing.

INTERVIEWER: When SeaLab I concluded, did you have to go back to your boat?

MR. BARTH: Yes.

INTERVIEWER: You went back to being a quartermaster?

MR. BARTH: I went back to being a quartermaster. The captain said, "Where the heck have you been?"

INTERVIEWER: When you told him, what was his reaction?

MR. BARTH: He didn't understand it. He wasn't interested in it. He was only concerned about the fact that his chief quartermaster wasn't riding the submarine. Where in the heck was the quartermaster? Then, an article came out. The *Saturday Evening Post* did a nice story on us. It had a lot of pictures and on the cover page was the SeaLab. After that, he relented.

INTERVIEWER: Did you get your picture in the magazine?

MR. BARTH: I have one at home in a frame.

INTERVIEWER: Was he impressed?

MR. BARTH: I don't know. I didn't stick around long enough. The ship was in a shipyard. The submarine was in a shipyard in Philadelphia and I went there and finished up my time. I then got a set of orders to go to Panama City permanently and that was the end of my submarine riding days. I did about ten years, I guess.

INTERVIEWER: We're at roughly what, 1963?

MR. BARTH: No. We're up to January of 1965. Everyone who had been on the SeaLab program, including those of us who had been in Genesis, were brought to Panama City as part of the Man in the Sea Program.

INTERVIEWER: Tell me about the Man in the Sea Program.

MR. BARTH: Well, it was, by that time, proven that we could put men under pressure, breathing helium at depths. We had actually had four of them at 200 feet on SeaLab I, so Dr. Bond had drive. He would answer all the questions and go from first base to second base and prove it to everybody on second base that he could go to third base and then go on home. He had a program to get it done and he brought us all in from where we were, and I was on that particular submarine in Philadelphia. All the other guys were on different ships. Some were over here and some were over there. We all went to Panama City. Some of them went to the EDU at the gun factory in Washington and continued doing some other work, such as tests and so on. The rest of us went to Panama City, and we brought in something like 20 or 24 more guys and trained them for different aspects of what we were planning to do on Sealab II, which started in August of 1965.

INTERVIEWER: What were the facilities in Panama City like? What was there?

MR. BARTH: There was a small little Navy base. It's still there today. That's where I work now. That's where the EDU is. That's where the Navy Diving School is. It's a little base. It's a laboratory, really. It has a lot of scientists and a lot of guys who think they're scientists. But they're involved with a lot of things that take place underwater. The diving community is well represented in Panama City, but it was smaller then. Thirty-five years ago, it was a lot smaller. The base is constantly growing, but it's a neat little base. There are some good people there. Of course, it's right on the bay. The bay is right near the ocean. It empties into the ocean. It's a good place to dive and probably the only base that has that much activity involved in the ocean. They wanted the SeaLab program there. They built SeaLab I there. They built SeaLab I for us in Panama City.

INTERVIEWER: You said 'they' built Sealab I. Who were 'they?'

MR. BARTH: They were people at the base.

INTERVIEWER: Okay. They fabricated the base?

MR. BARTH: Yes. I was in the area because I was visiting my folks. That was in December of 1963, before Sealab I. My parents lived in a town not too far from there. I was home visiting with them and he asked me to come to Panama City. The people in the diving business at the base said, "Hey, we think we can help you with this project."

They had, in their scrap yard, a couple of those great big, old, long, steel HY80 tubes that were roughly ten feet in diameter and about thirty-some-odd feet long. They brought us down there, showed them to us and asked, "Do you think we could make a house out of these?" None of us were underwater habitat experts, so we thought, "You know, why not?"

INTERVIEWER: Where would those HY80 tubes have come from to begin with?

MR. BARTH: Many years ago, there was a program at the Navy base in Panama City that was called a 'mine defense laboratory.' They did a lot of stuff with mines. Those two big things, 'floats' we called them, were involved many years prior to that time, and they used them for some test program. They were used but HY80 is good steel. They were used and put out in there. But they were like cigars. They were rounded at one end and pointed at the other. We took both of them and cut the pointed end off of one, the rounded end off the other, and put both ends with the round end. We cut a hole in the bottom of it and did all the things that were necessary. We put six bunks in it, along with all the things that we needed, like a toilet and a shower. That habitat is still there, as a matter of fact, in the museum.

INTERVIEWER: What, then, was the next step from SeaLab I? What was taking shape there?

MR. BARTH: We gathered in Panama City in January of 1965 and started training for SeaLab II, which was going to take place that summer and did take place that summer.

INTERVIEWER: What sort of training did you do?

MR. BARTH: We had new guys who were not all Navy divers. We had some civilian oceanographers, but they were diver-qualified. We had a couple of other guys who worked at the base, as a matter of fact. We had other sailors who were divers, but not trained in saturation. But there weren't a heck of a lot of us who were trained in saturation. We embarked on programs. We

asked, "What are you going to do on the bottom?" They said, "This guy is going to do this. That guy is going to do that."

There were three teams. Each team had ten men in it, for a total of 28 altogether, because two guys stayed thirty days. They trained to do that stuff when they got on the bottom, but we had them dive in some different equipment that we were going to use on the bottom. We had them dive using other hand-held apparatuses that we wanted them to use on the bottom.

INTERVIEWER: Were they tools of some sort?

MR. BARTH: They were tools, like hand-held sonar devices. They were things like that. We had a wealth of different things.

INTERVIEWER: They weren't active sonar devices, were they?

MR. BARTH: Yes.

INTERVIEWER: Really?

MR. BARTH: Ping. Sure. I forgot the device's name, but, yes. It's probably still around, but I'm sure they have a better one now. It has been around for many years. You could hold it in your hand. It had earphones. You could ping and get a response back from a coffee can if you wanted to. We had a lot of that to do, and we were in Panama City doing all that training from January until around June. Then, we all met out in California and met the new habitat and went from there.

INTERVIEWER: Although the parts were discovered at the base, where was the habitat actually fabricated?

MR. BARTH: SeaLab I was fabricated at the base. SeaLab II was made from scratch at the naval shipyard at Hunter's Point, California, near San Francisco. It was a different habitat altogether. It was bigger.

INTERVIEWER: Was it a lot bigger? What else about it was different?

MR. BARTH: Well, it had a lot more stuff inside. While we were doing all that, we were also learning to make it work better. We built a bigger habitat. We had electric heaters in the floor to

keep it warm. We had a better system for scrubbing the carbon dioxide, for heating the place, for everything. It was a little bit fancier.

INTERVIEWER: The cold was a big problem, wasn't it?

MR. BARTH: It always was.

INTERVIEWER: We were talking about the fabrication of the habitat for Sealab II at Hunter's Point. Were the divers, or the aquanauts, themselves involved, the people who had to work the habitat? Were they at all involved in any changes that were made to the second-generation habitat?

MR. BARTH: Yes. They were a good deal involved. They were involved in the human engineering side of it, like 'where to put this,' 'put it here as opposed to putting it over there,' 'where do you think we can put this,' 'we can put something here or there,' 'where do you want it,' and that type of thing.

Scott Carpenter, who is a smart man, was involved in some of it. Scott was due to be the team leader of the first and second teams of SeaLab II and in fact, was. A lot of us were up there. The engineers or the builders of the habitat, not necessarily the engineers, but the builders, would rely on us to help with the ideas. We did that extensively on SeaLab I. By that time, we had some people who had SeaLab I behind them, so they knew a little bit more about where we wanted things. Obviously, when they were designing something, they had to design it so that it was safe and so that it worked better one way, as opposed to another. As far as where something was to be placed, they'd put it where we wanted it, if it were at all possible. That applied on SeaLab III, too.

INTERVIEWER: Where was SeaLab II positioned, physically, in terms of geography?

MR. BARTH: It was taken down to Long Beach Shipyard. We put it on a barge. It was taken down to the shipyard at Long Beach and the final outfitting took place there. Accumulating all of the stuff that we needed was done there. There were some parts still missing and so forth.

From there, we picked it up, put it in the water and towed it down to the Scripps Pier. We had a support ship anchored, an old barge that had been used during the Polaris days, and it was our topside support ship. It was a mile off the inner Scripps Pier, if that, and we put it on the bottom and made sure it was working. Then, on August 28th, which happens to be my birthday, the first team of divers went down. That's the reason I remember the date.

Now, today, when you do a deep dive, you can't swim down. You have to be transferred under pressure and you make your descent into the pressure zone by means of a chamber and a bell, and you ride the bell down. On SeaLab I and SeaLab II, the teams left the surface, swam down and got into it. Of course, when they came up, they had to get into the bell, surface and decompress from the bell into a chamber. They all went down, two at a time, got in it and stayed for 15 days. The second team went down and relieved them. The third team went down and relieved the second.

INTERVIEWER: How deep was it?

MR. BARTH: It was 205 feet deep.

INTERVIEWER: Were you a member of one of the teams?

MR. BARTH: Yes. I was on the second team.

INTERVIEWER: Who were some of the others who participated in SeaLab II, as divers?

MR. BARTH: I happened to be the only one.

INTERVIEWER: The only one? Was Carpenter involved in SeaLab II?

MR. BARTH: Yes. He was the team leader for II.

INTERVIEWER: Does that mean he stayed down for thirty days?

MR. BARTH: Yes.

INTERVIEWER: Was it consecutive? Did he come up and then go back?

MR. BARTH: No. We had one doctor go down on the first team and he stayed 15 days. He came up after that 15-day period and went back down for the third team. He did a total of thirty days, but had 15 days off in the middle. Scott was the only guy to do a full thirty days.

INTERVIEWER: First of all, tell me about the physical aspects of it. When you went into the SeaLab II structure, how was it different from the first one? You gave us a good view of what it was like to be inside the first when you looked around. Put yourself in the same situation. You're inside the second now, looking around. Contrast the two structures.

MR. BARTH: Well, I'm not seeing much because it's dark outside. There's no light from the surface. It's cold, as opposed to the bottom on SeaLab I, because we had coral heads and clear, warm water. On SeaLab I, we had darkness. There was some visibility, but with a light. We have beautiful portholes. We have great, big portholes in SeaLab II. You just can't see a doggoned thing outside.

INTERVIEWER: Did that make a difference in how it felt to live in a habitat for 15 days, seeing as you were the only one who had the common experience between the two?

MR. BARTH: Yes. It was the difference of a bright, sunny, warm day in the hypothetical camper. We were in a pretty zone, in a nice, warm place. There were pretty trees, good visibility, and mountains.

In the case of SeaLab I, there were a lot of critters out there, including some nice fish. We were in tropical waters, as opposed to the chilly Pacific off of California. SeaLab II was dark, dingy and very cold, and we saw little of the tropical fish. We had fish down there on SeaLab I. We always had light coming through the porthole, and we had minute shrimp, or perhaps plankton, that stuck on there all the time. The shrimp would come and eat the plankton or whatever small critters those minute shrimp ate. The fish would come and eat them and then, a bigger fish would come and eat those fish. We always had that going on.

INTERVIEWER: The whole food chain was right outside your window.

MR. BARTH: It was the big guy eating the little guy and it was to the tune of sea lions coming by and eating all of the big fish. You couldn't see anything on SeaLab II. Visibility outside the thing was so bad that if one of the guys were outside, he'd have to come to the porthole and make a face at you or something before you could see him.

Going outside wasn't a lot of fun because you were cold. The water temperature was cold. I don't remember what temperature we had, but in SeaLab I, we could sometimes go outside, in a set of trunks and nothing else on but facemasks. We were always told to go back inside and to cut it out, but we were just horsing around. We would go out naked. We couldn't do that on SeaLab II. It was cold, dingy, and dark. It was not a fun dive.

INTERVIEWER: It was cold inside, also. Was there any heating inside?

MR. BARTH: Oh, yes. It was okay inside. We had good heat. We also had something in SeaLab II that we didn't have on SeaLab I. It was a big tub that we kept full of hot water, and there was nothing better than getting in it after coming in out of the cold, and you were cold to the bone. Jumping in that warm tub was even better than making love to a pretty girl.

INTERVIEWER: Was the choice of a dramatically different environment deliberate? Did they want a cold, dark, more northerly climate, as opposed to Bermuda? Why not go back to Bermuda?

MR. BARTH: Well, they wanted a change. Divers did not generally get to work in the water in Bermuda, unless we were diving in the Bahamas or got to go to pretty places. Generally, it was in the middle of the winter, in a lake that a airplane was going to crash in. You chipped the ice and went down and recovered bodies or it was though you were recovering a drowning or something. They thought, "Why don't we make it realistic?" We were also looking for somebody who could support us. We went around the country like a bunch of gypsies and had to look for somebody who had a pier and electricity, and was willing to take all us mavericks in and support us. They had to give us the facilities on the beach, in the case of Scripps, to do it. All those things came into play. I was never involved in what went on in the offices in Washington. I was just one of the grunts in the water.

INTERVIEWER: As far as the people program was concerned, how did SeaLab II differ from SeaLab I? You described the various tasks. You described the kind of things Dr. Bond wanted

you to do. Are we talking about the same stuff, only more of it, or are we talking about different tasks?

MR. BARTH: It was both, probably. There was more of the same as far as the area of research and physiological stuff. We were still sending them bottles of bodily fluids and blood and so forth.

We had a dexterity coordinator outside, one of those things you had to crank one way and crank another the other to get the thing to travel in the right direction. It was like one of those mazes that they had you go through, and all kinds of stuff like that. We had equipment that we were testing.

We had three teams. Each team was geared toward a specific thing. They may have been the salvage people and their job was to salvage an airplane, foam it, and let it go to the surface. We had an airplane laying out there. They had to go out there and foam the airplane. We had oceanographers, three of them.

INTERVIEWER: Do you remember who they were, by any chance?

MR. BARTH: Yes. They were Bill Polbert, George Dowling and Wally Jenkins. We had Berry Cannon on, as well. All four of those guys, including Berry Cannon, came from the base in Panama City. I was on the bottom with three of the oceanographers on team two on SeaLab II, and they had different things that they wanted to do, but we would help.

INTERVIEWER: Were any of the Scripps people involved with it?

MR. BARTH: Yes.

INTERVIEWER: You said they were playing host?

MR. BARTH: Yes. There were three people from Scripps who were involved in it, I think.

INTERVIEWER: Do you remember any of the names?

MR. BARTH: Yes. One was Art Fleshig. I call him Art 'Flyspeck,' but the other two I don't remember. That was 36 years ago. Come on. Give me a break.

INTERVIEWER: I understand.

MR. BARTH: I can't remember my kids from thirty years ago.

INTERVIEWER: You're doing really well. Well, you said, 'different tests.' For example, there were three teams. You described a salvage team and an oceanography team.

MR. BARTH: Well, some teams had multiple programs. They weren't all salvage. One had salvage as opposed to the other two, which didn't. There was always something that we had to do. We had a weather station. I was the one who maintained the weather station on my team. I'd go out and up the line. We had this thing hovering off the bottom roughly thirty or forty feet. We'd go out and work on that.

We worked with porpoise from Point Mugu. We had a porpoise called 'Tuffy' that came down to us, and one of the guys in my team was someone I had actually been at the training tank with in New London. His job was working with a porpoise and a sea lion, both of which were trained animals. I'd go out and work with him, Ken Conga, a friend of mine who's long since gone now. But he worked with those porpoises. You and I are divers and we get lost. Porpoises are sent from the surface.

We had a noisemaker, too. He found us and we hooked a line back to him. He swam, guided or led us back to some particular place. There was a lot of that went on. We were trying to work and we developed a heated electric suit to warm divers. I had one. Some of the other guys had them. They were battery-operated suits. We'd go out and make dives and try to evaluate those suits. We had different pieces of equipment. We were on the edge of a canyon. We skirted down into the 350, 360-foot range down this canyon. We used different apparatuses to do all these different things.

INTERVIEWER: You had to tote your own lights?

MR. BARTH: Yes. I'd have to think some on that. We had a lot to do. We got up early in the morning, had a bite to eat and talked about what we were going to do that day. The team leader would go over everything, and each team had their work laid out. Once it was their time to go

outside, they'd go outside and do their thing. They went out for an hour or two, more or less, and come back. The next team then went out, or we might have had two teams out there.

INTERVIEWER: I'm not sure it was on SeaLab I or SeaLab II, but could you say anything about the cottage cheese caper? What was that all about, if you remember?

MR. BARTH: Cottage cheese?

INTERVIEWER: Yes. Someone decided they needed to have cottage cheese and had it delivered?

MR. BARTH: I don't recall that happening on my team, but I wasn't sitting there watching everything going on. When the other guys were down, I was off doing something else, standing watch or something, or I was just at home, taking it easy. That could have happened. If they had a particular request, we'd try to get it for them. As a matter of fact, I went to the store several times and got things that they wanted.

The porpoise trainer, Kenny Conga, was a Coca-Cola freak. He was, I think, addicted to the stuff. We didn't have any Coke on the bottom, for some reason or another, and the doggoned porpoise would come down and there was a harness that the porpoise wore for different things. Just about every time the porpoise came down, the people topside had a bottle of Coke tied to this harness. Kenny would take it. He'd grab it and run into a corner somewhere, like a caveman with a side of beef, and drink his Coke, daring anybody to come try and take it away from him. It was selfish.

INTERVIEWER: While you were doing this sort of thing, the manned space program was going on at the same time. Of course, Carpenter was a by-product of that program. Did you feel that in terms of visibility, assistance, and furthering the program, the visibility of the space program helped or hindered what you were doing, or did it matter at all?

MR. BARTH: I don't know that it mattered. We were certainly envious of their ability to garner the attention. Nobody is more of a space freak than I am. I think it's the neatest thing going. I think that NASA has done fantastic things with what they've had. Of course, they've had good

money to do it, but that's what things cost. But they've put men on the moon and done all those things. Granted, they lost people, but never in space. I'm fascinated. Of course, my friendship with Scott and the ability to ask him questions all these many years has added to that, but I wish that we, in this country, had just a fraction of the knowledge about the ocean as they have about space in the space program. I'd sure like to have just the money that it takes for one shuttle shot for our underwater programs. But I don't deny them. I don't have a bit of animosity toward those guys. I think the space program is the best-run organization in the United States of America. God, I just wish that we had been that lucky, to do the things they did. They've always had a neat group of guys to get done what they've been able to.

INTERVIEWER: What do you think SeaLab II accomplished, to further the process along, or to move it along?

MR. BARTH: You'd probably have to ask that of somebody like Walt Mazzone, whom you talked to this morning. There were a lot of things that we knew that we were capable of. If you are a company and come up with some new, unique product, and you and I are the guys that made it, we are comfortable with it. We know it's going to be received well in the world. It's a well-needed piece of equipment. This thing that you and I made gives us the capabilities to do things we never could, but we have to prove to the rest of the world that it does, in fact, do those things. We have to sell it.

NASA, for example, has, gosh, sales promotion people for the space program and they are great guys. They're unique. We never had that capability. I would like to be able to say that in SeaLab II, we answered a lot of our own questions. We proved that we could get the job done. As a matter of fact, all the skeptics, who were obvious to us and existed, never showed up after SeaLab II was over. It was successful. We put 28 or thirty-some odd people in the depths and left them down there for two weeks and never hurt anybody. One guy got the bends. Then, all of these guys started coming out of the woodwork, you know. The Navy decided, "Yes. Those guys

know what they're doing." That was what we did on SeaLab II. We proved to them that we could do what we said we were going to do.

INTERVIEWER: When SeaLab II was finished, to where did you have to go back? Was it Panama City?

MR. BARTH: I was living in Panama City. We went back to Panama City and knew that Dr. Bond was going to try for SeaLab III. We went back to Panama City in November of 1965 and the ball started rolling.

The next year, we all met outside of the city. We left Panama City and went to San Diego and set up housekeeping there. We started bringing in newer people and training them for SeaLab III. SeaLab III was made from the SeaLab II habitat by refurbishing or redesigning it, whatever you want to call it.

INTERVIEWER: Whatever else was done to the habitat, besides the effort to constantly make it level and improve the attitude of the structure?

MR. BARTH: We added a room on each end. It gave us more room. We did different internal things like you would do on a car. You know, the 1980 version looks the same as the 1981 version, but there are new and improved things inside. The cigarette lighter works better. The bunks were better. The refrigerator was better. The cooker was better and so forth. The biggest thing was that we had to set SeaLab II on the bottom. Unless we had a level ball field out there, whatever the angle was of that field that we set it in, the habitat was going to be that way. We changed that aspect. The habitat was buoyant and hung off a clump that we put on the bottom. It hovered, so to speak, not floating around, but it hovered. Then, we clamped it. We put legs on it. The legs were kind of my idea. By that time, I was the habitat officer and was therefore responsible for some of the things we did, like outside storage, for example.

INTERVIEWER: By 1965, what rank were you?

MR. BARTH: I was chief quartermaster. I made warrant the next year, I guess it was.

INTERVIEWER: When you moved to San Diego, you became part of a larger organization, didn't you?

MR. BARTH: Yes. It was much larger.

INTERVIEWER: It was the submergence program. What effect did that have on your ability to operate the formulation of goals and the nature of the project, as opposed to the two that came before, from the point of view of the diver, of the swimmer participant?

MR. BARTH: We had a lot more people. We went from a small 'ma and pa' organization to a large corporation with a board of directors and so forth. We had a heck of a lot of boards of directors.

INTERVIEWER: Everybody wanted to run the show?

MR. BARTH: That's all I want to say about that. When you made one step, you were sure that you could make the second step. When you made the second step, you were pretty sure you could make the third step, and you made it. Pretty soon, you could eliminate the next four or five steps because you went from one to three. You could go from four to six without a problem and so on. You learned that you were capable of more and you did more and then, you went on to the next step. That was what we did constantly. We showed that we could do that. We answered our own questions. We generated the things we wanted to do, found out ourselves and at the same time, we generated answers to those people who didn't think we could do it.

We had new managers on SeaLab III that we didn't have previously. We had to recognize other people that were part of the management staff of the Man in the Sea Program. Obviously, we didn't always agree with things they said. By that time, it was in the late sixties. We had almost ten years of experience doing it ourselves and never having to worry about doing it right or wrong and so on. All of a sudden, we had people who made sure that we did it safely. It grew from a ma and pa outfit to a large corporation. That is what it boils down to.

INTERVIEWER: Was that good or bad?

MR. BARTH: It depended on where you sat. I didn't like it.

INTERVIEWER: Why?

MR. BARTH: I didn't like the idea that there were a lot of people who didn't know my job telling me how I should do it. I mean, that's Bob Barth. I have been known to be a little outspoken and opinionated, but I don't believe anybody should direct me as to how to do my job when I've done it for a long time and they just got here. I blame some of the problems that we had on things that that we shouldn't have had to go through, but again, that is my opinion.

INTERVIEWER: Did you start thinking that perhaps it was a place in which you shouldn't have been? Did you think that you should have been elsewhere?

MR. BARTH: Oh, no. No, I did not. I was selected as the team leader for the first team on SeaLab III. I had eight guys with me. We trained to do our particular jobs. We had five teams on SeaLab III and each team had a lot to do. My team was to get in, open it up and then, we had projects that we did outside. The second and third teams both had different things to do. I was selected as the team leader for the first team. Man, we hadn't gone to 600 feet before and we were going to go down and live at 600 feet. We were quite confident that we were going to be okay. It didn't work out that way, but it was a good opportunity. Not once in my life did I ever think that I wanted to be elsewhere. Lord, no.

INTERVIEWER: Did it not work out because 600 feet was too far?

MR. BARTH: That had nothing to do with it. Maybe it was just a question of some people who weren't trained enough, a problem with equipment not functioning as it should have or different things that went wrong that shouldn't have gone wrong. There was a redesign of something that worked fine in the first place.

INTERVIEWER: What was that?

MR. BARTH: It was the redesign of the penetrators that fed the electrical and other stuff into the habitat. They changed that on us and that was where we had our leak problem. There were a lot of boards of directors.

INTERVIEWER: What were some of the other problems that you were running into? You all were, as I understand it, getting a little agitated over the fact that things were not working the way they were supposed to. There were helium leaks. There were all kinds of things. What other things can you remember that were really aggravating to you?

MR. BARTH: Well, you're talking about a problem. The habitat, for example, was going to be on the bottom and it was going to house forty people or better. Each one of those forty people, or at least two, out of that forty, in each group, had a project.

Plus, everything was new. We had new people who wanted to put a stamp of approval on something. We had new systems in effect in the Navy that we didn't have before, regarding decision-making and the certification-type people and so forth. We were constantly being told, "You can't do this that way. You have to do it this way," as opposed to another way, or, "Here's the way we're going to change it. Instead of doing it the way you thought, we're going to do it this way." We had equipment that didn't make it there on time and we had to find a different way to do it. I think you find that in any organization that grows as rapidly as we did.

I saw things that annoyed me, and other guys saw things that might have been just the way they had to be. Heck, none of us like change. We were confident that we could do it, having done it before. You know, in my case, I was maybe so confident that I should have been more aware that all those things were going on. But I had done two SeaLabs and had been involved in all of the tests before that with the Genesis programs. I was kind of a smart aleck. I didn't need to be told by some Johnny-Come-Lately what it was. It didn't create a problem with me doing my job or him doing his. I just didn't always agree with the changes. Equipment was placed in there or reshuffled and I didn't think, or other guys didn't think, that it should have been. Those were natural things you ran into. Gosh, anybody is going to have that problem, but that's the way it is.

INTERVIEWER: As the manned space program has had casualties, SeaLab III had one, also. With the kind of swift and substantial changes, differing opinions and points of view that you described, do you think such things contributed to the loss of your colleague?

MR. BARTH: I don't know. Are you talking about opinions that should have been coming from people who were making those decisions, topside? I was never one of those people. My job was to look after the habitat and the people. I chose Berry Cannon. Berry was an electrical engineer who had been on the bottom on team I on SeaLab II. He was a good man in the water. He was a good worker. There was nothing about Berry Cannon that was in the negative column at all. I wanted him on my team and he was needed on my team. If there was a problem with the habitat, Berry knew how to fix it. I was lucky enough to be able to select the majority of the people who were on my team, and those were careful considerations to make. A thing that you broached was personality. You can get a person who might be the smartest guy in the world but has a personality like a dead cat and doesn't contribute to the rest of the team, someone who is not a team player. That guy annoys everybody. He doesn't pick up his share of the work. He's lazy. Those are the kind of guys you don't want. Of course, we didn't have them. We had good people, all around.

You can imagine ten guys, working for two weeks on the bottom of the ocean, and I mean *working*. You could get one nerd in there who didn't carry his load. He didn't need to be there. I was able to pick the cream of the crop for SeaLab III, team I, and I had good people. Berry was the unfortunate victim of a little bit of chaos and equipment malfunctioning and so forth, and he paid for it. I knew probably Berry Cannon pretty well, and I know darned well that Berry would have never said to quit because he was lost.

We always had that potential. We were diving and going to live in 600 feet of water. Obviously, if we kept going in that direction, we were going to have problems. We had new things, like deeper, newer equipment. The physiological attack on the human body is more pronounced as you get deeper, so your danger, if you want to call it that, is heightened. There was really nothing dangerous about saturation diving, but danger, if you want to use that word, increased as you get deeper. All of that was fully known by us. None of us were worried about it.

If you want to know the story about Berry's loss, I'll tell you. Team I had gone down. We had two PTCs. By that time, we had developed a chamber on the surface with a bell on top. We had two on the support ship. The way it was laid out was that I took half of team I in my bell, in my chamber, and we went to 600 feet. The rest of them got in the other chamber and went to 600 feet. I took four of us in the bell, including myself, and we went down to the ocean floor, 610 feet down. We went out and over to the habitat and worked on it. But we had some problems with the habitat, like getting into it, pressure versus this, and some other problems.

We didn't get into it on our first dive. Berry and I had on apparatuses, the diving equipment that was sent to us through the medical lock, transferred into the chamber and then given to us, and we took it to the bell. He and I each wore one when we went out and did our first dive. We didn't get in. We were extremely cold. We didn't have any heat, so the cold was getting to us. We came back, got in the bell and came back to the surface. We warmed up a little bit. Then, they took those two apparatuses out and fit in two new ones.

They had a habitat and were worried about it imploding on the bottom. It was leaking. They were trying to keep from losing it. Everybody was running around. Everything was accelerated. In the effort, somebody inadvertently grabbed an apparatus out of the rack that didn't have any CO₂ absorbent in it. The two of those were locked into us to replace the ones we had worn on the first dive. Berry grabbed the one that didn't have any CO₂ absorbent in it and I got the other one. You don't last too long at 600 feet without CO₂ absorbent on a semi-closed circuit apparatus. He was re-breathing his CO₂ because there was no absorbent. He got a high concentration of CO₂. It only takes a few minutes for that to happen. By the time we got there and had been out for maybe four or five minutes, he went into convulsions, and that was it.

We were doing things that people had never done before. There was a chance of losing someone. You hoped that something like that wouldn't happen, but there was a chance. It should not have happened, but it did. That didn't mean, however, we should have scrubbed a beautiful program like that, which they did.

INTERVIEWER: Do you think that was indeed the reason they scrubbed it?

MR. BARTH: I don't know. You'd have to ask those guys who were sitting up topside. I was inside. I had a weeklong decompression. When I surfaced after that decompression, everybody was gone. That was the end of that, except those who decompressed us. They were there.

INTERVIEWER: What did you with the SeaLab III?

MR. BARTH: The Navy put it somewhere for a while and eventually cut it up.

INTERVIEWER: Where did you go?

MR. BARTH: I stayed a little over a year more and I then retired.

INTERVIEWER: When was that?

MR. BARTH: I retired on the first of May in 1970 and went back to Panama City to build what is now where the Experimental Diving Unit is. I was offered a civil service job, to come back and help build the ocean simulation facility, which is a very large, hyperbaric deep diving facility. I had a lot of background in saturation by that time. The same people who generated all the interest, generated EDUs there, got us involved in the SeaLab program, built SeaLab for us, engineered SeaLabs II and III for us, were the same people who wanted to build the ocean simulation facility where I am today. I got out and went to work there but only made it about two years. I just didn't like civil service life. I took off for 16 years on the oil patch and worked off there doing different things. I came back about 15 years ago.

INTERVIEWER: What was the oil patch?

MR. BARTH: It was offshore petroleum diving.

INTERVIEWER: Were you working for oil companies or salvage companies?

MR. BARTH: I worked for a French diving company and then started with another guy. Another two guys started their own company in the Middle East in a city that you've never heard of called 'Dubai,' and we started a diving company there. We eventually expanded into the North Sea and Southeast Asia, out of Singapore. We worked Egypt, Iran, the North Sea and Indonesia.

INTERVIEWER: What sort of work would you do for the oil company?

MR. BARTH: I was diving.

INTERVIEWER: What were you trying to accomplish?

MR. BARTH: Well, the majority of the oil in the world today comes from the ocean. You don't just run down and stick a hose in the ground. You have to do a lot of things. You have to put structures in. You have to drill. When you get X number of wells in some particular field, you might have a field that has upward of thirty or forty wells in it. You have to connect them all with a pipeline. You have to feed them into a place that takes the petroleum and does something with it. It's underwater construction.

There are different phases of the operation. There's exploration, the seismic work to find that there's petroleum there. There's the drilling. You might find, from your seismic work, the field has to be laid out with forty wells in a forty square mile area, or whatever it may be, and they design all that. Their diving companies do the underwater phase of it for them.

INTERVIEWER: You have no regrets about SeaLab?

MR. BARTH: My life?

INTERVIEWER: Yes.

MR. BARTH: No, I have not a one. There has been the pretty girl here and there with whom I screwed up, but other than that, no.

INTERVIEWER: Is there anything that you thought I would ask but didn't?

MR. BARTH: No. I had no idea what you were going to ask. I didn't figure it would be all this easy.

INTERVIEWER: There you go. Thank you for your time. I really appreciate it.

MR. BARTH: Okay.

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UNDERSEA & HYPERBARIC MEDICAL SOCIETY

ORAL HISTORY OF THE MAJOR PARTICIPANTS
IN U.S. NAVY UNDERSEA TECHNICAL DEVELOPMENTS
INTERVIEW OF
DR. ROBERT BORNMANN

Kensington, Maryland
Tuesday, July 22, 2003

PROCEEDINGS

INTERVIEWER: Would you tell us something about your early childhood, and start with when and where you were born, and where you went to school?

DR. BORNMANN: I was born in Pittsburgh, Pennsylvania. But before I was five, my family moved to Charleston, West Virginia. I went to elementary and secondary schools in Charleston, West Virginia, graduating from Stonewall Jackson High School, a school that no longer exists. I graduated in 1948. I then went to Harvard and graduated in 1952. I went to the University of Pennsylvania Medical School and graduated in 1956. I interned at Ford Hospital and then spent two years on active duty in the Naval Reserve with the Navy Antarctic expedition, Deep Freeze 3, where I was the naval officer in charge of the Cape Hallett IGY station.

I applied for a Navy residency in internal medicine, but there was no mail delivery. They said, "Fill out a supplemental form." which I never received until after the rolls were closed for the following year. So, I went back to Ford Hospital for a first-year of residency in internal medicine, which would now be a second year (after the internship).

In the middle of that year, I decided that I had really enjoyed the Navy. I came back on active duty with a regular commission. When I went to the Navy's Bureau of Medicine and Surgery (BUMED) with the intention of applying for residency training, it was again too late in the year. They asked if I would mind going to submarine school, and spending a couple of years in the submarine force, while they looked for a place for me in the medicine residency program of a Navy hospital at the level appropriate to my already-completed training. I said sure. Captain Gerald Duffner was the Director of

Submarine Medicine at the time. Again, it was so much fun that I never went back into the hospital program. When I graduated from submarine school, Captain Duffner asked me to go to the underwater swimmers school in Key West and I was there for ten months. Then he asked me if I'd like to spend the summer with Ed Link in the Mediterranean, and I did.

When I returned from that in early October of 1962, I spent 12 months in a fellowship with Professor Chris Lambertsen at the University of Pennsylvania. From that, I was sent to the Navy Yard to be the assistant medical officer at the Naval School Deep-Sea Divers, as it was then called. Bob Workman was the head of the Medical Department of both the Experimental Diving Unit (EDU) and the diving school. My submarine school classmate, Mickey Goodman, was the assistant medical officer.

INTERVIEWER: From what you said, it sounds as though maybe Duffner was the person who got you into the diving field. Is that correct? Was it Captain Duffner, or was it someone else who influenced you to become an undersea medical officer?

DR. BORNMANN: Well, it was Joe Rossi.

INTERVIEWER: Tell us something about Joe Rossi.

DR. BORNMANN: Joseph J. Rossi was a very, very interesting guy. He was a trained pediatrician. He was a commander, I guess, at the time. He was the assistant in the BUMED personnel branch. I went in to see him, and he said, "Well, what can we do with you?" When Duffner came in, Joe asked, "How many people do you need for the next class of submarine school?" "How many you got?" "Would you accept Bob Bornmann?" He said, "If he's interested." I said, "I have 20/200 vision. Is that a problem? It is for flight surgeon, the aviation medicine training at Pensacola." He said,

“No, it's no problem for you.”

So I went to submarine school training which included the medical officer's course at the diving school. Then, Duffner called me up and said, “Nobody volunteered to go to Key West. I really need someone that I have confidence in to go down there, because we had a small problem with the medical department there. Would you accept?” I said, “Captain, I'll go wherever you send me. I'd love to go, just send me.”

INTERVIEWER: Of the people you have encountered in your diving career, whom would you say you admire the most, and why? How did that person influence your career decisions?

DR. BORNMANN: Well, that's a very difficult question to answer, because I have been associated with, or worked for, a series of extremely interesting, talented, and accomplished individuals, starting with Joe Rossi. Incidentally, Joe Rossi resigned his commission to become a Trappist monk. After he'd been there eight weeks, the Prior called him in and said, "Joe, a Trappist monastery is not the place for a fat Italian who likes to talk as much as you do."

Then, I met Captain Duffner. I met Ken Ploof and Dave Schaible at the underwater swimmers school. I met Lambertsen. I was the assistant to Bob Workman at the experimental diving unit. When I was transferred from that, I became the assistant to George Bond in the SeaLab Program at the Deep Submergence Systems Project office. I also worked for Jack Tomskey.

When I left there, I went to England as an exchange medical officer. I worked for an astonishing group of individuals, eight of whom made flag officer, and three made vice admiral and surgeon general of the Royal Navy. I won't go into a detail with their

names, because they're probably not of interest to the American Navy. But when I came back, I was on the staff of J. Edward Snyder, Jr., the Oceanographer of the Navy. Ross Williams relieved him as Oceanographer of the Navy. I worked with Brad Moody when he was just a captain, before he was promoted to Rear Admiral. The list just goes on, continuously. When I was in the Mediterranean, I spent four months with Ed Link, the inventor of the Link Trainer. He was the inventor and developer of many things for underwater work.

INTERVIEWER: It is clear that you have encountered a lot of extraordinary people. But did any of those people become a role model for you?

DR. BORNMANN: They all did.

INTERVIEWER: It was kind of eclectic?

DR. BORNMANN: Yes, it sure was.

INTERVIEWER: You got a little bit from each?

DR. BORNMANN: I got a little bit from each. Some of their qualities didn't fit in with my personality. But the ones that did, I glommed onto. As a matter of fact, when I worked for George Bond, I learned to copy his writing style. As you know, he was a superb writer. I improved my own writing by drafting things for him to send out as official correspondence.

INTERVIEWER: Who would you say, among those that you've encountered, had the most to do with, or influenced you most, in making career decisions? Are there two or three people that you would single out?

DR. BORNMANN: No. You're not going to get a response from me, Don, on that line. I'm sort of the guy that stumbled happily along in life, accepting what was given to me,

and was blessed by an extraordinary succession of gifts in that area. I don't know that I deserved it. I just sort of fell into it. I was grateful to the people I met. But I'm not a decisive person.

INTERVIEWER: As you went through your career, associated with diving and divers, you said you went to the underwater school. You went to the medical officers' course in diving and so forth. Of those schools that you had the opportunity to observe, was there a best school in any way? Was any one of those that you encountered the best school?

DR. BORNMANN: Well, the best school would be the one that most nearly reached the objectives for which it had been established. I would say that that's like asking Ford [motors?], "What is the best car you ever produced?" They will tell you, "the one we're manufacturing this year."

INTERVIEWER: It wasn't the Edsel, though.

DR. BORNMANN: If you had asked them that when they were producing the Edsel, they would have said yes. Now, I've got to tell you, when I was at the underwater swimmers school, it was at the height of its career. The skipper was Ken Ploof, and the training officer, later the executive officer, was Dave Schaible. We had outstanding instructors. We were taking on new tasks and doing them well.

Then, I got transferred up to the diving school, and the same thing was true. The Navy was going through a change in its approach to diving. We were given greater and greater tasks so as to be able to dive to deeper depths for longer periods of time. The diving school and its training, and the experimental diving unit and its R&D just reacted to the challenge in a superb fashion. I'm grateful to have been there to see it.

INTERVIEWER: The underwater swimming school no longer exists, correct?

DR. BORNMANN: Well, I think there is an underwater swimmers school, but it's not run by the Navy. I'll tell you more after our reunion next May, in San Diego.

INTERVIEWER: Can you talk about the underwater swimmers school, when you saw it at its height, as it evolved into its demise, if you will? Where did it go? How did it fraction?

DR. BORNMANN: The underwater swimmers school, as I understand it, was established to train EOD swimmers in diving, both second-class air diving and SCUBA diving. Having a capability to train divers, they were asked to train second-class divers for other purposes. The Atlantic Coast UDT asked if we would set up a program to train UDT swimmers to become SCUBA divers and that was done at Key West.

As it turned out, Dave Schaible, who was the executive officer at the underwater swimmers school, went up to Indianhead to become the commanding officer of the EOD school, which was a tri-service school. He succeeded Ken Ploof, who had also gone to be the skipper of the EOD school. Dave got money to build a facility with the capability to carry out the EOD diving training right there in Indianhead. Then, the Indianhead school was closed and moved down to an Air Force base, I believe. I can't remember its name, but it was somewhere near the Florida panhandle.

INTERVIEWER: It's Eglin Air Force Base in Florida near Pensacola.

DR. BORNMANN: There is a tri-service EOD school there. I don't know where they train their divers. But only Navy EOD are divers. The old separation of responsibility was the high-tide mark. If it was "wet" it was a Navy responsibility. If it was "dry" it was an Army responsibility. They say that the Army's creed is, in an indeterminate situation, 'Just piss on it and call in the Navy.'

INTERVIEWER: You were in diving at the time when saturation diving was in its infancy, and watched that through its application in the Navy to the time that now, we have only a few saturation divers in the Navy. Can you talk some about the early years, and bring it through how it impacted you and some of your involvement in seeing that saturation diving became an acceptable way to dive, I suppose is the way to ask the question?

DR. BORNMANN: Actually, saturation was essential, but not in the way in which its creators envisioned it. I don't want to get sucked into the debate about who was the creator of saturation diving. If you go by priority, Haldane mentioned it as a possibility, though he never did anything about it. In my mind, George Bond, a Navy Medical Corps officer, brought saturation diving into the Navy.

I was also associated with Ed Link in the Mediterranean in 1962 when he did the first at-sea operational helium-oxygen saturation dive. Ed's vision was to reduce the cost of diving by decreasing the amount of decompression for a given amount of work underwater. George's vision was of people living and working under the ocean. That last was how the three SeaLab projects were envisioned. It made it possible for the Navy to take on long, deep diving, because even if you made a thirty-minute dive to 750 feet, you might not have been saturated when you left 750 feet, but you certainly were saturated before you reached the surface again.

The big change was to make the divers' residence in a deck decompression chamber, rather than in a habitat on the ocean floor. Commercial diving companies all around the world adopted that process, procedure, and equipment. But we lost out in the race with the engineers who developed first the remotely operated vehicles (ROV), and

then the autonomous vehicles (AUV), and the armored diving suit. Deep human diving is [was] becoming more and more infrequent. As I understand it, the specific requirement for the Navy, for a human diver, is to be able to dive to 300 feet, which, curiously, is what we could do in 1957, when I came on active duty in the Navy.

INTERVIEWER: You spent a career in the Navy. You certainly spent most of it in diving and submarine related fields and positions. Did any of that affect your retired life? If so, how?

DR. BORNMANN: There was not a great call for submarine medical officers in the civilian medicine establishment. I was advised, five years before I retired, to get a diploma in another specialty. Because I'm basically a lazy guy, I figured the easiest thing to do was to get a certificate in occupational medicine, which accepted a lot of the experience and the education that I had had in the Navy as a submarine and diving medical officer. But I didn't work in that area. When I retired in 1985, I essentially went and put my feet up and enjoyed myself.

INTERVIEWER: Think back to your first underwater experience and tell us about it.

DR. BORNMANN: I couldn't even tell you what it was. You're referring to the training?

INTERVIEWER: Yes, or tell us about whatever your first underwater experience was.

DR. BORNMANN: Well, I am not a phobic person. But I have had three panic attacks that I can remember in my life. One of them was when I accidentally turned off my air during an examination, a job to complete on the bottom in the Anacostia River. I struggled for a minute, and then I said, "Well, I have enough air in the helmet. I'll just finish the job and go on up before I worry about it."

The second time was when I was in a Royal Navy submarine, and they turned the

ventilation off. They went silent. I was in a bunk bed in a British submarine and I couldn't find the zipper of my sleeping bag. I was in a cocoon, and it was getting hot. My heart rate went up. I finally got my fingers up to the top of the zipper, unzipped the sleeping bag, rolled over and went to sleep. I don't even remember when the fans came on again.

Then, the third time was on an airplane, when I was in the middle of a three-seat arrangement. The overhead baggage level seemed to be right above my forehead. The lady in front of me let her seat back. It was inches from my face. I said to the guy on the aisle, "Let me up." I got up and walked around. I calmed down.

INTERVIEWER: In your diving career, is there any single event that is most vivid in your memory?

DR. BORNMANN: No. I was not much of a working diver. I was a bureaucrat, an executive manager in my association with divers.

INTERVIEWER: Were you involved in any of the wartime diving experiences, such as Vietnam?

DR. BORNMANN: No.

INTERVIEWER: Did you have any life-threatening experiences in diving? Were there any?

DR. BORNMANN: Well, actually, people died in diving. But they always seemed to die before I arrived or after I left. At Key West, there was an individual who collapsed on a several-mile run and died of acute hemorrhagic pancreatitis. There was a guy who drowned at the diving school when Walt Bergman was a student. Paul Linaweaver was on the medical staff, and that was before I arrived. Then, at the EDU, there were two guys who were burnt in the EDU chamber fire when I was at the diving school.

INTERVIEWER: How about your own life? Did you ever encounter a life-threatening situation in diving?

DR. BORNMANN: Yes. My life was saved. I had a regulator failure. I couldn't breathe. I tried to surface, and I got hung up. My SCUBA bottles had got caught on something. The corpsman in the group saw me struggling. He reached down, grabbed me by the head, pushed me down, freed me and pulled me up, and saved my life. He told me, when I explained what had happened and how I got in the particular predicament, "Oh, I remember. I tried that regulator and it didn't work, so I used another one." When I arrived, it was the only one left.

Because of his failure to report it, he risked causing my drowning. Instead, he ended up saving my life. I later found out that this same corpsman had purchased for the sick bay the barbiturates that a medical officer used to commit suicide. After he left the Navy he taught his boss' wife how to shoot a pistol. She shot and killed her husband, his boss. You ought to interview him for an oral history.

INTERVIEWER: I don't think so.

DR. BORNMANN: He was a diving corpsman.

INTERVIEWER: What about the equipment that you used in diving? What kind of equipment were you qualified to dive with, so to speak?

DR. BORNMANN: In addition to the deep sea air and helium dress, I started out with the simple air SCUBA, a two-hose regulator. I was trained with the semi-closed circuit and the closed-circuit apparatuses, but never used it operationally.

Then, I was involved in the biomedical research to develop modern Navy diving equipment. The other thing was that in the 1970s, the Bureau of Ships or NAVSHIPS

had developed a new type of SCUBA for use by SEALs. Dave Schaible was a captain, a SEAL captain, out in San Diego. I had worked with Peter Bennett for several years at RNPL , when I was in England. Peter had gone to Duke University. I arranged with Peter to take half a dozen prototype diving rigs from the EDU. Dave Schaible sent SEAL personnel from the Navy to Duke, and we ran a program to familiarize the SEAL personnel with the proposed new equipment, to check the biomedical background in its use, and to develop new decompression schedules for the gear..

INTERVIEWER: In your diving career, is there anything that you experienced, and it could be more than one thing, that you would categorize as something you will never forget?

DR. BORNMANN: There were no epiphanies, if that's to what you're referring.

INTERVIEWER: Well, I think you may have already told us, but as a Navy medical officer, what factors motivated you to select submarine and diving medicine as a career specialty, or was it just opportunistic?

DR. BORNMANN: Well, I'd hate for you to think that I'm an opportunist. But it did happen by chance encounter, and by having a moment of not knowing what to do, and someone said, "Why don't you try this?" That was truly a critical pivot moment in my life. It turned out to be a greater thing than I'd ever imagined when I said, "Sure, why not?"

I've got to tell you, without being disparaging of the Navy medical department hierarchy, that during most of my career, I worked for line officers. That was repeatedly an outstanding experience. I have talked to other Navy doctors who worked in medical clinics and hospitals and they didn't have nearly the amount of fun that I did.

INTERVIEWER: Was that because of your association with the line in the Navy?

DR. BORNMANN: It was that and working on truly naval tasks and missions.

INTERVIEWER: In the field of diving and submarine medicine, as you practiced it, what did you encounter that you would say was the most intellectually stimulating?

DR. BORNMANN: I'd have to think about that answer.

INTERVIEWER: You can think about it, and we can come back to it.

DR. BORNMANN: Okay.

INTERVIEWER: You have mentioned several people who influenced you in your Navy career. Going to the line side, you mentioned Dave Schaible, for example. Is there anyone else on the line who really shines out as a person who really struck you as a role model, or someone who influenced as to what you did, or decisions you made? Are there any other line officers you can think of who interacted with you in your career?

DR. BORNMANN: Well, the first one that comes to mind is clearly Admiral J. Edward Snyder, Jr. Ed Link wasn't in the Navy but he was an authentic historical character in the United States. Being associated with him, and seeing how his mind worked, and then going back, and over the next ten to twenty years, finding out all the things he had done, and remembering little comments and stories he told were fascinating. You ought to get Charlie Aquadro to tell you about Ed Link, too, because Charlie spent more time with Ed than I did.

INTERVIEWER: Thinking back now, in your Navy career, and knowing where we are today, and I say 'we' to mean the Navy diving and submarine medicine fields, collectively, what would you say are areas that still require biomedical research, or are there no areas left? Are we simply re-plowing old ground, as one of the diving medical

officers said one time, after he became an admiral. I can't think of his name.

DR. BORNMANN: Walt Welham, Charlie Waite, Lou Seaton, Jim Zimble, Hugh Scott, and Jim Summitt all made admiral.

INTERVIEWER: It was Jim Summitt. He said that all we were doing in undersea research was re-plowing old ground.

DR. BORNMANN: He may have been talking about specific expenditures, not about the program as a whole. Would you say there are still areas to study?

DR. BORNMANN: Well, going back to his comment, I think one of the defects of American Navy labs is they don't do library studies before they start spending the available research funds. Then, they end up, as Dr. Summitt said, re-plowing old ground.

INTERVIEWER: For the readers of this book, define 'library studies.'

DR. BORNMANN: Well, there was an initiative, for instance, to come up with a solution to cold weather and cold water exposure. One lab manager said, "I've got to get a hunk of those funds. Anything will do, as long as we can sell it in Bethesda." They ended up, as far as I could tell, never checking to see what the Royal Navy, the Norwegian Navy, the Canadian Navy, and the Canadian forces had ever done in this area. They just went ahead and said, "It sounds like a good idea. Let's find out if it works."

INTERVIEWER: Ocean floor habitat diving was moving along at a remarkable pace during the early part of the last half of the twentieth century, until we lost Berry Cannon during the operation of the Navy SeaLab III. From then onward, habitat diving lost its luster. What is your opinion as to why that happened? Was it Berry Cannon's unfortunate death, or was it something else? Also, if Berry Cannon had not died, what is your opinion as to what the Navy would have developed from the SeaLab experiments?

DR. BORNMANN: First of all, Berry Cannon was a wonderful individual human being. His death was tragic, and a great loss. But I think that the subsequent history of diving would not have been changed much if he had lived and if SeaLab III had successfully completed its planned program. All the Navy objectives in the SeaLab III program were attained later.

INTERVIEWER: The DSRV's, or Deep Submergence Rescue Vessels, are going out of service. They're being replaced by another type of submarine rescue system in the Navy. What is your opinion about the utility of the DSRV's during their lifetime, and what is your opinion about the new submarine rescue system, the Submarine Rescue and Diving Recompression System, if you are familiar with that new one?

DR. BORNMANN: Well, I'm not familiar with the new one. I can give you no evaluation. I was at DSSP when they designed and built the DSRV's. They functioned admirably well during their life program. As far as I know, they were never utilized since they were never called on. Are you asking me about the engineering quality of the vessel, or about the philosophy of submarine escape, rescue, and survival.

INTERVIEWER: Do you have an opinion on the statement that has been made about the DSRV's, that they were primarily for telling the public, in general, that if your sailor goes down in a submarine, we can go get him, and for no other real purpose?

DR. BORNMANN: Don, I don't understand the question. I don't think my comment would add anything to the debate.

INTERVIEWER: The reason I asked the question is because that has been said although I don't agree.

DR. BORNMANN: I know you don't but I don't have a high opinion of the question.

INTERVIEWER: We'll leave it alone. What is your opinion as to the equipment that was developed for submarine rescue, such as the one atmosphere diving unit, or diving suit, and the submarine escape and immersion equipment, the British submarine personnel escape system, and those kinds of things? What is your opinion of those pieces of gear?

DR. BORNMANN: I think they were marvelous accomplishments. Particularly the submarine rescue and escape equipment. The one atmosphere diving suit is being used commercially right now. Right?

INTERVIEWER: Yes.

DR. BORNMANN: You don't know what the situation will be in any future submarine loss or tragedy. We do the best we can to anticipate it, and to come up with something that might help, in a hypothetical future situation. But it's a struggle. It's a balance of objectives, resources, and trade-offs. It's about whether you need it, whether you can afford to put it aboard, and whether that energy and money could be better spent to avoid the accident that disables the submarine.

INTERVIEWER: In the field of diving and submarine medicine, what proved to be the one thing that brought you the most satisfaction? Is there any single thing?

DR. BORNMANN: No. I had 27 years, of which almost a quarter century was spent in undersea medicine, and working with submariners and divers. It just was a succession of wonderful collaborations, acquaintances, insights, and personal satisfactions.

INTERVIEWER: You surprised me with that response.

DR. BORNMANN: Why is that?

INTERVIEWER: I would have guessed, with a high level of probability, that you would have said the tour you had in the research and development command, monitoring and

developing and overseeing the undersea research program for the Navy medical department. That's where, to me, knowing you, you had the most influence of your whole career, I thought, anyway. You really did a lot of good things there.

DR. BORNMANN: But I also had a lot of frustrations. I'm telling you that when I look back at my career, I had more fun when I was a lieutenant than when I was a captain.

INTERVIEWER: Well, the fun goes away with responsibility sometimes.

DR. BORNMANN: It's a different type of satisfaction. 'Fun' is probably the best term to use for what you did when you were thirty. What you did when you were forty had a lot of responsibility. It wasn't just you. It was the people you were working for, some of whom you never met. But as I said, the entire quarter-century was just replete with all sorts of satisfactory situations.

INTERVIEWER: In that quarter-century, was there anything that you would consider your most important contribution to diving? Can you single out anything in particular?

DR. BORNMANN: Well, again, I'm not sure that any of them were all that important, particularly since we've turned the deep oceans over to the engineers and their vehicles. But I did help set up, or at least suggested, the establishment of a program for exchanging duties between medical officers of the Royal Navy and the United States Navy. I was a little startled when they canceled the flight surgeon exchange to change it to an undersea medical officer exchange. But that's the way they decided to do it. The exchange, I think, began when I got together with Eric MacKay at Lambertsen's lab in Philadelphia in 1963, and we said, "Hey, why don't we swap jobs?" It eventually happened. In 1970, I swapped jobs, not with Eric, but with David Elliott.

I was also the person who set up the additional duty for individuals in the Surgeon

General's office, to work in a chamber at the EDU and at NMRI. That lasted for what, twenty years? But [it] no longer [exists] as far as I can tell. The diving program at Bethesda has been transferred to the EDU in Florida. There is no longer any way for people who work in the Surgeon General's office to get diving or chamber pay. We had people out in the fleet doing magnificent jobs and they were the type of officers the Surgeon General wanted to come back to take important management assignments in Washington at BUMED. They were faced with giving up their submarine pay or their diving pay and taking a pay cut in order to be transferred to a very important assignment. It didn't work out the way I imagined it. But we were certainly trying to alleviate the problem. I think that we got some very fine individuals to come to BUMED. Whether they would have come without the chamber pay, I don't know.

INTERVIEWER: Did you have any disappointments? Can you recall any disappointments that you encountered in undersea activity, things that you would like to have seen differently?

DR. BORNMANN: Well, of course, one always is disappointed. You find that it stems from a difference of opinion and judgment with your superiors. Often, they have, in subsequent years, been proven correct. In other cases, their decisions have been proven incorrect. Whether or not it has been adjusted is just a matter of history. There are some people that still think that the Navy's giving up the blimp program was a terrible mistake.

INTERVIEWER: That's true. If you had it all to do over again, would you follow the same course?

DR. BORNMANN: Yes. That's kind of a difficult hypothetical question to answer. But the simple answer is 'sure.' I'm completely satisfied with the course of my career. Let me

say further that when I go to reunions in places like Panama City, and see the young people at the diving school and the experimental diving unit, and when I go out to San Diego and see the people working in the submarine area, and in the North Island Headquarters for the DSRV's it is a different Navy. It's a different culture. It's a different time. But if any young man asks me, "Is the Navy a place that I should consider for a career?" My answer is a resounding and unhesitating 'YES!'

INTERVIEWER: Good. In the past half-century, what would you consider the most significant achievement made in undersea technology?

DR. BORNMANN: The ROVs and AUVs were the most significant. I mean, I'm an old man. I'm 72 years old. I think about the status and the capabilities of medicine when I was a medical student and graduated with an M.D., and what the Navy can do in the ocean this year, compared to what they could do in 1960. When I got into the program, it was a different world. You made a small contribution, and someone else built on that, and then another person built on that, and you end up with a different world. That's what's happened in the last half-century, in both medicine, and in Navy technology and capability.

INTERVIEWER: If in your Navy career, all the barriers that you encountered in doing things were removed, and you had been given absolute authority to do anything you wanted, what would you have changed or done differently, or have developed differently?

DR. BORNMANN: I can't answer that.

INTERVIEWER: Why not?

DR. BORNMANN: Well, I can't answer it because I've never thought of it. Basically, I'm

an individual that respects discipline and authority. Even though I've disagreed with decisions that have been made, as I just said, who am I to say that I'm right and they're wrong? History will have to make that determination, and I'm not sure that even history is clear in its judgments. I had no great overwhelming disappointment, if that's what you're looking at.

INTERVIEWER: No. I'm not necessarily looking for a disappointment. I just wanted to know what would you have done, or [who] you would influence to do [things] differently, or develop something that wasn't developed and those kinds of things.

DR. BORNMANN: Well, again, as I said, when I retired from the Navy, I was confident that the people who remained on active duty were thoroughly capable of running it without my advice or assistance. I'd had my time. I enjoyed it. Then, it was their time.

INTERVIEWER: In putting this book together for the Office of Naval Research, we're looking at a hundred-year timeline. Can you identify three top events in the past hundred years that, in your thinking, changed the way that we view undersea technology today, and the philosophy of Man in the Sea?

DR. BORNMANN: Well, let me answer in a little different way than you're thinking. Gunner Stillson and Dr. French came out with their report on deep diving, and then the first modern Navy diving manual in, I think it was 1914 and 1915. When they did that, they thanked the Office of Naval Intelligence for providing them with information and reports on what was going in the United Kingdom and Europe.

Today, we have exchange officers. We have information exchange programs. We have a memorandum of understanding. The Office of Naval Research has contacts in almost every European laboratory, Navy and otherwise. Our associations, like the

Undersea and Hyperbaric Medical Society, are not parochial organizations, but international societies. Our meetings are an international exchange. When we talk about what's been accomplished in the latter part of the century, we're talking about international program accomplishments, not just successes of the United States Navy. I think that's the biggest change from 1903 to 2003.

INTERVIEWER: In the first half of that hundred year timeline, the navies of the United States and other countries were unquestionably the leaders in undersea technology and the development of that technology. A lot of the Navy divers then left the Navy and went into the commercial diving field, and continued developing what they had learned in the Navy. Neither of these seem to be prevalent today. Why?

DR. BORNMANN: Well, you're talking about in the 1960s. I mean, you started out with a hundred years, but you're actually talking about the 1960s and the 1970s. Well, there are two things. First, that the specific operational requirement for the Navy today has reverted back from what it was announced to be in the 1960s. Second, commercial diving has recognized its role, and has actually set up civilian diving training programs so that they aren't so reliant on the divers who retired from the Navy, or who didn't reenlist.

There has also been a reduction in human diving on the outside, as well as in the Navy, due to the fact that we have underwater machines that will do things much more safely than human beings could, at a deep depth. Once you've got a machine that can do that, and it can work at sixty feet or six hundred feet, it is basically still cheaper than human divers.

INTERVIEWER: Would you say, then, that developing underwater vehicles or machinery should be our focus in the future, rather than Man in the Sea?

DR. BORNMANN: Well, the human eye, fingers, and brain are miraculous creations. You're never going to be able to eliminate that from work under the sea. What you're talking about is the safest and most effective way to utilize the eyes, hands, and brains of a human operator accomplishing work under water.

INTERVIEWER: In which of the major accomplishments in the development of undersea technology did you have a major role? Try to focus on some of the areas, like what was that development for? Why was it important? What was your role in developing that technology? Who else made it happen? What technology was used to make it happen? If it went wrong, why did it go wrong?

DR. BORNMANN: It would be very difficult for me to answer that. Basically, I think of myself as sitting in the catbird's seat, watching a lot of fascinating things happen. I didn't have an essential role. There's no question that they would have happened had I not been around. But I saw some wonderful things happening.

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UNDERSEA & HYPERBARIC MEDICAL SOCIETY

**ORAL HISTORY OF THE MAJOR PARTICIPANTS
IN U.S. NAVY UNDERSEA TECHNICAL DEVELOPMENTS**

**INTERVIEW OF
REAR ADMIRAL BRAD MOONEY**

San Diego, California
Wednesday, September 24, 2003

PROCEEDINGS

INTERVIEWER: Brad, I was wondering if we could start off from the very beginning. Where were you born and what was your childhood like, and how did you actually get involved with the U.S. Navy?

RADM MOONEY: Well, I was born in Portsmouth, New Hampshire. That was fortuitous. I was born in 1931. When I was a youngster, just before World War II, Portsmouth was building submarines and, of course, built submarines throughout World War II and afterward.

One of the things I guess that helped the course of my life, and I guess I shouldn't have said it 'helped,' but it was the sad sinking of the USS *Squalus*. I remember that well. You've seen the picture, I'm sure, of the bow of the *Squalus* coming up, slipping out of the sling and going back down.

INTERVIEWER: Yes.

RADM MOONEY: Well, I was on the scene that day. It turned out that a friend of the family was a banker in Portsmouth. He had a Crisscraft [sp?]. He took us out to that area, and the only time I went out to that area where the salvage was going on for *Squalus*, and it happened to be the day it came up and slipped out. That, of course, was a big issue.

INTERVIEWER: You would have been eight years old at the time?

RADM MOONEY: Yes, I was. I recall the salvage fleet bringing the *Squalus* up the Piscataqua River and taking it to the Navy yard. I remember the pontoons on each side of it as they towed it up the river. Later on, after my parents had divorced, I went to live during part of the school year with my mom. Harold Prebel (?), who was the first survivor to come out of the barrel on the *Squalus*, lived across the street. I got to know Harold Prebel very well. Also, during the whole

Squalus disaster, my dad was the president of the American Red Cross chapter in Portsmouth. He was involved in helping the families of the people who were on the *Squalus*.

Coming from a submarine town, I wanted to get into submarines. My high school teachers urged me to go to the Naval Academy. I went there right out of high school, a couple of weeks after I graduated, in 1949. I went to the Naval Academy and graduated from there in the class of 1953.

During the summer that I was on leave, between my second and first class years, I was at home in Portsmouth, but I volunteered to serve on the USS *Tang*. The *Tang* was up in the shipyard at that time. They put me alongside the engineer on the *Tang* and every day I was home I spent a good deal of time working in the shipyard on a real live submarine.

After graduation, I went to an APA, troop transport for a year. In those days, you had to be qualified as an OD underway before you could go to submarine school. When the year was up, I was qualified as an OD and I went to submarine school. I was married December of 1953. Four or five days later, we went to the Mediterranean for six months. When I came home in July from the Mediterranean, I had hardly gotten to know my wife. I went to submarine school and I stood last in my submarine class. I went through most of the academic board meetings, and for the one I didn't go to I volunteered to serve tea. But I think I spent a lot more time with my family than I should have, and a lot less time with my books.

However, and this may help some other youngster sometime, after I graduated, I went to the club in New London for lunch with my wife, and our speaker at graduation was Joe Grenfeld (?), who was a famous World War II submariner. He came over to me and said, "I understand you're the bucket man in the sub-school class." I indicated that yes, I was. He said, "Well, so was

I.” Then, he started listing to me a number of people who were bucket men in their classes and had done very well after that.

I brushed myself off and served on submarine USS *Burfish* in Norfolk. I wasn't the first person to qualify in submarines in that class, but I was the first person to qualify for command of a submarine. I knew I had a lot of catching up to do because I didn't do well in sub school.

After the *Burfish*, I went to Sarda, New London. After Sarda, I went to sub school to teach. I didn't go to teach the subjects that I had difficulty with, but I taught tactics. I did that for a year, and then I taught advanced tactics, PCO tactics, for another year. Then, I went sub lance staff.

The staff was split. The operational staff was in Norfolk. The logistic, training and personnel staffs were in New London. I was there on the training staff. That was during the time that about one Polaris boat per month was being activated, so we had to train the crews. Essentially, one crew a month had to come off the line. That was a challenge. While I was there, were I going to go into the nuclear program, I would have applied but didn't. I wasn't ready to accept Admiral Rickover as my religion.

INTERVIEWER: Was he notorious at that point?

RADM MOONEY: Oh, he was notorious at that point. George Peperidy Steele (?) was at the desk next to me. He was the only nuclear person on subland staff. He was the first one who came there. He was in a very difficult position, because he was obviously Rickover's man on the staff. He had some loyalty to Rickover, as well as some loyalty to our boss, who was Admiral Dasby (?). He asked me why I hadn't applied for nuclear power training, and I said, “Academically, they probably wouldn't accept me because I was the bucket in my sub school class.” In any event, I wasn't ready to accept that as my religion. We discussed that a bit.

Later on, there was a submarine in the New London area from which they had just fired both the executive officer and the skipper. I was asked if I would like to go there and be the executive officer of the boat. It was the USS *Sea Robin*. I volunteered and went. We had a good skipper. We had come in within two days of one another. We went to the Mediterranean about a week after I reported aboard. The crew just needed some leadership, I think. It was a good crew. We had a very successful tour in the Mediterranean. I came back from that around Thanksgiving of 1963. We were in the Mediterranean in April of 1963 when the USS *Thresher* was lost. Our next port of call was, I think, the Thursday before Good Friday in April. We went into Monaco. That was experience of a lifetime, really.

It [was/is] the official residence of Prince Rainier and Princess Grace, and as soon as we got into port, [they] put their flag at half-staff. We were invited to go to their home for a Saturday night affair, at which a Monagast pianist was to play eventually, and television in Philadelphia [?]. David Niven was there, and so was Jessie Royce Landis, who had played Princess Grace's mother in *High Society*, I think the movie was called. It was quite an evening.

My skipper was actually born in England and came to the United States at age three. Johnny Johnstone. We went to have a beer in the hotel de Paris, in Monaco. While we were sitting there he said, "You know that gent over there is Edmond Murray, Winston Churchill's bodyguard? Let's invite him over for a beer." He went over and said, "You're Edmond Murray, aren't you?" He was. Edmond Murray joined us in a beer. He said, "Sir Winston's here in the hotel." After a discussion of a variety of things, Ed Murray indicated that Sir Winston loved westerns. We went back to the ship that evening. The next morning, we asked for volunteer movie projection operators. We asked how many guys wanted to show movies to Winston. Every one of them volunteered.

They went over to the flagship of the 6th fleet and got the best westerns that they could find. For the rest of our time that we were in Monaco, every morning, afternoon and evening, a movie projection officer or sailor went and sat with Sir Winston Churchill and showed him western movies.

They wouldn't allow people in uniform to go to Monte Carlo, and we were having social events for most of the wardroom when we had to be in uniform. I asked the wardroom if any of them would volunteer to turn their civilian clothes in so that the sailors could go ashore and go to Monte Carlo. Well, we gave them to the torpedomen in charge on watch in the forward torpedo room. Every afternoon and evening, seven suits of civilian clothes went ashore. They ended up in Monte Carlo. Troops went in there and had a wonderful time. Otherwise they wouldn't have been able to go in there, as they were in uniform. We had good cruise there.

INTERVIEWER: You had a chance to meet with Winston Churchill.

RADM MOONEY: Yes.

INTERVIEWER: Now, I understood he was like a night owl. He would be up until three or four in the morning.

RADM MOONEY: That could be. We didn't stay up that late with him, you know. I think most of our movie projection guys came home by about ten. He did three movies each day. We wanted to get home from that trip by about Thanksgiving. I was asked if I would like to take the USS *Trieste*. The reason for that was that I had headed in for an ocean PG and a request was sent to PG at Monterey. I had put in for the USS *Dolphin*. The *Dolphin* had slipped several times, and I found out that I had passed *Dolphin* by, as it turned out. I said that I'd love to go to the *Trieste*. I was advised by most of my friends, seniors and peers not to do it. It was sort of a dead end.

That tour on the *Trieste* changed my life. I went to it in January of 1964. It had a new bathyscaphe. It wasn't the original Piccard bathyscaphe. It was the USS *Trieste II*. It had a different hull. We had to work that up, and I did some scientific dives off of San Diego for geologists, physical oceanographers and marine biologists.

We found the deep scattering layer, lived in it one day and followed its migrations up and down in the mid-water. Then, we packed it up and sent it to the East Coast and went back there to look for the *Thresher*. The bathyscaphe had looked for the *Thresher* in 1963 and found some of the debris, but the hull hadn't been found.

Admiral Rickover's staff, of course, was anxious to find out if there was any radiation there. Also, Admiral Joe Grenfeld was anxious not to bring any further grief to the *Thresher* dependents, so they called it a 'research' operation rather than a 're-search' operation. It was under the auspices of ONR. Frank Andrews was our OTC. On about the 18th of August 1964, we found the hull. We took readings around the hull, but there was no radiation there. We were in good shape. We took water samples and all that. We came back from that and did a lot of dives for science.

INTERVIEWER: If I may go back, the cause of the *Thresher*'s loss was determined to be due to a ruptured pipe?

RADM MOONEY: It was a piping failure in the aft, yes.

INTERVIEWER: How was that determined? Was it from what you observed there, or were you able to bring parts up?

RADM MOONEY: No. We didn't bring any parts up. It was pretty much from what was observed. It was sort of like a crime scene investigation, or CSI, like you have on television these days. They put all the evidence together and came up with a piping failure aft. There was a

sealed brace joint on a seawater system. There were two valves before that. They were welded valves. There used to be a sea valve and a backup valve. Behind that, you could have your sealed brace things. I believe that one of those valves wasn't there and it [what is 'it'] went immediately to a sealed brace joint. The technique for measuring the bond in the sealed brace joint was, I think, faulty. It was the best that we had, only it had gave more of a bond that actually existed and that was what they felt let go.

In any event, I had friends on there. I saw the wife of my closest friend this last weekend at the 50th reunion that we had in Annapolis. Her name is Edna Dena (?). She lives in Rye [where]. Her husband was lost on the *Thresher*. I met with her son. It was several years before I could face her. Then, I was at a class reunion in Annapolis and came out of my hotel room and bumped into her in the passageway and we grabbed each other and stood there and cried. That sort of broke the ice, because I couldn't face that lady. But after that meeting, Mike's son asked to see me and wanted to know what it was like down there where his dad was. We had a long discussion about that. His son was at this reunion that I just came back from. They're doing well.

INTERVIEWER: Now, you didn't have all the technology we have today as far as search and navigation was concerned. Can you describe the typical search operation then?

RADM MOONEY: Yes, I can. As a matter of fact, I'm supposed to speak at a luncheon that's going to be in New London, on the *Alligator*. I'm not sure why I'm speaking, because Clive Custer and Bob Ballard are going to be there. I think I'm the comedy relief. In any event, one of the things that I want to talk about there is the technology that's available today as opposed what technology we had back in those days.

By today's standards, navigation on the bottom was not existent. It was done by eye. In 1963 and 1964, they dropped three-dimensional things with sash weights. They put a window

sash weight on them. They colored various colors and they were all numbered. From a surface ship, let them go so that they would be little avenues down there that you went around in a search. Of course, they went down through the water column much in the same fashion as leaves drop from trees. They didn't go down in an orderly fashion at all. They were all spread around the place with no orderly numbering or color system at all, and it was terrible. They impeded the progress more than they did anything else. But we, of course, were let off on the surface at a datum that they felt was the best datum possible for where the *Thresher* was.

INTERVIEWER: Was this for the ran (?) or something?

RADM MOONEY: Yes. There was a surface ship there and it dropped us off. The vagaries of the water column took us to different places between there and getting down [to] 8,200 feet. Once we get down there, we saw some light debris on a couple of dives, but we had a fire. We lost all propulsion power on the bathyscaphe on one of our first dives in 1964. We tried to reset the circuit breakers but they wouldn't reset.

It involved Larry Shoemaker, our chief scientist, McKenzie, and me. There was a little bit of current. Shot was a commodity in demand, because we used shot, you know, for ballast. We'd only brought so much shot with us from the west coast, and it was hard to come by anyway. They'd [who] steal all of our shot.

INTERVIEWER: Now, was the shot like BBs?

RADM MOONEY: Yes. The way you controlled the bathyscaphe I liken to a dirigible. A dirigible has a rigid gas bag. If you take the gas out of it, it retains its shape. With a blimp, if you take the gas out of it, the shape collapses. It's filled with aviation gasoline. But in there, there's a silo forward and aft that's full of steel alloy shot. At the bottom of that silo is an electro-magnet. If you have a current, the electro-magnet will magnetize the current in the orifice and it forms its

own valve. If you interrupt the current, the shot will flow like sand out of an hourglass and you get light. In the center of the bathyscaphe there was a tank that you could release the gasoline with. It was replaced by water, so you got heavier. It was those two things that played to give you the buoyancy that you needed, or the neutral buoyancy.

When you went down, there was some heating by the compression of the gasoline. On the bottom, there was a degree of cooling of the gasoline, so you got heavier. We were getting heavier, and thought it was just because of the cooling. When we surfaced, we found out that we had burned a hole in the hull and it was aviation gasoline that we were losing the entire time.

In any event, we stayed down for about seven hours and let the current take us, because we figured, "Why abort the dive and lose all the shot? Hopefully the current will take us where we want to go," and it did. We got into some pretty heavy debris and thought if we got underneath it, we would not be able to drive ourselves out.

When we got into where it was big, we decided to surface. Once we got to the surface, you had to come out of the bathyscaphe, go topside and shut two ballast tank vent valves on either end of it. When we did that, we were waist-deep in aviation gasoline. We saw the electrical distribution box burned open. A big cable that was about three inches in diameter had cooked like a hot dog. The skin on it was off. We'd obviously had a very large discharge fire, an electrical fire.

We went back to Boston and I immediately called the captain, Russ Bryan. He later became Chief NAVSEA. He was, I think, production officer of the Portsmouth Naval Shipyard. He said, "Come to Portsmouth right away. We'll help you." We went and got up there at about two in the morning. He had assembled a team of experts, his engineers. We told them what the problem was, and they said they would take care of it. They took the whole electrical system

apart in a month. They rebuilt it, tested it and took it apart. They took it to Boston, put it on the bathyscaphe and tested it. We went to sea again in a month.

During that month, Jennifer was born, my youngest daughter. The story I have just told you is one that I mentioned several years later to a person at the Pentagon. That person said, "Well, we've got a project that we want to name, and we have just gotten the name. We'll call it Project Jennifer." If the people that read this are interested, there's a book by the name of *Project Jennifer*.

INTERVIEWER: I've read that.

RADM MOONEY: It will tell them what it's about. At that time, of course, it was very classified. Anyway, we went out and made some more dives. On one of those dives, by luck, we landed on top of the hull of the *Thresher*.

INTERVIEWER: Was that the dive on which you'd lost power? You said you drifted.

RADM MOONEY: No. It was more than a month later. They had fixed the electrical system, and then we started diving again. On about the 18th of August, I think, we made a couple of dives after we'd been repaired. Frank Andrews, John Howland and I made the dive and we landed on the hull. We then saw why they hadn't been able to find the *Thresher* with sonar. It had gone down and dug its own hole. The best that way I can describe it is that it was sort of like a sand pit, and it had swished around and come to rest up against the wall of the sand pit on one side. The other side was totally open.

When we landed, we landed ninety degrees from the axis of the hull and could see the bottom on the open side, and we wondered why we couldn't get down to the bottom. Then, we were letting gas go and so on, and we couldn't get down there. We could see it about thirty feet

beneath us. We got a little bit of buoyancy, swung ninety degrees and there was the hull. That was when we first found out what it was.

It was a big hole in the hull with a piece of metal sticking up. Of course, to us, that piece of metal was a potential can opener for our 3/16-inch hull that we had [on the bathyscaphe?]. We very gingerly maneuvered around and got a lot of pictures of it. Then, we went down to the open side and scraped paint off the bathyscaphe on both sides as we went down in that hole. But we got fresh water, or salt water readings, which we brought back for radiation-measuring purposes.

INTERVIEWER: It was really a stroke of luck.

RADM MOONEY: Oh, yes. But it had dug a hole, so if you were off to one side of it and had sonar, you were shooting your sonar beams right over it, across the sea floor. In any event, that was over. We went back to San Diego and did a lot of dives for science. Then, they were going to do some reconfigurations on the hull of the *Trieste*. We lost the hydrogen bomb off of Spain. An Air Force bomber was re-fueling from a tanker and they collided and crashed. Three H-bombs went into the tomato fields of southern Spain and one went into the ocean. I was sent over there. I was the gent who had the responsibilities for [searches?] below 300 feet. A diver named Red Moody had the responsibility [for searches?] above 300 feet. I had the *Myzar* (?) with a towed camera sled. I had the *Aluminaut* and the Cubmarine. I also had *Alvin*. They were submersibles, except for the *Myzar*.

INTERVIEWER: The *Thresher* wasn't part of it.

RADM MOONEY: No. But the experience that we had with *Thresher*, of course, gave us some experience of how we should do it. Once we got over there, the first thing that was obvious was that there no common navigation system, so there were multiple contacts that couldn't be correlated to one another. They set up a good, short baseline navigation system over there on the

surface, at least. Then, we had pretty good data that had been sort of overlooked. There was a fisherman named Seymour Otes (?), who was sort of the head of the fisherman's union in Pompaneria or Lagartera, Spain. They were upset because they were denied fishing in the area. They thought there might be radiation and that sort of thing.

However, before I had gotten there, they'd taken him to sea because he said he saw half a man (?) in a parachute go in the water. They thought that might be the bomb. He lined up the mountains appropriately and said, "It's right here." They marked that spot, but the Navy folk who were there and used to very precise navigation and cuts, not just eyeball navigation, discounted what he had given them.

But going back to Portsmouth, New Hampshire, the lobster fishermen there navigate like Seymour Otes was navigating in Spain. After I'd been there a couple of days, I went over to the bar in Lagartera with John Lindbergh. The Air Force gave us a Jeep to drive there, and we found Seymour Otes in a bar and got him to sea on a minesweep[er]. We said, "Tell us again where the bomb went in," and he said it was about ten yards from where he indicated the first time. Immediately, that became a firm datum.

We figured that if the parachute on the bomb did not open, it would have gone down like a rock. But if it had opened, it would have gone with the current. We figured out what the currents were. That gave us a search area, and we made some segments for that search area and started diving in them. The *Aluminaut* was not very maneuverable, so we gave it the areas that were more flat and *Alvin* got the areas that had really rough terrain. *Alvin* found the bomb. Then, we tried to recover it. We hooked a grappling hook into the shrouds and straps of the parachute. Upon lifting, they cut through those shrouds and straps. That can be done on anything. It doesn't have to be terribly sharp. But you can cut through the nylon very easily when it's under tension.

We dropped it and the parachute billowed and the currents took it away. It took us a couple of weeks to find it again.

One thing that I had been taught when I was in small vehicles [training?] was to never have two small vehicles in the same area. But I violated that. *Alvin* was down there. She found the bomb and was sitting beside it, but it she was almost out of battery power. We sent the *Aluminaut* down and had a rendezvous at the bomb with both vehicles' lights on.

Normally, with backscatter, sixty feet is the world, you know. Because the two vehicles had their headlights shining at each other, like on the road in a storm, they could see each other further away. They made a rendezvous and *Aluminaut* came in and babysat the bomb until *Alvin* could get back squared away. Then, we put a marker down beside the bomb so that we could get back to it more easily. I guess that was the first time we really used underwater markers like that. That gave us an assist. We had a cooperative target down there to go after.

This entire story is compressed. I figured out how many days we were doing this. We also used *Curve*, which was an ROV that recovered torpedoes at the laboratory here in San Diego. It went in close with the grappling hook to get a certain number of straps and shrouds on the bomb so that we had a couple hundred percent safety guard because we were going to lift it this time. But the parachute billowed because of the wash from the *Curve*'s propellers. We could see the pictures on the surface with the cameras, so I said, "Drive it in there."

They drove *Curve* into the parachute and got it totally tangled in it. Admiral Guest, bless his heart, was an aviator, and this was all foreign to him, you know. But he had been the one who told us how many straps and how many shrouds we should have. I could not tell him I had that number of shrouds and that number of straps, but I felt pretty confident that we did. We had totally entangled the *Curve* in the parachute, and he said, "Cut it loose."

Some of my friends at the Naval Electronic Lab, which is now the Spaywar Center (?), were there with the senior civilians whom I had known for a while. We had some discussions, Admiral Guest and I, as we went along. I think he respected my advice because I was about the only guy there who had done any deep sea work. They said to go in and convince him otherwise, because they didn't want to cut it loose. Neither did I.

INTERVIEWER: Why did he want to have it cut loose?

RADM MOONEY: He wasn't assured that there were enough of the straps and shrouds to lift it safely, you see. I went into the wardroom on the ASR. I think it was Blackbart ['Black' Bart?] Bartholomew, in his book about divers who quoted me or maybe Alvin quoted me in his book on the Sea Baby. In one of those books, I'm quoted as saying, as I went into the wardroom, "This is dumb as hell, sir," which is what I said.

Admiral Guest and I had a discussion for about three hours, and it was heated. I was a lieutenant commander. I figured, "I'll never get anywhere after this." We had a heated discussion for about three hours, and finally he said, "All right, go ahead," and we lifted the bomb. Then, we had to display it before the whole world. The news media was there.

INTERVIEWER: I suspect there was a lot of pressure from Washington during this whole operation.

RADM MOONEY: Yes. A couple of the sidelines were interesting, I think. Every day, Admiral Guest had to send a secret message on the status of the operation. We knew that there were e-link stations that the media had set up along the coast of Spain. They were also listening to our UQC transmissions between the ship and the submersible, and I stayed off the cruiser most of the time. We had established a code and changed it everyday. A person on the sub that was diving that day had a copy of the code. I had a copy of the code, and a person who was in the CIC on the cruiser

with Admiral Guest had a copy of the code. It was made up of the colors of the rainbow and the characters in the *Peanuts* comic strip. 'Lucy-Purple' meant something, for instance. We could talk to one another with this code. It changed every day. He was sending secret messages to Washington.

The next day, *The Paris Tribune* had almost verbatim what he was sending in the secret message. Guest decided that every day, he was going to take one ID (?) off the message. The day he took the ID for our Ambassador from France, it didn't appear in the *Tribune*. He put it back on and it appeared in the *Tribune*. He took it off and it there was no story in the *Tribune*. He said, "I'm not going to send him anymore messages." Biddle Duke was the Ambassador.

At about that time, we had dropped the bomb. Biddle Duke insisted that he get the word by such and such a time, as to whether we had found find the bomb or not. The day that we found it the second time, I wanted to make darned sure that we knew where it was. We had all the ships go over a buoy, calibrate their navigation equipment and come out over the site. [I/the ships?] was talking with this code to the submersible to find out what the slope was, and all the questions I figured Guest would ask me, and I didn't know that he had a deadline.

At about a quarter to four on the day he had to tell Biddle Duke the answer, I spurted this information into the cruiser, and he received it. Later, he got a hold of me and told me how he had a deadline and we [had to] beat it by 15 minutes or he was going to have to say no. That was a tangent on that whole operation. Do you have any more questions?

INTERVIEWER: I know that Hollywood took a lot of artistic license in the movie *Men of Honor*.

RADM MOONEY: Yes.

INTERVIEWER: Was there any indication that the Soviet Union was in the area?

RADM MOONEY: Yes. There was a trawler. A trawler came through one day and a submersible was on the bottom. I think it was the ASR, or it may have been the USS *Hoist*, a salvage ship. But I asked them to go out, shoulder that trawler and do everything short of a collision to get them out of the way. They did that and the trawler moved out because we didn't want them operating overtop the submersible. That was the only evidence that there was any Soviet reaction there.

INTERVIEWER: The movie has a scene of the bomb being brought up and the diver, Chief Brasier. Was it actually during the lifting of the bomb that the cable broke or let go?

RADM MOONEY: No, it wasn't. That was Hollywood. There was good deal of fact in that movie, but there was some Hollywood in it, too.

INTERVIEWER: My understanding is, being the officer in charge of say, the *NR-1*, you were on the upward track in the submarine community. Was the *Trieste* looked at with the same kind of detail? Were you really on the upward track to being the officer in charge of the *Trieste*?

RADM MOONEY: No. Remember that I mentioned to you that people advised me against going there because it was sort of dead end. Don Walsh had already made his dive to the bottom of the ocean, seven miles down. What's left type things [What was left to do?]. It seemed like an adventure that I wanted, and so I was glad to do it. You can see it changed the rest of my life, because after the time I had *Trieste*, I got involved in deep ocean work, and here I am at 72, and I'm still in deep ocean work.

I had command after I got home from Palmyrus. I had a diesel submarine in the Pacific. Then, I made a couple western Pacific deployments during the Vietnam War. I came back and served in the Pentagon. The legacy of the *Thresher* was the sub-safe system, designed to make our submarines safer. They really examined the whole slew of the systems down there and found

several that were in need of enhancement. Those changes were made and are apparent in our submarines today.

The deep submergent [submergence?] systems review group, Admiral Stephens' group, came out with a report on the *Thresher* and the improvements that ought to be made in search, inspection, recovery, large and small object recovery, diving and man [in?] and the sea. My first duty in the Pentagon was to go through that report. It wasn't finished then. But I worked with the people on the report, and went through it and implemented the elements of that report.

After that, I went out to Sub-dev (?) Group One and had to live with my sins. The things that I had sent out of the Pentagon were things I had to live and comply with out at Dev Group One. Before I left the *Trieste*, it had moved from the laboratory at the NEL, or the Naval Electronics Laboratory, to the fleet. It was a fleet asset that later became the nucleus for Sub-dev Group One, which is now Sub-dev Five.

After a couple of tours at the Pentagon and the Dev Group, I had a shore command in Charleston. Then, I had another tour at the Pentagon. Then, I had one at the Naval Training Center in Orlando. In Charleston and Orlando, I was sort of like a city manager. At the naval station in Charleston, I was like a city manager with a waterfront. At the training center in Orlando, I was like a city manager of a base at which your main battery was schoolhouse, you see.

After that, I went to Washington and was assigned the Drop 11, which was total force planning and included education programs and training. I was there for three years. Then, I went to the Oceanographer of the Navy for three years. Then, I went to Chief of Naval Research for four more years.

My duties during the last 25 years I was in the Navy were part of the things that I had learned when I went into the deep ocean program in 1964. Since retirement, I've been able to work as a consultant with companies that have been involved in deep ocean work, and I am still doing that.

A couple of years after I got out of the Navy, my consulting was interrupted when I had an opportunity to go to Harbor Branch, and I was the president and managing director of Harbor Branch. That was fun, because they had a couple of submersibles there that could go to 3,000 feet, and other assets and good scientists. I've pretty much run out of lies, now.

INTERVIEWER: You have certainly had a very interesting career. You mentioned Project Jennifer. I'm kind of interested in that. When was that, in 1975, or so?

RADM MOONEY: I think it was in 1972.

INTERVIEWER: Did you have any involvement in that, other than the fact that the project was named for your daughter?

RADM MOONEY: No. I knew of it, and it was named for my daughter. I forgot one item. When I was chief staff officer at the Dev Group in 1972, the United States had lost a classified package in the Pacific, and we had to go out there and find it and recover it.

It happened in April of 1972, I think, at about the same time Jennifer was going on. I was OTC. I didn't make the dive, but *Trieste* went out there. We didn't search for it. Navigation had improved tremendously. I said that technology was bad. Fred Spiese (?) from the Marine physics lab searched for it and found the item that we were to go after. He gave me the position of three transponders on the bottom of the Pacific, on the back of an envelope, literally. He said, "This is where you have to go." We went out there. The first time we got into the area the *Trieste* was

being towed by the *Apache* and it was in an ARD, so that was sort of home [?]. I was OTC. I wasn't skipper at the time.

We sort of skidded into the position where we thought we were [supposed to be] because we wanted to make sure that we knew what the wind and currents were. The first time we pinged we found all three of those transponders. There had been a lot of advances between 1964 and 1972. After that, we were at the whim of the weather. We were just about in the place where the trade winds and the Siberian lows fought for control of the weather there. It would change in a matter of minutes. But we went out in October. The weather window pretty much was shut by the time we got there, and it took until April, but we weren't out there all that time.

In April, we went down and recovery it. It was at 16,400 feet. At that time, and for about ten years after that, that recovery was in the *Guinness Book of World Records*. I think it was the deepest recovery that had been made up to that time.

INTERVIEWER: It was in the *Guinness Book of World Records* even though it was a classified dive?

RADM MOONEY: Yes. We said that it was a classified package.

INTERVIEWER: ONR has been involved, of course, in a great deal of deep ocean exploration. What did you see, as the CNR, during your detail there? What was going on?

RADM MOONEY: We founded *Jason*. Of course, we also funded *Alvin*. We needed to have a test bed to test *Jason*. Robert Ballard and I had been friends for a long time. Ballard was over by the Azores and was coming home. We convinced John Lehman, the Secretary of the Navy, that rather than build the test bed to test *Jason*, it might be wise to sort of slip by where we thought the *Titanic* was and test it there. That was all tongue-in-cheek. But on the way home, Ballard went by the place that was the most probable site of the *Titanic* and found it.

INTERVIEWER: He wasn't actually an exploration to find the *Titanic*? It was just on the way home?

RADM MOONEY: It was just on the way home. The federal government really didn't fund the search for *Titanic*. But since we were testing our *Jason*, we swung by there to see if he could find it. He swung by there and found it. I met him when he got into Woods Hole. I don't think that Bob would be opposed to my telling you this. Like most people who have achieved some of the things that Bob Ballard has achieved, there is an ego there. But people need to know the other side of that. I was at National Geographic when he gave a talk on the *Titanic* and presented the pictures he had. He got to the stern of the *Titanic* and he stopped and changed the subject very quickly. He'd read so much about the *Titanic* and it almost got as though he knew the personalities of everybody there [on the *Titanic*?].

The stern was where everybody went to try to save him or herself, so there was chaos on the stern of the *Titanic*. That was really where people died. When he found the stern on the *Titanic*, they immediately stopped and had a memorial service. That was the first time that the *Titanic* was found, but he couldn't talk about it. Later on, when I was the Chief of Naval Research, he came by the office and I said, "You seemed to choke up when you were talking about the stern of *Titanic*." He told me that he did.

I told him that I couldn't bear to see Edna Denoa after I had found the hull of the *Thresher*. The two of us sat there in my office. I cleared my schedule all that afternoon, and the two of us sat there talking about what those two events meant to us. We cried like babies, talking about it. It was really horrible for me to see the way *Thresher* went, and it was horrible for him to see the stern on the *Titanic*. [insert] When he came back to port about two weeks before that, I'm

trying to think of the gent's name at NRL. He'd gotten the Nobel Prize in chemistry. I'm trying to think of his last name.

INTERVIEWER: We'll find it and put it in. [insert]

RADM MOONEY: I left my office and went over to NRL to congratulate him and asked, "What obligation do you feel to the youth of this country?" He hadn't thought about that. Later on, during the National Science Fair, I invited him and he gave out all of the ONR scholarships to the kids. His wife's name is Anna. She might well someday get the Nobel Prize. If she does, it will be the first husband and wife since the Curries, I think.

Anyway, when Ballard came back from the *Titanic*, I asked him the same question. He said he hadn't thought about it. He said, "I'll tell you in six weeks." In six weeks, he came up and outlined the *Jason* program. That's still going well. Kids all over this country and other countries are able to witness things on the seafloor and control ROVs on the bottom, halfway around the world. He's really done a lot to educate youngsters on the ocean. That's the kind of guy and sensitive person Bob Ballard is.

INTERVIEWER: That's an interesting perspective, because I read a book that Bob Ballard had written about the animosity, I guess, at Woods Hole, that he felt with the faculty and the fact that many felt he wasn't doing real science.

RADM MOONEY: That's right.

INTERVIEWER: There was a lot of animosity.

RADM MOONEY: Yes. Well, I've talked to a lot of people who think he does 'gee-whiz' science. My answer to that is it may be gee-whiz science from your perspective, but since Jaques Cousteau, who has enlightened more people in the world to the importance of the ocean to

mankind than Bob Ballard? Maybe he is even equivalent to Jacques Cousteau. You probably get money to do your science, so don't knock Bob Ballard.

INTERVIEWER: I guess that one of Sub-dev Group One's primary missions was submarine search and rescue. Deep Submergence Rescue Vehicles (DSRVs), of course, are going out of service. There's only one left now, I guess. They are being replaced by another type of submarine system. First off, what's your opinion about the utility of the DSRVs while they were in service?

RADM MOONEY: While they were in service, they were the rescue system for the world, for submarines. To every nation that ran submarines we gave the template they needed to build their hatches, and if they built those hatches to that template and had a problem, we could rescue people from their submarines. It was for more than just the United States.

Of course, we've tested it on many of our allies' submarines, in transferring people and so on. Those manned vehicles were there, the *Turtle* and the *SeaCliff*. The *Turtle* and the *SeaCliff* were built for ONR as autech (?) vehicles and someone forgot to put the money and billets up for people to operate them. Bill Cyril (?) used to be the supervisor of salvage and is still a good friend of mine. Bill called me one day and said, "You know it's going to be a real black eye for the Navy if they take the *Turtle* and the *SeaCliff* as soon as they're finished at the Electric Boat Company and put them up on the block." We were expanding the *Trieste* group and training people to run the DSRVs, so we carved out of those the people who ran the *Turtle* and the *SeaCliff*. They became the workhorses of the deep ocean fleet for a long time. I have a story that I think will interest you. We also had all of the training for SAT divers there at the Dev Group.

INTERVIEWER: IX501?

RADM MOONEY: IX501. On one Friday evening at five, I was still there doing some work and the yeoman answered the phone and said that someone wanted to talk to me. Someone got on the

phone and said there was a bomb on the IX501 it was going to go off at seven. We had seven divers at 300 feet, coming up from 1,000 feet, on the IX501. I knew where the divers in that group had their beer on Friday night. It was at the Brigantine here in San Diego, off by Shelter Island. We called there and got all the master divers back. We had about seven or eight doctors, submarine medical officers, and we called call their homes. Their wives were home, but they weren't home yet. We said, "When your husband gets there, turn him right around tell him to go back to the Dev Group."

Once we had assembled all the doctors and all the master divers, I asked, "What do we do?" They had a caucus, and talked and talked and talked. Their recommendation to me was to get an ambulance to the IX501. Get the submarine tender man [and the?] their hyperbaric chamber. Have the police on the base clear all of the roads between the IX501 and the submarine tender.

They put those seven divers on the surface. They had been at 1,000 feet for over a month and were decompressing at 300 feet, which normally would have taken three more days. They put them on pure oxygen, brought them up and put them in the ambulance. They drove them down to the submarine tender and put them in the hyperbaric chamber there. We squeezed them down a little bit further than 300 feet, and not one of them got a twinge.

INTERVIEWER: How long was it between the time they came up and the time they were back at pressure?

RADM MOONEY: It was probably less than twenty minutes. That was the first time in my life that I sort of handed my commission to everybody else, the divers and the medics there, because I didn't know what to do. They were the guys who had the knowledge. I didn't have that

knowledge. I depended one hundred percent on their best advice as to what we should have done. I did that and we lucked out. None of the divers were hurt. There was no bomb.

INTERVIEWER: We can edit this next question out. I've read that the DSRVs' real mission was not submarine rescue. Would care to talk about that? If not, I would understand.

RADM MOONEY: I think that's false. The real mission of the DSRV was submarine rescue.

INTERVIEWER: What's your opinion of the new submarine rescue system that is presently being developed?

RADM MOONEY: It has some integration problems that need to be overcome. It can rescue people at a little bit larger [?] angles than a DSRV system. Since we put the ASRs out of commission, we have no place to put the rescuees these days. This new rescue system provides a place to put the rescuees so that they can make a second trip down to bring up some more rescuees. In that sense, I'm not sure that whoever made the decision to put the ASRs out of commission really recognized that they were really cutting that capability. With the chambers that are transportable by air, they can put the people in and have a place for them to be while the rescue system goes out and makes a second and third and fourth trip. That's certainly something that is absolutely needed today.

INTERVIEWER: Now, there is the air-water interface that you have to go through. I guess that you did not have that with the mother sub before the DSRVs.

RADM MOONEY: That's right.

INTERVIEWER: When you were transferring to a mother sub, the crew would be under pressure with the DSRVs, though.

RADM MOONEY: That's true.

INTERVIEWER: There was that limitation, then.

RADM MOONEY: The limitation is that if a downed submarine or damaged submarine has people in it who are at an elevated pressure, they have to be discharged in an equivalent elevated pressure to decompress them, and we can't do that today.

INTERVIEWER: Along the same lines, there is the equipment that has been developed for submarine rescue, such as the atmospheric diving suit and the side suit. Is this going in the right direction?

RADM MOONEY: I think so.

INTERVIEWER: In your particular field, what has proven to be the one thing that has brought you the most satisfaction, I guess, in your entire career?

RADM MOONEY: That's hard to say. I've had so much fun.

INTERVIEWER: It sure sounds like you've had a lot of exciting experiences. Do you have any regrets or disappointments related to your career in undersea activity at all?

RADM MOONEY: Yes, but I'm not sucking my thumb. I put in for that ocean PG. I never got it. I never got a post-graduate course. Every time that I was selected for post-graduate school, it was usually while I was in the Pentagon, because I was sort of one of a kind. In the Navy, if they say can't spare you then you can't go. I never got to go to a PG course.

I became a sub-specialist in oceanography, and then a proven sub-specialist in oceanography. But I don't have a master's degree or a doctorate. I wish that I had been able to get a post-graduate degree. But I look back to see which tour I would have had to give up in order to get that degree, and I can't think of a tour that I would have wanted to give up.

My work now is with the National Research Council, thinking about [?] the National Academy of Engineering. I work with Ph.Ds all the time, and they don't seem to look down on me for not having a degree. I've had a lot of practical experience.

INTERVIEWER: If you had your career to live over, and thinking in terms of constraints under which you developed your career, what personal decisions would you change and why?

RADM MOONEY: I'll probably sound very self-satisfied, but I don't think I've got any regrets in that regard.

INTERVIEWER: That's fair enough. Of all that you did during your career, what would you rate as the most significant in advancing Navy undersea technology?

RADM MOONEY: Well, it's sort of a continuing effort. You can see that I was in at the very beginning of the deep ocean program in the Navy, other than the *Trieste*, when it expanded. I was there when all of the new things started and I got some new submersibles and started saturation diving. Started [?] other than *Curve*, we got a series of ROVs and so on, which has benefited the offshore oil and gas industries, not just the Navy.

The flow of technology for a while was out of the Navy, but I think that now there's a flow going the other way, from the offshore industries into the Navy. If you look at all of that, it has had a great benefit to mankind, I think. I have sort of have grown with it, or it's grown with me, whichever way you want to look at it. It's a whole continuum of things that brings me from first being a submariner [to my present position], or my toilet training up to today, as I am now consulting on those things.

INTERVIEWER: Along those same lines, you're saying the Navy has contributed a lot toward the offshore oil industry and so forth. Since the first half of the century, the Navy was the world leader in diving and underwater exploration.

RADM MOONEY: That's true.

INTERVIEWER: Since that time, many Navy divers and leaders in this area have gone on to the commercial diving field. Currently, neither of these facts seems to be prevalent. What are your thoughts on that? It seems as though the Navy has lost that leadership role.

RADM MOONEY: Well, let's talk about the transition first. Many of the people who were hard-hat divers in the Navy were exposed to saturation diving. Some of them became saturation divers. They went to work for civilian dive companies when they retired from or got out the Navy. They became instructors and some part of the leadership of those civilian dive companies.

They continue to contribute to the civilian side of diving, using the expertise that they got in the Navy. They were part of the transition. It wasn't just the equipment. It was the talent that those people brought to the civilian dive community. Now, as the offshore industry moved deeper, the hard-hat divers couldn't go that deep, so the industry went to saturation divers and then they decided, "Hey, maybe we can use ROVs to do this." They are going to use ROVs rather than divers, but that's a continuing transition.

That whole industry was able to grow because of the foundation that was in the military. It was inevitable. Because that offshore industry is so important to the world, it became inevitable that there was going to be more money for development, equipment, research and those things. That is only a small segment of what's important to the Navy. Now, the flow of technology is from the outside in. That doesn't bother me at all that that flow is coming in, because you can think back and well, we started it. You can look around today at the offshore operations and the people who are working on very deep operations, and they're sprinkled with Navy folk who are there in leadership positions, still doing it, only on the civilian side.

INTERVIEWER: As the former CNR and a person with the leadership role that you are now taking in consulting, what's your opinion as to what we in the underwater world should be looking for in the future? We should be looking ahead, I guess.

RADM MOONEY: We need energy. We need a high-energy-density power source. That limits all of the things in the ocean right now. The automobile industries and other industries could dwarf anything that we could put into the research of high-energy-density sources, so we've got to watch the advances in those industries very carefully and then try to transition that capability into the ocean. There's our big one. That's a hard nut to crack.

INTERVIEWER: I would say you've got a lot to reflect on, but I don't think you're the type of person who sits back and reflects on what you've done in the past. You have certainly had a very full and satisfying career. I thank you for sitting for this interview.

RADM MOONEY: It was my pleasure. It sort of surprised me. Some things came up that I hadn't thought about for a long, long time. You can see that I just had a lot of fun. Something that's sort of interesting is that the kids that are in the industry today are just so bright. They are so much brighter than we were because, of course, they didn't start from zero. There was some foundation upon which they built their intelligence. They're just so bright. It also appears that they also have enough wisdom not to toss the oldsters out, because in many cases, they know that they don't have the experience. They ask the oldsters to be on advisory committees to help them, you know. But they're still the bright leaders. They recognize that the wisdom they lack is in some of the oldsters, and so they ask us for advice from time to time, to be on advisory committees and so on, and they seem to listen. That's good.

INTERVIEWER: That is good.

RADM MOONEY: I forget the date, but it was just before I got out of the Navy. I was asked to speak at a *Squalus* reunion. I went to Portsmouth and spoke to the assembled *Squalus* survivors. I think I've told you this story, but I'll redo it. I really wanted to recognize the divers who made the dives on the *Squalus*, and I didn't know that they were there, so I talked about the divers and what they did, saving lives and so on. The guys from the *Squalus* started smiling. When the thing was over, Captain Naquin, who was dead the year after, came up to me and said. "I'd like to have you meet these folks," and he had three of those divers there. They were the same family. They had become that over the years. He introduced me to three of those guys, two of who got the Congressional Medal of Honor, I think. I know one of them did. Naquin said, "Those guys you were talking about are right here. They're part of our crew." He introduced me to the divers. It was important to me, because I saw the *Squalus* when I was a kid, and I told them about that. The next year, Naquin was gone.

INTERVIEWER: Since this symposium, there have been four people who died. It was very fortunate that we had the symposium when we did.

RADM MOONEY: If you talk about the *Thresher*, most of the people with whom I've talked have never heard of it. They were born after it, you know. We tend to forget, with all the time that has passed and so on. But my kids remember it. I know that.

INTERVIEWER: I know with my students, when I talk about the *Squalus*, sometimes I'll see some blank looks on their faces. They have never heard about the *Squalus* and what happened. I think it's good to preserve these stories and retell them.

RADM MOONEY: Oh, yes. There was an O-9 in there, too, that I remember as a kid. I can't tell you what date it was roughly, but I remember it. It was almost 25 years from when I first saw the *Squalus* stick its nose up, and 25 years later, I was out looking for the *Thresher*.

INTERVIEWER: You mentioned you were on the *Tang*, as well. Did you talk with Clay Decker at the symposium a few years ago?

RADM MOONEY: No.

INTERVIEWER: Clay died a few months ago.

RADM MOONEY: Oh, did he?

INTERVIEWER: I guess he was the last surviving member who made the ascent.

RADM MOONEY: Yes. That was the old *Tang*, wasn't it?

INTERVIEWER: Yes.

RADM MOONEY: I was in the new *Tang*, 563. There was a series. There was the *Tang*, the USS *Trigger*, the USS *Trout* and the USS *Wahoo* or whatever.

INTERVIEWER: The original *Tang* was sunk in World War II.

RADM MOONEY: That was the *Tang* that he was on.

(Whereupon, the INTERVIEW was concluded.)

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About 16,000 words

SUBMERSIBLE BASTARDS
UDT 2/4, Little Creek, 1947-50
A Memoir

I make no claim that this is a history of Underwater Demolition. It is, at best, a personal memoir, my recall of events as I experienced them while assigned to Underwater Demolition Team TWO at Little Creek, Virginia from April, 1947 until June, 1950. Midshipman School taught me that Navy officers should never keep journals or diaries and the lesson stuck. So, lacking all but a handful of old photographs and the "sea stories" exchanged with others over the years, I can draw only on what I remember.

Oh, I have plenty of memories; it is their organization -- or disorganization -- that is the problem. Events shift from place to place, from one submarine or APD to another; names and faces refuse to correlate; chronology won't let itself be fixed either in reliable sequence or to dates on a calendar. This is probably true of a lot of autobiographical writing. Under the best of circumstances, memory becomes unreliable as we twist events, circumstances, participants to fit what we want to believe. Add to that the porosity of time -- more than fifty years in this case -- and I am not sure of what is left of reliability. In the end, my criteria of reliability more often than not are: this is the way I remember it; it seems logical; it feels right.

So, why bother. I believe that the period between the end of World War II and the beginning of the Korean War was crucial to the development of what is now known as Navy Special Warfare because it was a period in which that development might well have halted. It was a period when the very life of UDT was threatened, when there were only some 2-300 UDT officers and men in the entire Navy, when many in the Navy questioned the need for unconventional characters running around in greens and sand shoes, when service in UDT imposed limits on career advancement, when material support was niggardly at best. There was no career path in Special Warfare then; the Bureau of Naval Personnel limited Regular Navy officers strictly to three years in UDT and enlisted men were handicapped in their advancement efforts by chances to gain shipboard experience in their rates. Perhaps an incident which probably occurred in the Fall of 1947 or early 1948 illustrates the tenor of the times for UDT. Rear Admiral Draper Kaufman, the "Father of UDT" paid a visit to Little Creek. Rip Talent and I accompanied the Admiral to the O-Club for a hamburger and beer that noon. During our lunch, Rip asked the Admiral what his career advice he had for UDT officers. The Admiral's response was prompt and short: "Get out of UDT." (The difficulties of the period are accurately and vividly described by Don B. Belcher in "Dedication I" of his book, Fifties Frogs, Journal of the Underwater Demolition Teams.) UDT officers and men from both the East and West Coast

teams hung on, though, so that the legacy from the Naval Combat Demolition Units of World War II to present day SEALs remains unbroken.

The period is also important because it marked the submergence of UDT, the development of a capability to remain underwater for more than the span of a man's breath, the capability to operate from submerged submarines. LCDR F.D. Fane, commanding the UDTs at Little Creek recognized that UDT had to go truly underwater, that the conventional beach reconnaissance/obstacle clearance missions of UDT had to be expanded if UDT was to survive. At Little Creek, what became known as the Submersible Operations Platoon (SUBOPS) came into being to pursue new techniques and tactics in underwater operations under Fane's direction and leadership. Fane didn't exercise his direction and leadership from behind a desk; he was there in the water with SUBOPS, usually going first. I was fortunate enough to be assigned to SUBOPS from its inception until I was ordered out of UDT. Consequently, the focus of this memoir is on SUBOPS and my experiences with the men of that unit. This focus, however, is not intended in any way to downgrade or detract from the accomplishments of all the other UDT officers and men, both on the East and West Coasts. While we "Submersible Bastards" were playing our games, the rest of the officers and men of UDTs 2 and 4 at Little Creek, of UDTs 1 and 3 at Coronado, California were working under the same difficult circumstances to keep alive in an unbroken tradition what has come to be known as Navy Special Warfare, exemplified today by the U.S. Navy SEALs.

In the Spring of 1947, I made my escape from an old AP on which I was the most junior officer by volunteering for Underwater Demolition. In April of that year, I reported for duty to UDT2 at Little Creek, Virginia as an officer trainee in the first postwar UDT training class. I was a Lieutenant (junior grade) at the time. (That class and several subsequent training classes remained unnumbered, a source of considerable confusion at reunions in later years, as old UDT types argued about who came first among postwar replacements.) LTJG Allen Jones, Jr. and ENS Richardson reported for training at the same time along with about 40 enlisted personnel.¹

At the time I reported, LCDR F.D. Fane was Commanding Officer, UDT 2 and the senior UDT officer on the East Coast. (I don't believe that COMUDTLANT had been formalized yet.) LTJG "Ski" Wryczinski, a former Yeoman, was Executive Officer of UDT 2. LT (or LTJG, I'm not sure) "Hal" Iverson commanded UDT 4. Among the other wartime officers in the two teams at that time were LTJGs Carson R. "Rip" Tallent, Bill Mason and H.L. "Gary" Garren, Jr. Gary Garren was deployed to the Antarctic with Team 4 at the time. It was Garren, as CO, who had brought the newly designated UDT2 from Coronado, California to Little Creek, Virginia. Garren and Iverson not only had to beg for office, warehouse and barracks space from the commander of the Little Creek Base but also establish the UDTs as independent commands on the base. When a UDT man was put on report by a Base MAA for being out of uniform (wearing greens instead of dungarees,) Garren had to convince the base commander that he, not the base commander had punishment jurisdiction over the UDT man. Fortunately, Garren was able to produce a letter from the Navy's Judge Advocate General assigning punishment jurisdiction to the designated

¹ I will use rank or rate held at the time throughout this memoir.

COs of UDTs. Shortly thereafter, F.D. Fane arrived to assume command of UDT2 and UDTs, Atlantic Fleet. Upon Garren's return from the Antarctic and Ski Wryczinski's departure to civilian life, Garren became Executive Officer of UDT 2.

Even before I met Garren, I was in awe of this wartime officer who was off swimming around in Antarctic waters. But as soon as he returned, we discovered that we had received our commission in the same midshipman training class at Plattsburg, N.Y. We soon became the closest of friends and remained so until his death in 2000,

^ If there was one officer who all of us trainees held in awe, it was Rip Tallent. He was the Training Officer for that first postwar class and he demonstrated to us from the outset that he wasn't to be toyed with. But we all respected him as a fine officer and, when we weren't doing pushups or sand-running, a friend.

We trainees stood in awe of the senior enlisted men of the teams perhaps even more than of the officers. After all, it was the enlisted instructors who ramrodded us through most of our activities, who stood over us shouting at us to get moving, who harassed us constantly and laughed when we moaned and groaned. Still, however much we felt put upon, we could never forget that both the officers and enlisted men who were pushing us had earned their qualifications during wartime and had experienced in combat that they were trying to teach us in peacetime. Among the combat-tested men who were our instructors were MRC "Al" Foster, GMC John "Andy" Devine, YNC Jack Riggan, GM1 Sam Bailey, GM1 Robert Winters, EN1 John Koerber, BM2 Joe DiMartino, GM2 Hugh Peddy, GM3 "Benny" Sulinski; many others, of course, but memory fails.

If that training is for me, now, a blur of fatigue, fear, fun and exhilaration, three events stand out in memory:

- The Mile Swim (without fins) required to qualify for fins. Rip Tallent had us far out in Chesapeake Bay for about three hours, swimming against the current while successive schools of stinging sea-nettles drifted over and around us. I can still see Rip standing in the bow of an LCPR shouting, "SWIM," when we complained about the sea nettles. As for the current, I don't think we covered much more than a quarter of a mile over the ground in the entire three hours before Rip finally decided that we had swum the "equivalent of a mile."

-Then, there was the day that ENS Richardson taped a 2lb. block of tetrytol against the web of a 90 lb. jettied-steel rail on Beach 7. Who could forget the look on Commander Fane's face as he picked up the telephone to croon "Helooo" when the Base Duty Officer called to complain that an eight-inch piece of heavy shrapnel had just penetrated the roof of COMPHIBTRALANT's quarters and ripped a chunk out of the mantelpiece over the admiral's fireplace.

- One day toward the end of training, the class moved across the Bay to Fisherman's Island for field exercises. That night, Gary Garren and Hal Iverson decided that it would be a good idea for some of us to go back across the Bay to infiltrate the Amphibious Base on a reconnaissance exercise. We made it into the base undetected -- no great feat in those days -

- and split up into pairs to cover assigned targets. BM3 Frank Kappesser and I spent a couple of hours lying in a tulip bed outside the OOD shack at the Main Gate, making notes on everything that went on and all that a sleepy security crew said. There is a story, quite often repeated at reunions, that a sentry came out to relieve himself on me while I remained motionless and undetected. I remember vaguely a sentry coming out and relieving himself in close proximity but, perhaps due to some phenomenon of psychological denial, don't remember getting hit.

But the coup of that night was the pair (names unrecalled) who made their way into the quarters of COMPHIBTRALANT and are reputed to have chalked, "UDT was here" on the foot of the bed occupied by the admiral and his wife. COMPHIBTRALANT did have his problems with us.

It is, perhaps understandable that in the conventional Navy of that pre-USS COLE, pre-9/11 era, substantial segments of the Navy's hierarchy considered UDT as undisciplined trouble-makers who had no legitimate function in future naval warfare but the Navy was to learn better..

With training completed in June, 1947 and UDT qualification in their records, the members of that first postwar training class settled down to become full-fledged members of UDTs 2 and 4. Al Jones and Richardson were assigned to UDT 4; I landed in UDT 2. We were soon to learn that, despite so many questions about the Navy's need for UDTs, incessant demands for our services would deny us many uninterrupted periods at Little Creek.

In the Fall of 1947, Bill Mason led a small detachment to Panama City, Florida to survey beaches in the vicinity of Tyndall Air Force Base in advance of a scheduled amphibious landing exercise there. I was sent along to be Mason's Asst. O-in-C and to gain some experience. Somewhat in awe of having "Frogmen" in their midst, the base personnel treated us royalty and miles of wide, almost deserted beaches made the deployment more pleasure than work. That is until, one Sunday morning, Mason and I ran into what apparently was the so-called "Red Tide." By the next morning, both of us felt like we were near death from influenza. We turned into the Air Force Dispensary where the doctor diagnosed us as being hung over from too long at the O Club. and issued us some APC pills. But the worst symptoms disappeared in a few hours although I looked as if I had a good case of measles and itched miserably for several more days. Despite that, we finished the survey work on time. That deployment yielded an unexpected opportunity for Mason and myself. On one of our last nights at Tyndall, a Saturday, Bill and I were having a few drinks at the O Club. An Air Force major in uniform was especially attentive to us. After he bought us several drinks, he revealed that he really was a reserve officer. After a couple more drinks, he further revealed that he was a recruiter for the Zionist Irgun and said that he was very interested in our demolition skills. While nothing very specific was said, the major implied that we could make a good deal of money with the Irgun. We, however, decided that we weren't interested in any such adventure.

Soon after Mason's detachment returned to Little Creek, UDT 2 embarked on an APD (probably USS CARPELLOTTI) for an amphibious demonstration at Miami Beach, followed by a large-scale amphibious exercise on the beaches we had surveyed. The landing exercises were followed by ship visits to New Orleans and Galveston with several days of liberty in each place. Life in UDT seemed pretty good to us recent trainees.

Sometime during that period, LCDR Fane directed me to take a small detachment of men from both teams to Naval Air Station, Jacksonville, Florida. We were to conduct a demonstration in the Air Station swimming pool during the All-Navy Swimming Meet being held there. Sam Bailey, Joe DiMartino and Benny Sulinski were among the men in the detachment. As often in such cases, we gathered together whatever gear we thought might be useful and would come up with a specific demonstration script once on site. Now, there was an old Jack Browne lung which had been in the team warehouse since the teams moved East and wasn't highly regarded. But, Fane had recently acquired a dozen or so Lambertsen Amphibious Respiratory Units (LARUs or Lambertsen Lungs) from an Army/Navy surplus store. LARUs had been used by the OSS Maritime Unit during WWII operations in SE Asia. UDT had been equipped with some LARUs during WW II but their use had apparently been limited to a few scanty indoctrination dives. In any event, no one at Little Creek knew much about the capabilities, limitations or proper use of either the Jack Browne or the Lambertsen units. There was, however, under the impetus of Doug Fane's thinking about the future of UDT, increasing interest in developing a true underwater capability for UDT. So, we included the Jack Browne and a Lambertsen unit in the gear for Jacksonville, thinking we might be able to use them in the Olympic-size swimming pool. Once in Jacksonville, I think it was Benny Sulinski who took the LARU down for a dive in the pool with, as I recall, the oxygen bottle filled with compressed air! . Fortunately, Sulinski swam only one length of the pool before we decided that there was no drama in someone swimming underwater, almost unseen, so we dropped use of the lungs from consideration. We put together a pretty good show without the lungs and the audience loved it. Base authorities were less enthusiastic when they discovered that the explosive charges we used had cracked half of the pool's underwater lights. Those charges were small: a nonelectric blasting cap with about two inches of detonating cord attached. But after assembling the charges, Sam Bailey had some eight inches of detonating cord left over. So, to avoid carrying it back to Little Creek, he simply taped it to one of the charges. That almost brought the house down -- literally.

LCDR Fane had recognized shortly after the end of World War II that the "Underwater" in Underwater Demolition Teams was a misnomer since virtually all operations were conducted on or very near the surface and, in the latter case, only for the duration of a man's held breath. If UDT was to survive and progress, a true underwater capability had to be developed. Fane learned that Dr. Lambertsen was training Army personnel in the use of the LARU at Ft. Knox, Kentucky. Lambertsen had originally developed the LARU while a medical student at the University of Pennsylvania. Unable to interest the U.S. Navy in his apparatus in the early days of World War II, he had attracted the interest of OSS. He joined OSS himself and trained personnel of the OSS Maritime Unit in underwater operations as well as participating in such operations in Southeast Asia himself. In January, 1948, Fane brought Lambertsen to Little Creek where he spent several days indoctrinating selected personnel in the use and maintenance of the LARU

This indoctrination was essential if UDT men were to start using the LARU. Without such training, use of a breathing apparatus such as the LARU would be extremely dangerous. The LARU was a closed-system, recirculating, oxygen-breathing apparatus. Pure oxygen, admitted to a breathing bag from a small, pressurized, supply bottle, passed through a hose and one-way valve to a full-face mask from which the swimmer inhaled oxygen. Exhaled breath passed through another one-way valve and hose to a canister mounted behind the swimmer's

neck and filled with Baralyme (soda-lime) which absorbed the carbon dioxide. After passing through the carbon dioxide absorption canister, theoretically clean oxygen was returned to the breathing bag. A valve controlling the flow of oxygen from the supply bottle allowed the swimmer to replenish the oxygen in his breathing bag as it became depleted. Theoretically, such a system was highly efficient. Because pure oxygen was provided (the air we breathe is only about 20% oxygen) and was stored in the supply bottle at an initial pressure of about 1,800 psi., an ample supply of oxygen could be carried in a relatively small bottle. Since the system was closed, the swimmer left behind no stream of bubbles by which he could be detected. But there were several dangers. If all air was not removed from the breathing bag at the outset, the swimmer could deplete his oxygen supply while still inflating his lungs with odorless, useless nitrogen and thereby succumb to anoxia. Further, even with a LARU in perfect condition and fresh soda-lime in the canister, carbon dioxide absorption was less than 100%. As the Baralyme became exhausted or the canister leaked even slightly, carbon dioxide absorption was further degraded and the swimmer would breathe high levels of carbon dioxide causing headache, disorientation, ultimately death. Fortunately carbon dioxide intoxication is quite uncomfortable and the trained swimmer would recognize it at an early stage. Oxygen toxicity was a more insidious hazard. Pure oxygen breathed under greater than atmospheric pressure is toxic. Depending on the depth at which he is working, the amount of exertion, the presence of carbon dioxide traces, and his own inherent susceptibility, the swimmer on pure oxygen will sooner or later experience euphoria, muscle spasms, then a full-scale epileptiform convulsion which renders him totally helpless and leads shortly to death. The progression of these symptoms after onset is very rapid; once onset is detected, unless the swimmer is experienced and lucky, his recognition of what is happening to him will come too late.

Fane had also recognized that most of the advantage of a true underwater capability would be lost if swimmers had to be transported to their target areas on surface ships or in submarines required to surface to launch their swimmers. Ideally, an underwater mission would be conducted entirely submerged: from port-to-target-to port. With this in mind, he had contacted Commander, Submarine Squadron TWO and laid the groundwork (awkward term in this context but, then, CO UDT 2 once received a letter from Army Engineers addressed to “Underground Demolition Team TWO”) for attempts to launch swimmers from submerged submarines utilizing the submarines’ escape trunks.

With such future operations in mind, Fane led a detachment of UDT officers and men to the U.S. Navy Submarine Base at new London, Connecticut. Among those making the trip in addition to Fane were Garren, Tallent, Mason, Jones, Foster, Devine, Kappesser and myself from UDT 2. Koerber, Sulinski and DiMartino Martino may have represented UDT 4 and others were certainly involved. Submarine Base personnel instructed and qualified the UDT officers and men in locking out of a submarine escape trunk as well as in free ascent (without breathing apparatuses) from the 100’ lock in the Submarine Escape Training Tower. Additionally, all the UDT men underwent oxygen toxicity susceptibility testing, breathing pure oxygen in a recompression chamber pressurized to the 60 foot level for up to 30 minutes. I introduced the UDT contingent to the spectacle of oxygen poisoning by promptly throwing a classic convulsion. Several others followed shortly thereafter. Legend has it that the sight of wildly thrashing, frothing UDT men being hauled out of the building on stretchers caused a number of submarine trainees waiting nearby for their turns at escape training to defect from submarine training.

This visit to New London by the UDT detachment accomplished far more than the training and experience which accrued to the UDT men. A solid relationship between UDT and Submarine Force, U.S. Atlantic Fleet was established. This was important in more ways than one. If UDT was to expand its underwater capabilities on any meaningful basis, Fane had to attack very real problems: not only those of submerged transport but of getting equipment and learning to use it, of selecting personnel who were psychologically and physically suited for underwater operations, and of gaining Navy institutional support for efforts which were to many senior officers of the surface Navy beyond the conventional missions, missions which they often supported only reluctantly in the first place. The solutions to several of those problems converged rather neatly in the relationship with SUBLANT. The advantage of submarines as transport vehicle has already been mentioned. Moreover, submariners who traditionally held themselves relatively independent of the surface Navy were quicker to understand and support experimentation with new underwater techniques and tactics. Perhaps most importantly, submarine medical officers were not only quite familiar with such effects as oxygen toxicity, carbon dioxide intoxication and other diving hazards but the Submarine Medical Research Laboratory under Captain Willmon was already conducting active research into the etiology of oxygen toxicity utilizing the service of an expatriated German physiologist, Dr. Schaefer. For their part, the UDT men provided Dr. Willmon's laboratory with a ready pool of research subjects, The UDT men also realized that free ascent training in the 100' tower offered a unique opportunity for psychological and physical screening of candidates as well as for increasing self-confidence in underwater environments for those candidates found suitable for further training. At least one subsequent Replacement Training Class went to new London in its entirety for tower screening. One additional element in the UDT/SUBLANT relationship was to prove crucial in the next few years. Vice Admiral Fife, Commander, Submarine Force, U.S. Atlantic Fleet was enthusiastic in his support of the UDT efforts and of UDT/SUBLANT cooperation.

With selected personnel trained in the use of the Lambertsen units and the New London exercises completed, the stage was set for actual UDT/submarine operations. In February, 1948, UDTs 2 and 4 embarked in APDs for conventional reconnaissance and demolition operations at a beach on Viecques Island during the amphibious phase of Atlantic Fleet's winter fleet exercises. (It was probably during this cycle of exercises that a small detachment of UDT men penetrated beach defenses a day or two before D-Day, "obtained" some USMC fatigue uniforms and a jeep and spent several days harassing the defending forces in the hinterland. One UDT man, posing as a Marine courier, presented U.S. Marine Corps Lieutenant General Keller M. Rockey with a package containing a booby-trapped hand grenade which, if it had been real, would undoubtedly have killed the general and several of his staff. General Rockey, too, became a strong supporter of UDT. Among other things, at a subsequent reception in Port Au Prince, Haiti, the General startled several UDT officers by greeting each of them by name.)

Following participation in the fleet exercises, the officers and men who had been through the New London indoctrination rendezvoused at St. Thomas with the submarine, USS GROUPER commanded by CDR Charles F. Putnam². Dr. Lambertsen joined Fane, Garren,

²In describing these early swimmer/submarine operations, I have bolstered and corrected my memory by reference to the well-documented account in John B. Dwyer, Commandos From The Sea, Boulder Colorado: Paladin Press, 1998, pp. 116-124. See also, Francis Douglas Fane and Don Moore, Naked Warriors, New York: Appleton-

Jones, Foster, Devine, Bailey, Kappesser, Piotrowski, Petway and myself, among others, for operations from GROUPER in Pillsbury Sound. between St. Thomas and St. Johns. The objective of the UDT/GROUPER operations at this time was to test the feasibility of launching and recovering UDT swimmers from a submerged submarine. On February 20, 1948, GROUPER bottomed in 54 feet of water. to attempt to launch and recover swimmers via the escape trunk. Because of the bulkiness of the LARUs and the necessary presence of an escape trunk operator from the submarine's crew, only two swimmers at a time could occupy the cramped, cylindrical escape trunk, Fane and Lambertsen were the first to exit the submarine and swim to the surface after which they swam back down and reentered the submarine. The other UDT men followed in pairs, with each pair making two exits and recoveries that day. The ability to operate from a bottomed submarine had been proved and soon became routine.

The next step was to test the capability of leaving and reentering a submerged, underway submarine. On February 22, 1948, Fane and Lambertsen again led the way, locking out of the underway GROUPER, then returning. Again, the other swimmers followed. Although the speed of the submarine was usually held to bare steerage -- and depth control -- way, about two knots, the speed of the submarine increased to six knots on at least one occasion when the diving officer began to lose depth control. Despite a battering from the six-knot, over-deck current, the swimmers were able to hang on although the effort created an immediate danger of exhaustion or, worse, oxygen poisoning. Still, these exercises proved the feasibility of delivering and retrieving combat swimmers by submerged submarines and gave the UDT swimmers a high degree of confidence in their ability to operate successfully from submarines.

Upon completion of the St. Thomas exercises with GROUPER, Fane and his officers and men knew that they were truly in the underwater business. It was apparent, however, that the limited availability of equipment as well as the need for selecting personnel carefully would require concentration of effort if the development of underwater operations were to proceed in a highly focused manner. While returning from those operations aboard an APD, I wrote a memorandum to COMUDTLANT proposing that a separate platoon be established and manned with personnel selected from both Teams 2 and 4 to specialize in future underwater development. I have no idea as to whether or not that memorandum influenced the decision -- very likely, Fane had already planned such a step -- but, shortly after return to Little Creek, COMUDTLANT formally established the Submersible Operations Platoon, or SUBOPS as it came to be known. I was fortunate to be assigned as Platoon Officer, with LTJG Al Jones as Assistant Platoon Officer. Among the enlisted personnel who made up the initial complement of SUBOPS or who were to join it shortly after with the selection of some men from the 2nd and 3rd replacement Training Classes of 1948 were MRC Al Foster, GMC Andy Devine, GM1 Sam Bailey, GM1 H.L. Piotrowski, DC1 Wilson Bane, BM3 Frank E. Kappesser, Frank Hale, GM3 J.J. Petway, BM2 Roy O Rollins, QM3 Ronald LeMay, GM2 Henry Spiegel, TM3 John P. O'Brien, GM2 Chester C. Stevens, BM3 Glen Baker, BM2 Joseph DiMartino, GM3 Benny Sulinski, QM3 James Cook, Thomas McAllister, BM3 George Phipps, BM2 William C.

Century-Crofts, Inc., 1956, pp.277-302 for a vivid and more detailed description of early UDT/submarine operations in the Caribbean. There is some conflict between sources regarding command of USS GROUPER during these February, 1948 operations. My memory as well as Commander Fane's book cite Commander Miles Refo as CO, GROUPER. Dwyer, relying on GROUPER's patrol reports for the period, cites Commander Putnam as CO, GROUPER.

Hollingsworth, DC3 Harold L. Crowell, and “Robbie” Robinson. (George Phipps was killed in action in Vietnam years later. Thomas Mc Allister died in an accident during operations near St. Thomas. Joe DiMartino, later an early SEAL officer, was once dubbed one of “America’s Ten Most Dangerous Men” by TRUE Magazine. I believe that several of these men subsequently earned commissions and several were among the first SEALS.)

SUBOPS was established as an entity within UDTs 2 and 4. But there seemed to be a danger that its identity could easily be lost in the routine daily activities of the teams. There was also a need for work space as well as for separate and secure storage for the LARUs and supporting equipment such as bulk oxygen bottles, a compressor, a variety of tools and so on. Another consideration was classification security. By the very nature of their work, combat swimmers require secrecy. While there was a need to advertise UDTs accomplishments in going underwater in order to gain higher level support, it seemed advisable to most of the SUBOPS men that the general population, Navy and civilian, not be afforded free access to what we were doing. SUBOPS clearly needed a “home” of its own, separate from the regular UDT warehouses and offices at Little Creek.

It happened that there was an unused, concrete block brig surrounded by a barbed wire topped, eight-foot, chain-link fence with a lockable gate immediately behind the UDT 2 and 4 warehouses. Although it was partly subdivided by steel-barred confinement cells, several of them filled with rusting bunk frames and rotting mattresses, the brig offered the advantages of a spacious office, a large room suitable for a workshop, toilet facilities and a number of empty cells useable for storage or small work spaces. The idea of taking over that old brig was broached and Fane began applying his persuasive powers to the Amphibious Base hierarchy. After continued urging and somewhat inflated claims as to the security classification of SUBOPS activities and equipment, Commander, NAVPHIBASE LCREEK granted permission for SUBOPS to occupy the brig provided that nothing be disturbed and that the building be available for return to the base within 24 hours.. We moved into The Brig promptly and, within a couple of weeks had it cleaned out, painted and converted -- permanently -- to our own uses. All of the decaying detritus of earlier use were stuffed into a couple of the back cells and forgotten. WE put a heavy, secure lock on the gate and posted “RESTRICTED AREA -- AUTHORIZED PERSONNEL ONLY” signs on all four sides of the fence. The fence and gate were especially valuable in protecting SUBOPS from kibitzing by non-UDT personnel of all ranks as well as casting a protective cloak of mystery over what we were doing. No doubt, certain empire-building proclivities were also satisfied. In any event, The Brig, as it became known, was to play a significant role in furthering UDT’s underwater aspirations for a number of years.

Some of the SUBOPS men were eager to increase their technical training in underwater operations by qualifying as deep-sea, “hard hat” divers. It was clearly to UDT’s advantage to have such expertise available within the teams. Accordingly, Chiefs Foster and Devine, both already qualified as Salvage Divers, were sent to First Class Diving School. Later, in August, 1949, Kappesser and McAllister went to Second Class Diving School at Portsmouth, Virginia. They were followed shortly after that by Phipps and Hale. R.O. Rollins was already a Second Class Diver when he joined UDT. (After leaving the Navy, Hale made a second career in deep-sea diving, serving as a Diving Supervisor for several years during the construction of well platforms in the North Sea oil field.)

It was at about this time that UDTLANT lost two more of its most experienced officers. Hal Iverson and Bill Mason had already left. Now, Rip Tallent and Gary Garren were ordered to shipboard duty. This loss of experienced officers was to plague UDT for a number of years. At that time, there was no career path in special operations for officers of the Regular Navy. While Naval Reserve officers could remain in UDT for more extended periods, young, Regular Navy officers were permitted only three year tours of duty in UDT.³ While the enlisted men were not subject to a specific duration of duty in UDT, they clearly suffered career disadvantages. Except when embarked on ships for transit, they had little chance to expand and hone their expertise in their respective occupational specialties. In preparing for fleetwide advancement examinations, the men had to rely on their own perseverance in studying and their initiative in taking advantage of scattered opportunities to gain experience aboard ship. It is a tribute to the quality of the men who volunteered for UDT that so many were successful in successive fleetwide examinations and achieved the highest levels in their respective rates.

Even back in the early days of SUBOPS, UDT men were thinking about expanded missions. LCDR Fane, of course, had already taken UDT truly underwater and established the viability of UDT/submarine operations. In early 1947, Fane had proposed the development of a ship assault capability to the Amphibious Type Conference. Back in The Brig, we talked about what missions beyond conventional beach reconnaissance and obstacle clearance we might perform. At one point, LTJG Garren and I drafted a letter proposing that the evolving underwater capabilities be exploited for their application to such missions as ship assault, as well as hinterland penetration for reconnaissance and intelligence collection, sabotage and commando-style raids. We also discussed the potential of air delivery to supplement submarine transport. I have no idea of what happened to that letter except that it obviously didn't get very far. Still, such ideas were not viewed with any enthusiasm by the mainstream Navy. Despite the valuable contributions of NCDUs, Scouts and Raiders and UDTs during World War II or the feats of British and Italian underwater operators, few in the Navy seemed to consider unconventional operations appropriate in the nuclear age. Reactions to a ship assault exercise at Argentia, Newfoundland, to be described shortly, confirmed to us the widespread disdain for such "games."

Doug Fane, however, was persistent.. He continued to evangelize the conventional Navy at all levels as to the need for expanded support for underwater operations as well as to scour the country for useful equipment. He located two crated British submersible boats in a west coast warehouse and had them shipped to Little Creek. Dubbed "Sleeping Beauties" by the British, these boats, with hulls of sheet steel, were each 12'8" in length, each with a single, open cockpit. A Sleeping Beauty was powered by an electric motor and an automobile-type storage battery located in a watertight compartment just forward of the cockpit. Two ballast tanks, one on each side of the operator's legs, as well as a small trim tank in the bow of the boat provided depth and trim control. Kingston valves in the cockpit and an air-pressure system permitted flooding and blowing of the tanks. A rudder provided lateral control of the boat while diving

³When, in June 1950, I received orders for duty in a heavy cruiser, I called the LTJG Detailer at BUPERS and begged for a one-year extension in UDT. His refusal was accompanied by the blunt comment, "The place for a young officer of the Regular Navy is on the bridge of a combatant ship."

planes, one on each side of the stern, allowed attitudinal control while running submerged. Instrumentation consisted of a wind-up clock, a magnetic compass and an air pressure gage. If I recall correctly, a Sleeping Beauty was capable of a maximum surface speed of 5 knots and maximum depth of 50 feet. The operator of an SB, sitting in the open cockpit, had of course to wear a breathing apparatus. The only protection he had from the sea was a heavy canvas skirt, secured around the coaming of the cockpit, which he could zip up around his neck. SUBOPS personnel promptly shortened "Sleeping Beauty" to "SB", from which other UDT personnel derived SUBOPS' alternate sobriquet: "Submersible Bastards."

The SBs were painted a dull, wartime gray when we received them. The SUBOPS men promptly repainted them with Navy-issue "yellow striping" for safety reasons and hauled them down to the Little Creek beaches to try to figure out how to use them, with little success. Dr. Lambertsen again came to the rescue. He had operated SBs for OSS in Southeast Asia and quickly taught the SUBOPS men how to operate the boats. However, it was apparent that, after long storage, the boats were not in very good condition. The battery compartments leaked because of dried gaskets, electrical insulation was in poor condition and a number of screws and screw sockets were rusted or missing. There were no spare parts available and American substitutes could not be used because all the fittings were to British specifications. Fane arranged for Chiefs Devine and Foster and several more SUBOPS men along with me to take the SBs to New London where we were to overhaul the boats with the assistance of SUBLANT technicians. I think that the submariners at New London were both amused and fascinated by the idea of working on these "tin underwater canoes." Again, SUBLANT cooperation was unstinting. The electric motors were overhauled in Submarine Base shops, New London provided tools and material so that the SUBOPS men, under Foster's supervision, could drill and retap all screw fittings to American specifications. New batteries were obtained. Finding suitable material to make the battery compartments watertight proved to be a problem. One of the base shops came up with suitable neoprene gasket material and cut new gaskets to precise dimensions. The battery compartment of an SB was fitted with a small, cylindrical relief valve intended to relieve any buildup of battery gas. Its functioning required a rubber sleeve which would fit tightly enough to prevent any water from getting in and yet stretchable enough to permit battery gas to escape. That stumped us for a while until the Base Dispensary came up with rubber surgical tubing which worked perfectly. Finally, the Submarine Base made the Base Swimming Pool available for shallow water testing of the boats. To be completely watertight, the neoprene gaskets for the cover plate of the battery compartment required some sort of sealant. SUBOPS men tried everything from red and white lead to commercial roofing compound. Finally, an asphalt-based compound proved useable. By the time the problem was solved, however, the swimming pool was decorated rather liberally with red, white and black smears which the SUBOPS men worked on for hours but never eliminated entirely. If that swimming pool at new London still exists, perhaps some of those stains remain as a memorial to SUBLANT/UDT cooperation.

I have already alluded more than once to the lack of support perceived by UDT officers and men. Many of us, in fact, felt that UDT was hanging on to its existence by its fingernails. As is frequently the case for elite units within the military, UDT was viewed by a good number of Navy officers with suspicion and a certain amount of resentment. Some argued that, in the nuclear age when wars would be fought at long range with advanced weapons, UDT was an archaic holdover from World War II and should be eliminated. The large majority of those who

ever thought about it were willing, of course, to tolerate UDT so long as UDT men behaved, didn't become too presumptuous and didn't pose any excessive drain on Navy resources. (Our licit drain on Navy resources certainly was minimal; our illicit drain was probably more substantial.) There were some senior officers -- Admiral Fife, Admiral Barbey and General Rockey for example -- who recognized the potential and supported efforts to move ahead. But it was often rough going for the UDT men on both coasts as they tried to carry out what they saw as their appropriate roles with extremely limited and often obsolete resources. LCDR Fane recognized clearly that, despite some legitimate requirements for classification security of UDT operations and developments, attracting the attention of influential elements of the Navy and convincing them of the need for properly trained and equipped underwater units were vital.

Thus, the stay of the SUBOPS detachment at New London to overhaul the SBs was interrupted by an order to proceed with one boat to the Naval War College at Newport, Rhode Island where Fane was to address the officer students. We drew a truck from the base Base Motor Pool, loaded one SB on its wheeled dolly onto the truck and shrouded it with canvas. Motivated more by theatrical interests than by any perceived threat to national security, I drew a sidearm from the Base Armory. Two of us -- it may have been George Kudravitz who drove the truck -- took off for Newport. We arrived just in time for Fane's presentation before several hundred Navy officers among whom were a good many future admirals. I just had time to strip down to swim trunks, put on a LARU and get pushed out onto the stage sitting in the cockpit of the SB. If the presentation impressed the assembled audience-- and it clearly did -- it was due to Fane's rhetorical skill because I couldn't do a thing except sit there, occasionally wiggling the rudder and diving planes at what I thought were appropriate times. The sidearm I carried did come in handy during our drive back to New London. Kudravitz got hung up in a traffic jam at a busy intersection. I was in uniform, had that side arm in a polished holster strapped around my waist and that heavily-shrouded shape on the flat bed lent an air of mystery to the truck. I stepped out into the intersection and stopped traffic in all four directions while Kudravitz drove on through, laughing his head off. Perhaps we did get a bit presumptuous at times.

In October, 1948, Fane, a detachment from SUBOPS and a heavy load of equipment including one SB were flown to St. Thomas to rendezvous with USS QUILLBACK (SS424) commanded by LCDR C.R. Clark. Joining the UDT detachment were Dr. Chris Lambertsen, LCDR E.R. F. Johnson, USNR, A.C. "Al" Dyer (Johnson's assistant and technician,) a Lieutenant Colonel from U.S. Army Engineers (name unrecalled,) William Fields (a civilian engineer from the Bureau of Ships,) and a Navy Chief Photographer's Mate (name unrecalled.) In addition to Fane, the SUBOPS detachment consisted of Ensign George Atcheson (on TAD from the West Coast teams,) Chiefs Devine and Foster, Sam Bailey, Henry Piotrowski, Frank Kappesser, George Kudravitz, A.B. Henderson, J.J. Petway and myself.

E.R.F. Johnson was an experienced diver and a pioneer in the development of underwater photography, Cameras, both motion picture and still, designed and built by Johnson and Dyer were among the first to be used successfully to produce high-quality, underwater photographs. Intensely interested in what Fane and his SUBOPS crew were attempting, Johnson volunteered his and Dyer's services at Johnson's own expense. With their expertise and equipment, the operations

from QUILLBACK could be documented with dramatic photography. Moreover, both Johnson and Dyer as well as Chris Lambertsen became, as far as the SUBOPS men were concerned, integral and highly respected members of their close-knit team. Although considerably older, Johnson could outswim most of us and Chris Lambertsen became and remained our mentor in the truest sense of that term.

A major objective of the operations with QUILLBACK was to develop techniques for operating small submersibles from a full-scale mother submarine. At the outset, Lambertsen had the opportunity for the first time to train and qualify SUBOPS SB operators in water of more than a few feet in depth. Under Lambertsen's guidance, all of the SUBOPS men quickly became qualified SB operators. The next step was to experiment with taking the SB off the deck of the bottomed submarine and landing it again. This, too, was accomplished rather quickly. The logical extension of these operations, of infinitely greater tactical significance, was developing the capability of taking off from and landing on the deck of a submarine while it was underway submerged. The SUBOPS men had already learned to handle themselves on the deck of a submerged, underway submarine during the GROUPER operations. But, could the SB take off and land and could the SUBOPS deck crew handle the boat on deck?

A serious problem was that the parent submarine could not operate submerged at less than two knots and the SB's maximum submerged speed was little more than that. Taking off should be easy: the SB operator could simply gain some buoyancy and let the submarine go out from under him. But there was little margin of speed to allow the operator to maneuver onto the deck while landing. Lambertsen came up with the idea of streaming a length of 21-thread line with a buoy at one end and the other end secured to the bull nose of the submarine. The idea was that the SB operator would intercept and latch onto the buoy being towed by the submarine, cut the motor so that the SB was towed by the submarine, gain negative buoyancy and settle on to the deck. It seemed a dicey sort of operation at first and Chris Lambertsen, because of his superior skill and experience in the SB, made the first attempts. E.R.F. Johnson and Fane were on deck to photograph the operation; Atcheson, Bailey and Piotrowski, all big and strong men, constituted the recovery crew who would help guide the SB onto the submarine's deck and secure it there. As described by Johnson, quoted in Fane and Moore, *op. cit.*, the overdeck current as well as choppy surface conditions whose effects could still be felt 30 or 40 feet underwater, made the recovery extremely difficult. The operation required exceptional skill and endurance on the part of the recovery crew.⁴ Still, Lambertsen proved that the launch of a Sleeping Beauty from the deck of a submerged, underway submarine as well as recovery of the SB were entirely feasible. I soon got my chance and had no great trouble executing the maneuvers. Soon, a number of the men had become quite adept at the maneuvers..

While the initial launches and recoveries were made on the foredeck of the submarine we must have at some point moved SB operations to the afterdeck of the submarine. I'm sure that most of my launches and recoveries were made aft of the submarine's sail. One end of a towline was secured to the after side of the submarine's conning tower with the buoyed loop at the other end.. As it turned out by trial and error, the best tactic was for the SB to approach on the surface but partially trimmed down (i.e., with its deck awash) on a course roughly perpendicular to that

⁴At this time, there was no shelter for the SB on the deck of its parent submarine. The SB, when on deck, was secured in its wheeled dolly which, in turn, was lashed to the deck of the submarine.

of the submarine from a point off the bow of the submarine. The SB operator had to judge his course and speed to reach a position over the submarine's deck just aft of the conning tower as it passed. The SB operator would reach out, pass a short length of line secured to the bow of the SB through the bight of the towline, cut the motor so that the SB was then being towed by the submarine, then flood the ballast tanks to gain negative buoyancy and settle down into the hands of the waiting SUBOPS recovery crew. Initially, there was a minor problem for the operator in getting a purchase on the bight at the streamed end of the towline. One of the Chiefs quickly came up with the idea of fabricating a steel hook, perhaps a foot long, from a piece of reinforcing rod. With this secured to the short length of line secured to the bow of the SB, the operator could easily reach out to snare the bight of the towline. That worked like a charm.

All of this was, of course, recorded on film by Johnson and Dyer. But Johnson wasn't satisfied with simply filming these operations from a standoff position. He soon conceived the idea of mounting his motion picture camera on the SB. Foster, Devine and Dyer devised a suitable mount for the large, waterproof "blimp" which encased Johnson's 16 mm. movie camera. The mount was placed between the forward edge of the cockpit and the after edge of the battery compartment. Normally, to run submerged with proper control of the boat's longitudinal attitude, the SB operator had to let water into the trim tank in the bow of the boat. Fortuitously, the weight of Johnson's camera blimp, placed where it was, almost exactly compensated for the weight of the water normally admitted to the trim tank to trim the boat. Of course,, you had to aim the boat to aim the movie camera but the pilot could start and stop the camera simply by reaching up a few inches to activate a trigger on the side of the camera blimp. Another of Johnson's cameras was a 35 mm. still camera encased in a cubical, waterproof case about 8"x8"x8", with a pistol grip fitted to the bottom. It was awkward for the pilot to carry this camera in his lap in the cramped cockpit so the men cut a square hole and constructed a well just aft of the cockpit of one of the boats. With the still camera stowed in the well with the grip sticking up, the pilot had only to reach over his shoulder to pull the camera out.

The SB operators were soon taking still and motion pictures of anything and everything: the parent submarine, coral heads, schools of fish, and barracuda (which seemed fascinated by the bright yellow shape and would swim alongside the SB eyeing it suspiciously with their huge eyes.) I recall filming footage of the slowly turning screws of QUILLBACK from directly astern as well as footage of the submarine's JT sound head tracking the SB. What I am sure was footage obtained by SUBOPS men with Johnson's camera showed up in several Hollywood movies in later years, presumably obtained by Hollywood directors from the U.S. Navy Photographic Center at Anacostia, D.C. The SB operators also like to dive bomb the submarine's sonar heads. I once incurred the wrath of a QUILLBACK Sonarman by slapping the steel hull of the SB with a wrench just as I guided the SB close to the JT sonar head.

The limited capacity of a submarine's escape trunk became a source of concern as future tactical operations were considered. It took a number of minutes to put each pair of swimmers out and recycle the trunk for the next pair. Launching even the number of men required to handle the SB on deck could easily consume half an hour. In an attempt to find a faster way of getting swimmers in and out of a submarine, Fane and Kappeser made a daring and almost fatal attempt to test the feasibility of exiting and reentering through the submarine's forward torpedo tubes. As it turned out, the coarseness of the tubes' pressure controls caused sharp fluctuations of the

pressure inside the tube with the result that the swimmer's face masks were lifted off their faces. Fane did succeed in reentering the submarine through a torpedo tube but it was a close call. Johnson, who was filming this evolution, described it in detail. His description is quoted in Fane and Moore, *op.cit.* Fortunately, both Fane and Kappesser emerged from this experiment without serious damage, if somewhat shaken.

Other hazards were ever present during all of these operations. The swimmers always had to be alert for any signs of impending oxygen toxicity; the characteristically rapid onset of oxygen toxicity symptoms, already mentioned, made timely detection a tricky matter. Fane, Johnson, Kappesser and I all experienced possible oxygen toxicity, CO2 intoxication or both at one time or another during operations with QUILLBACK. Ironically, Kappesser was involved in three of these incidents. When Johnson experienced symptoms, Kappesser who was swimming with Johnson as his "swim-buddy" saw him to the surface safely and without acute symptoms. Fane and Kappesser himself also experienced symptoms at one time or another. One day while we were operating in the open sea far from QUILLBACK with a borrowed U.S. Army J-Boat as a safety boat, Kappesser and I were swimming together at probably 40-50 feet depth.⁵ Everything was going well when I suddenly felt a slight twitch in the muscles of my right calf. For reasons I have never understood, aside from the characteristic feeling of well-being, the first symptom I had experienced earlier when going into a full-scale, convulsive seizure, was that same twitching. As soon as I felt it that day, I immediately jerked on our "buddy line," pointed toward the surface, ripped off my face mask, inflated my breathing bag and shot toward the surface with Kappesser close alongside. Luckily -- really luckily -- the symptoms didn't progress but LCDR Johnson who was in the J-Boat told me later that I was very flushed and that I babbled unstoppably for the next fifteen or so minutes. Thanks to Kappesser and previous experience which allowed me to recognize the first symptoms, I avoided a dangerous oxygen toxicity incident.

Less serious if promptly treated but still capable of disabling a swimmer temporarily were easily infected coral cuts and very painful, multiple punctures by sea-urchin spines, sustained frequently during shallow water operations. (Some of us, while based at St. Thomas had learned from local fishermen that urine is the best treatment for sea urchin wounds.. With 21 spines in the instep of my foot one time, the pain was sufficient for me to test the treatment. It works.) Ear infections also were relatively common. When he was present, Dr. Lambertsen lined us up every morning and swabbed our ears out with preventive medication.

By the time these operations in the waters off the American Virgin Islands took place, the U.S. Army Chemical Warfare Service had taken over the abandoned U.S. Navy Base. Army/Navy relations probably have never been better than they were at St. Thomas. When we weren't working with a submarine and SUBOPS men were at St. Thomas, often for several months at a time, the Army post housed us, subsisted us and gave us material support as if we were part of the Army contingent. During one extended stay, annoyed by the prices of bar drinks in Charlotte Amalie, the SUBOPS men chipped in to buy a keg of rum. They kept the keg in the Military Police post at the entrance to the base and drew their nightly requirements on their way out of the base. The Army made the sturdy, wooden J-Boat (somewhat similar to an old-style,

⁵ A maximum allowable depth of 35' was later established for closed-system oxygen breathing apparatuses.

Navy, 50-foot Liberty Boat) available whenever needed. The J-Boat did yeoman service plucking SUBOPS swimmers from the water when they needed assistance. Al Jones and I were at the St. Thomas Army base with a dozen or so men at the time USS MISSOURI went aground in Hampton Roads. One evening, Al and I received an order from the Post Commander to appear in uniform at the Army's morning parade. Puzzled, wondering if we were going to be drummed off the post, we duly appeared the next morning. Then with the Army personnel lined up in front of us at attention, the Post Commander announced that the two visiting Navy officers were present because the Post Chaplain would offer a prayer for the U.S.S. MISSOURI and the U.S. Navy. The Army people thought that an hilarious joke.

SUBOPS returned to Little Creek with a clear sense of accomplishment and E.R.F. Johnson's film to document what they had achieved. They were ready to do some showing off. It may have been during this time that Fane somehow arranged to get Commander, Amphibious Force, U.S. Atlantic Fleet to visit The Brig for an inspection of SUBOPS and a briefing on its operations and future plans. The SUBOPS men worked around the clock to prepare The Brig and themselves for COMPHIBLANT's visit. The Admiral arrived on the appointed day, inspected SUBOPS Platoon and The Brig, witnessed dry demonstrations of the Lambertsen Lung and Sleeping Beauties, then viewed films of the operations in Pillsbury Sound. The oral briefing on future plans emphasized submarine-delivered beach penetrations as well as ship-assault missions. The Admiral's response was noncommittal. He complimented the men on their appearance and bearing but said little else and made no comment on what UDT had in mind for the future. Still, we felt that the affair had gone off well and we anticipated increased support, both material and psychological, in the future. We were stunned when a letter was transmitted through the chain of command several weeks later directing COMUDTLANT to confine future operations to conventional reconnaissance and beach clearance missions.

Fane was, however, not to be deterred. Development of the underwater capability would continue by the best means available. The directive did mean that we would place greater reliance on activities at New London and cooperation with COMSUBLANT, while SUBOPS would have to retreat behind its locked fence to maintain a low profile while at Little Creek.

A clear opportunity to exploit SUBOPS capabilities in conjunction with SUBLANT soon came. In late 1948, Atlantic Fleet cold weather exercises were announced. The fleet-wide exercises in the North Atlantic would include an amphibious "invasion" of the U.S. Navy Base at Argentia, Newfoundland. COMSUBLANT, Vice Admiral Fife, was to command the defensive forces at Argentia and he wanted UDT participation in a defensive role. At the same time, COMPHIBLANT expected UDT to carry out offensive operations which were at least reasonably within the parameters of the conventional UDT mission. The result was that SUBOPS was thrown into a dual role, playing both sides of the coin. While most of UDTLANT, Teams 2 and 4 embarked in surface ships for normal UDT operations on D-Day, a detachment of SUBOPS under Fane's direct command went to New London to embark in USS GROUPER commanded, I believe, by CDR Miles Refo, for transit to and operations at Argentia. The detachment was small because of the limited space aboard the old diesel boat. The addition of a dozen or so men to the complement of an already crowded submarine didn't make for the most comfortable conditions. Sleeping on torpedo skids or "hot-sacking" with the always cooperative submariners was the rule. We passengers also had to qualify in the used of the submarine's

compressed air operated head (toilet.) Fane, unfortunately, failed on his first attempt to master this technique. In addition to Fane, Foster, Bailey, Piotrowski, Rollins, Hale, Phipps, Baker, myself and probably five others made up the UDT group in GROUPER.

Arriving at Argentia ahead of the attacking amphibious force on D-2 night, we operated first in an offensive role. Leaving the surfaced GROUPER under cover of darkness, we landed on a small pocket beach, camouflaged our rubber boats and fanned out to conduct hinterland reconnaissance and harass defending forces. At open point, Hale and I broke into the office of the U.S. Naval Air Station's Base Motor Pool and liberated some records, including a map of the U.S. Navy Base. Usable intelligence? Perhaps not but the defenders would at least know that UDT had been there. Others scouted defensive positions. We raiders had just reassembled at a rendezvous point when we heard a jeep approaching. We scrambled for cover and then, as the jeep with two Marines in it arrived, ambushed it. When the startled Marine in the passenger seat of the jeep fumbled for his .45 cal. pistol, I drew my combat knife.⁶ I was 99 percent certain that the Marine's pistol was unloaded but wanted to discourage the fellow just in case. I had no intention of using my knife although it would have been relatively easy to get him before he could get his sidearm untangled. I figured that we were both play acting. LCDR Fane, however, apparently assumed that I had been overwhelmed by adrenaline. He hurled himself across the hood of the jeep, knocked me aside, shouting at me to drop the knife. The affair ended amicably, though, when we explained to the Marines that they had been captured by a UDT raiding party. The two Marines thought that was great fun and promptly defected to our side. The entire UDT crew piled aboard the jeep to ride half-a-mile or so to a small, isolated pier where we talked a Navy boat into taking us back to recover our rubber boats, then carry us and the boats back to GROUPER.

GROUPER and our embarked SUBOPS crew shifted allegiances to join Argentia's defenders the next night, D-1 night. We had been directed by Admiral Fife to interdict the amphibious force attacking Argentia by conducting swimmer assaults to disable ships essential to the amphibious landing. GROUPER had withdrawn from the bay at Argentia after the D-2 offensive raid. After standing out to sea for some distance, GROUPER reversed and headed back toward Argentia, submerged this time. Commander Refo performed an incredible feat by guiding GROUPER over the rocky bottom of Argentia Bay deep into the amphibious objective area, within striking distance of the amphibious ships at anchor there.

This time, we locked out of the bottomed submarine to make free ascents to the surface, releasing inflatable boats on the way. Two objectives had been selected for the ship assault mission. Fane would lead some of the men to assault USS FREMONT, flagship of the Amphibious Assault Group. I believe that Fane and his crew intended to test a lightweight inflatable boat but shifted to a standard 7-man rubber boat when the lightweight boat was accidentally punctured. I don't know all of the details of that part of the operation; the group I was with was going in a different direction and we had our own concerns to think about. In any event, after attacking FREMONT, Fane and his crew were to return to GROUPER, swimming down to lock in. The second objective was an AKA (possibly USS OKANOGAN) which carried the Navy Beachmaster unit and the Marine Shore Party and their heavy equipment. These units

⁶Present day SEALs will probably be amused to know that back then, UDT men were not issued firearms as a general rule. Our standard weapon was a Kabar combat knife.

were critical to the establishment of a beachhead. A 7-man rubber boat coxswained by BM2 R.O. Rollins was to carry Chief Foster and me to a point roughly a half-a--mile from the AKA from where we would swim to make our attack. After dropping us off, Rollins and his crew were under orders to proceed to the next ship in the anchorage, there to surrender on board for safety reasons. After completing our attack, Foster and I were to swim about a half-mile to shore.

All of the UDT men wore heavy diving underwear and bulky, rear-entry, dry-suits for protection against the cold. (The monocellular material of which modern wet-suits are made had not yet become available; the World War II relics worn at Argentia were the only thing that UDT had at the time.) The assault swimmers each carried "Day and Night" flares in lieu of limpet mines. Limpets, either real or simulated, were not available and we had not had time to improvise reasonable dummies. If we reached our objectives without detection, we were to pull the "Night" ends of our flares, igniting brilliant red pyrotechnics to simulate the explosions of limpet mines against the ships' sides.

The exit from the submarine was, except for the trouble with the inflatable boat, uneventful and both groups started paddling toward their targets in choppy, frigid water. Fane and his group reached FREMONT undetected, popped their flares and, according to the umpire rules, put FREMONT out of action along with the commanders and staffs of the Amphibious Attack Group and the Marine Landing Force. Rollins crew dropped Foster and me in the water as planned and we began what seemed a very long swim to our target. Both of us had to fight the chop which, although not severe, was a tiring annoyance. Both of us began to feel dampness from condensation or minor leakage creep up the legs of our underwear. Such dampness inside a dry-suit which offers little insulation against outside water temperature can quickly cause dangerous chilling. Nonetheless, we made it to our target and were surprised to find no sign of security on deck. From what we could see, bobbing in the water at the side of the ship's hull, the AKA might as well have been unmanned. As I recall, we worked our way along the hull until we thought we were adjacent to the ship's engineering spaces in the vicinity of the salt-water intakes. We each pulled a flare there, two or three yards apart. Foster then worked forward while I worked my way further aft and we each pulled a second flare. At that point, we should have withdrawn and headed for the beach. However, after talking it over briefly with Foster, I decided that it would be best for us to go aboard the ship. Both of us were tired, becoming chilled and our "dry" suits were definitely leaking slowly. It was several minutes before a couple of astonished faces peered over the ship's rail approximately amidships. I yelled up at the faces, "This ship has been hit by four limpet mines and is sinking. Tell your Captain." "WHAT?" "This AKA is out of action. Tell your Captain." After a moment of stunned silence, one face disappeared. More faces now appeared over the rail and we called for a ladder. It took several minutes for the men on deck to get organized but a ladder was eventually lowered and we clambered on board. I repeated to the Officer of the Deck that the ship had been attacked successfully by UDT assault swimmers and that, under the umpire rules, the ship was out of action for twenty-four hours and I advised the OOD to inform the Commanding Officer. Foster found a bunk in the Chief's Quarters and I stretched out in my diving underwear on a Wardroom transom. Finding two underwear-clad strangers in their midst caused some consternation and no little curiosity the next morning. I had the dubious honor of making a courtesy call on a disgruntled Captain while clad in still damp, baggy, long underwear. I have always regretted my decision to board the ship rather than swimming ashore. Under actual combat conditions, there would of course have been

no question of not getting away from the ship. Even though we were in a training situation in which safety was paramount. there is no doubt that boarding the “sunken” ship to spend the night robbed our exploit of some of its impact.. I have always thought and still think that we would have made it ashore. Still, there was a very real danger of exhaustion or cramping overtaking one or both of us. So, despite my regrets, I think my decision was a wise one.

As it turned out, the Argentia story didn't end with the “disabling” of FREMONT and the AKA. Rollins and his crew proceeded to the next ship in the anchorage as instructed only to find no security on deck and a landing net hanging conveniently over the side. Rollins couldn't let that opportunity pass and decided to take matters into his own hands. He and his crew climbed the landing net and searched the deck stealthily until they found a sleepy OOD and deck watch huddled over coffee cups. Rollins promptly informed the OOD that the ship had been captured. After placing one of his men as a guard on the deck watch, Rollins sent the rest of his men to secure anyone they encountered who might interfere. Rollins then ordered the OOD to take him to the Captain. A sleepy U.S. Navy captain was soon thereafter informed by a Boatswain's Mate, Second Class that his ship had been captured and was held in enemy hands.

Unrealistic though some aspects of these events might have been, it was indisputable that a submarine had been able to penetrate an amphibious anchorage undetected and that assault swimmers from that submarine had been able to reach and attack ships which were unprepared and completely vulnerable. I have no doubt that had this been a real situation and had we been carrying real limpet mines, we could have placed them for delayed detonation causing severe damage to or the sinking of two ships essential to the amphibious assault while a third ship was captured or, at least, would have suffered the killing of its captain and some of its crew. As it was, umpire rules required that these ships be put out of action for 24 hours. That would have made continuation of the amphibious exercise impossible. The umpire rules were suspended.

I don't know what official evaluation was placed on this exercise by higher levels of the Navy hierarchy. However, the unofficial feedback we got from several fleet officers was quite derisive: we would never have attempted such an operation under actual combat conditions and we had only been playing unrealistic games.. Still, perhaps the matter was taken seriously in some quarters because, some time after Argentia, “defense against swimmer assault” was added to the list of annual exercises which Amphibious Force, Atlantic ships were required to conduct. More directly pleasing to us was Admiral Fife's expression of delight with the success of our operation. The Admiral's approval affected several of us in a very practical way shortly after the Argentia phase of the Fleet Exercise ended. The Club Officer of the Argentia Officers' Club ordered several of us UDT officers out of the Club one night because we were out of uniform (wearing rumpled, stained greens and sand shoes.) Although he was a nondrinker himself, Admiral Fife was in another room of the Club. Hearing of the incident, he immediately sent a staff officer to inform the Club Officer that we were to be allowed to remain in the Club as his guests and were not to be harassed.

In the meantime, SUBLANT personnel and the shops at New London had been at work on their own to improve their capability to support SUBOPS. It had become clear to both SUBLANT and COMUDTLANT that any tactically useful transport of a Sleeping Beauty

would require some means of housing it on the parent submarine. Most critical was the fact that the SB's maximum test depth was only 50 feet. Limiting the parent submarine to 50 feet during any but experimental or elementary training operations would be out of the question. New London solved the problem by converting a salvaged boiler casing fitted with a hinged, water-tight door and appropriate flood and vent valves, The casing was then mounted on the after gun-ring (foundation) of a fleet boat (USS THREADFIN, I believe.). Thus equipped with a SB "hangar" on its afterdeck, the submarine could operate anywhere within its own depth limitations while transporting the SB.⁷

In early 1949, the SUBOPS men were again off to St. Thomas to conduct training swims and improve their skills with the SB until the arrival of USS THREADFIN at which time, the submarine would embark them and an SB for participation in the annual Spring amphibious exercises at Viecques Island, P.R. By this time, the SUBOPS men were accepted as old hands on the Army post located on the old Navy base just outside of Charlotte Amalie. Our work consisted mostly of swims near St. Thomas or off Caneel Bay at St. Johns to improve our endurance as well as to insure that all of our equipment was in shape for the coming fleet exercises. The latter effort was thrown in doubt one day when we had been working with the SB in Lindbergh Bay, a half-mile or so from the Army post. Finished with our work for the day, I instructed Rollins to pilot the SB on the surface back to our base. Rollins was off the point of land which separated Lindbergh Bay from the piers at our base, running on the surface, when he experienced a battery explosion which blew off the watertight cover of the battery compartment. The SB immediately flooded and began to sink. When the explosion occurred, Rollins had the canvas splash cover zipped up tightly around his neck. To his horror, he found the zipper jammed. Trapped in the now submerged SB, Rollins coolly cut his way out with his combat knife.

In the meantime, the rest of us had returned to the piers in the J-Boat. When Rollins failed to appear within the several minutes it should have taken him to round the point of land into our view, we immediately took the J-Boat out to find him. We found him standing on an almost exposed coral head, not in the best of moods, but unharmed-- physically. The men soon located the SB lying on the bottom with the battery compartment cover nearby. We spent the rest of the day raising the SB and hauling it back to the piers.

LCDR Fane arrived at St. Thomas the following day on a previously scheduled visit. Needless to say, I was again -- deservedly -- in deep trouble for allowing a man to pilot the SB unescorted, even in a fully-surfaced condition. Rollins was safe and unhurt but the long-planned use of the SB during the amphibious exercises was now in serious doubt. I received orders to have the SB ready for Viecques -- or else. The men went right to work on the boat, however, and once again demonstrated their skill and versatility. There was no structural damage to the boat except that the screws which held down the battery compartment cover had been ripped out of

⁷According to Frank Hale, the hangar continued in use during post-SB years for storage of deflated and rolled-up rubber boats during transit. Hale and Phipps were on the deck of a submerged submarine one night to take the inflatables out of the hangar. The boats were jammed inside because of the residual bouyancy of trapped air. After a struggle, they got the first boat free only to have it pop toward the surface to the limit of its tether. Phipps, who had been pulling at that first boat got a wild ride to the surface, He allowed that his wild ride had been fun and told Hale, "Let's do it again.."

their sockets, destroying the threads of both screws and screw-seats. The battery was, of course destroyed. The men redrilled and retapped the screw seats to a larger size, fabricated a new gasket and a new battery was obtained.

We didn't know what triggered the explosion but it was clear that a dangerous concentration of hydrogen had accumulated in the compartment; the pressure vent on the top of the compartment cover obviously had not been adequate to prevent the build-up of an explosive concentration of battery gas. Something had to be done to prevent a reoccurrence. Chief Foster devised a CO₂ purging system utilizing a small bottle of compressed CO₂ connected to the battery compartment by copper tubing, with a valve to allow the SB pilot to release a shot of CO₂ into the compartment periodically. By dint of long hours spent, the repairs were completed within a couple of days. But with all of their skill, dedication and hard work, the men could not have completed these repairs without the assistance of the Army personnel on the St. Thomas Army Post. Army men pitched in with materials, tools and advice as if the repair job was one of their own projects.

With fleet exercises underway and the amphibious phase approaching, THREADFIN got underway from St. Thomas, with the SUBOPS crew and SB embarked, to put out to sea from where it would make a submerged approach to the amphibious objective area off the Vieques beaches. LCDR Fane, E.R.F. Johnson, Al Dyer and an Army Reserve officer, a friend of Fane's, were also on board. Johnson suggested to Fane that he could attach an external flash gun to the previously described still camera, load the camera with infra-red film and provide an SB pilot with two or three infra-red flash bulbs to permit clandestine, night photography of the beach defenses. Such photography, provided to the approaching amphibious force in addition to the coded beach reconnaissance messages normally transmitted by radio would enhance SUBOPS's and UDT's reputations considerably. Fane decided to send me into RED Beach in the SB to obtain infra-red photography of the beach defenses. It was probably on D-2 night that the submarine made a long, submerged approach to the objective area, an approach made eerie in its final stages as the submarine scrapped over sandbars. About two miles off RED Beach, scraping bottom at periscope depth, the skipper bottomed the boat. Two pairs of swimmers locked out to unload the SB from its hangar. Then I locked out with a safety partner. and manned the SB.

After surfacing the Sleeping Beauty, I blew it dry and headed for RED Beach fully surfaced. Navigation wasn't difficult on the initial run in. The submarine's Navigator had given me a vector to RED Beach and I had my magnetic compass and the silhouette of Vieques Island stood out clearly so that I could pick out the approximate location of the beach. Only a slight swell was running and I didn't have to use my LARU on the initial part of the run in. About 400 yards seaward of the shallow bay on which RED Beach lay, I purged my LARU of air, put it on and went onto oxygen. Then, I trimmed down the SB to run with the deck awash; I was prepared to submerge quickly if I sighted any patrol craft but none were evident. There was a small islet in the middle of the RED Beach about 200 yards off the center of the beach. I decided to run in under the cover of that islet before submerging, skirt the island, then run fully submerged into the beach. Once submerged, running at a depth of about ten feet, I had to rely in my magnetic compass. I porpoised to the surface once for a quick look but saw no surface craft and I seemed to be on course for a point about half way between the center and right flank of the landing beach. With perhaps 50 yards to go, I cut my speed to SLOW and crept in until I bottomed the boat in about eight feet of water. I was then about ten yards from the waterline. I left the SB,

removed the camera from its well and screwed in one of my three infra-red bulbs. I began swimming, then crawling cautiously along the bottom toward the beach. I knew that I was well covered with water but was concerned about causing some surface disturbance or stirring up enough sand to be detected from the beach. Finally, in less than two feet of water, I slowly raised my head until my eyes were just clear of the surface -- and found myself staring at a Marine sentry leaning against a concrete tetrahedron about five yards away. I pulled back under and backed off a yard or two to get a little more water over myself, then put my head out again. The sentry was still there, maybe asleep, maybe dreaming about his girl friend, but apparently unaware of my presence.

The situation seemed perfect to me. I pulled the camera just above the surface of the water and fired one shot of barbed wire and jetted steel rails near the center of the beach, wound the film, replaced the infra-red bulb and took another shot, angled along the length of the beach. Then, unable to resist any longer, I went under again to creep directly toward the sentry until I was in water shallow enough that my head and butt were exposed. There, I fired the last of my infra-red bulbs, taking a picture of the sentry from no more than four yards away. It was hard for me to imagine that the sentry couldn't see me or something of the infra-red flash but the sentry didn't react and, as I backed into deeper water, I figured I had got away with it. However, by the time I relocated the SB, restowed the camera and got into the cockpit, I knew that my efforts had taken a toll. Whether from chill, although the water was fairly warm, excess adrenaline, or something worse, I was shivering vigorously. Still, I didn't believe that I was encountering any serious physical problem. Clearly, though, it was time to withdraw. I told myself to calm down and reached down to crack the air valves to bleed a little water out of the ballast tanks to lift the SB just clear of the bottom before getting underway.

Suddenly, something clapped me on the shoulder; then something else covered the glass of my face mask. It scared the hell out of me and I instinctively went for my combat knife. Fortunately I couldn't get the knife out easily in the cramped cockpit and before I could, a swimmer appeared in front of me and reached over to push the "assailant" away from me. The swimmer pulled off his face mask and stuck his face in mine but I had already recognized the friendly face of Al Foster. In the meantime, Foster pulled the Army Reserve major none to gently away from the area. I gave Foster a thumb up as the pair disappeared in the cloudy water. As it turned out, after I left the submarine, Fane had directed a rubber-boat crew under Chief Foster to conduct a surface reconnaissance of RED beach. He authorized the major to accompany the UDT crew as an observer. The good major not only risked blowing the operation but, in the instant before an alert Foster calmed the situation, risked getting himself knifed.

Somewhat calmed down, I ran out from RED Beach at a depth of about ten feet until I thought I was clear and then blew the ballast tanks until I was running awash. With no beach silhouette to rely on and nothing but the tip of a submarine periscope as a target, I had to rely entirely on the magnetic compass and clock for navigation. It had taken me about an hour to run into the beach so I figured that I would run to seaward for an hour, keeping the best magnetic course I could, then run parallel to the beach searching for the submarine.

Once well clear of the approach to the bay on which RED Beach was located, I blew the tanks and surfaced fully. But the seas were beginning to develop a noticeable chop which was

creating quite a bit of spray so I stayed on oxygen for a while. It wasn't long, though, before I started to get a headache and realized that I was no longer thinking very clearly. I thought that the Baralyme canister of my LARU must be leaking and that I was experiencing the first stages of CO2 intoxication. At that point, running fully surfaced, I closed my oxygen supply valve and removed my face mask. I wanted to save what was left of the capability of the LARU to get me back into the submarine. I was taking a lot of spray in the face by this time, it was very dark, I wasn't keeping a very steady course in the chop and I wasn't at all sure of where I was or where the submarine was. Once, I considered turning around and running back in on the surface to beach the boat. There was no way I could miss Viecques Island. But that would have negated everything so I kept going. By the time an hour and a half had elapsed, I was getting very worried.

Then, out of the darkness, I heard, very faintly, a long, drawn-out "Brigadoon"⁸ At first, I thought I was hallucinating, done for. But I turned toward the sound and, a minute or so later, heard it again a bit louder. I steered directly for the sound then and, a couple of minutes later, saw a dark, bulky silhouette. Suddenly, there was Chief "Andy" Devine hanging to the submarine's extended periscope calling out at the top of his voice. I think it was luck more than anything else but I had missed the submarine by only a hundred yards or so. There was no question though, that had Andy Devine not made himself into a human homing beacon, I would have gone right on past, out to sea -- or would have exhausted myself searching fruitlessly for a slender periscope in a very large Caribbean Sea. A recovery crew soon popped to the surface and, too far gone to trust myself to take the SB down, I asked Kappesser to take the boat down on deck. I immediately put my face piece on, went back on oxygen and went on down to be locked in.

Back in the submarine, I sat in the wardroom babbling excitedly, or so they told me later. I felt exhausted but, at the same time, exhilarated. I guess I knew that I was rattling on like an idiot but I simply couldn't shut up. For one thing, I was waiting anxiously for Al Dyer to develop the film. There was nothing I wanted more than to see the picture I had taken of the Marine sentry in the middle of a dark night from a distance of a few yards without being detected. Finally, Johnson appeared in the hatch of the tiny wardroom with a glum expression on his face; Dyer was standing behind him. As gently as possible, Johnson told me that the film had come up blank. "My God," I thought, "what did I do wrong?" In that first moment, I felt that I had blown the whole operation. Johnson, though, quickly told me that it wasn't my fault, that there was no way I could have known and nothing I could have done. When the developed film came up blank, they checked the camera and found that the flash was a fraction of a second out of synch with the camera's shutter. It wasn't anyone's fault, just Murphy's Law at work. Despite later reports to higher authorities that night photography of the beach had been obtained, there weren't any pictures. For me, it was a bitter disappointment and I know that Johnson and Dyer felt just as bad. Still, we had added another notch to justification for submersible operations. We had pulled off the operation, the men on the launch and recovery crews, the THREADFIN's skipper and his crew and, of course, Andy Devine. We had proved that we could do what we set

⁸One morning in The Brig when I was mouthing off with some specious profundities, QM3 Barney Weathers announced, "Thank you Finian J. Brigadoon." referring, of course, to "The World's Smartest Man" character in the "L'il Abner" comic strip. Weathers put neatly in my place and tagged me with a nickname which still persists in certain quarters.

out to do and, in the end, were stymied only by a technological glitch. Murphy's Law.

There were a good many new faces back at Little Creek by this time. Except for LCDR Fane, the wartime officers had all left. LTJGs Bill Huckenpoehler and Jim Paulick, Naval Academy alumni, had graduated with Replacement Training Class 3. LTJGs Arsenault and Howard had arrived from the Explosive Ordnance Disposal Unit at Indian Head, Maryland.. They were the only nonvolunteer officers to enter UDT at that time but the addition of explosive ordnance disposal skills was clearly to UDT's advantage. LTJGs Boule, Moore, Clark, Smith and Huddleston qualified during 1949 or 1950. LTJG "Mac" McStay completed training despite a good ten years in age on most trainees. He was a former Chief Warrant Gunner and an acknowledged expert on explosives. Mac taught us such niceties as using explosives of different firing rates in the same array of charges to achieve maximum effectiveness in such tasks as ramping sand scarps, foreshadowing the sophisticated techniques now used to demolish large buildings.

One of the training classes had enough officers to constitute an all-officer rubber boat crew for the "Around the World" course during Hell Week.⁹ Clark, Smith and Boule were part of that officer crew. Al Jones and I, as Training Officers for that class, rode the trainees unmercifully during that night exercise, tracking them all the way, jumping them from ambush whenever someone cursed an obstacle or tried to light a cigarette. The officer crew almost had it made that night when I caught them portaging their boat along a paved stretch of road on a shortcut back to Beach 7. I ordered them to go to Beach 7 and start over. They finished their second time over the course sometime the next afternoon. I don't think those guys have ever forgiven me but I must say that they really earned their subsequent qualification.

SUBOPS itself remained fairly stable. All selected volunteers, most of the men stayed with UDT and SUBOPS although, as previously noted, some were absent for periods of special training and, as some men left for other duties or to leave the Navy, selected replacements from later training classes joined SUBOPS. New faces from outside UDT also "joined" SUBOPS from time to time. Army Warrant Officer Williams, a reconnaissance expert and skilled photographer was detailed to six months' temporary duty with UDT and was assigned to SUBOPS during that period as Assistant Platoon Officer. Fane was able to bring in Count Roberto Frassetto, a former Italian Navy officer who had participated in swimmer and small submersible assaults on British warships in the Mediterranean Sea during World War II, to Little Creek. He spent several weeks with SUBOPS, giving us the benefit of his experience. Frassetto returned to Little Creek several times during the next few years.

Another visit to UDT and SUBOPS at Little Creek was to have a profound effect, not only on UDT, but on American society and its recreational customs. While SUBOPS was doing its work at Little Creek, New London and in the Caribbean, a French Navy officer, Commandant Jacques Yves Cousteau (not as famous then as he came to be in later years,) had been pursuing vigorously the development of underwater swimmer capabilities for the French Navy. Cousteau

⁹The Amphibious Base at Little Creek had not yet been paved over. The all-night rubber boat exercise called "Around the World" took the trainees over rock jetties, through marshy areas where the trainees had to find their way through a tangle of open channels, most of which led nowhere, through the swamp into which the bases' waste disposal plant discharged, along narrow drainage ditches clogged with rocks and stumps. It was a tough exercise.

was concentrating his effort on use of an open-system, non-recirculating breathing apparatus in which compressed air is fed to the diver through a three stage pressure valve, then exhausted to the sea as the diver exhales. Such an apparatus had the advantage of virtually eliminating the danger of oxygen toxicity although the diver did remain vulnerable to other common diving hazards. Fane had heard about Cousteau's work. He made contact with Cousteau, then met with him when Cousteau visited New York. As a result, in the Spring of 1949, Emile Gagnon arrived at Little Creek with a one-bottle Cousteau unit. Gagnon was an engineer employed by Cousteau and the key designer of the air pressure regulator which was the heart of the Cousteau lung. Gagnon spent several days with the SUBOPS men, teaching them how to use and maintain the Cousteau equipment.

Shortly after Gagnon's visit, SUBOPS again deployed to New London. There, Fane made the first dive ever in the United States with the Cousteau-designed breathing apparatus. SUBOPS men followed Fane in diving the gear in the 100' tower. Not long after that, Cousteau licensed the manufacture of his equipment in the United States where it was first put on the open market under the trade name, Aqua-Lung . SUBOPS quickly acquired a number of two-bottle Aqua-Lungs .

Although the Cousteau system open system offered obvious advantages for SUBOPS work, particularly the ability to dive deeper without worrying about oxygen toxicity, we weren't ready to give up on closed, recirculating oxygen systems. I, for one, was concerned with the loss of concealment caused by the stream of bubbles emitted by an open-system apparatus. Others objected to the mouthpiece which replaced the face-covering mask of the LARU and the loss of voice communication between swimmers. Hale and Rollins, who often swam together, learned Basic Sign Language so that they could communicate by hand while using Aqua-Lungs. Although the two bottle Aqua-Lungs obtained by UDT provided ample dive time, they were much bulkier than the LARU, making exits from submarine escape trunks even more problematical. The Aqua-Lungs also created a pesky logistics problem for SUBOPS. Pure oxygen of breathing quality for the LARUs had been readily available from the Navy supply system, the same oxygen used by aviators. We needed much larger volumes of compressed air for the Aqua-Lungs . Ironically, compressed air which one would think more easily available than pure oxygen wasn't available, not in breathing quality. When it was available in large tanks, it was often contaminated with oil and other impurities. We got a commercial compressor but, like most commercial compressors, it didn't provide oil-free air. As they did so many times in those years, the SUBOPS crew went work to jury rig a filter system using old oxygen bottles filled with diatomaceous earth. However, the home-made filter system never worked very well. Finally a very expensive commercial compressor designed to provide breathable compressed air was obtained.¹⁰

¹⁰In those days, the quarterly operating allotment of each Underwater Demolition Team was \$400. That was intended to cover all of the ordinary material and supply expenses of the team. Overexpenditure could result in severe sanctions against the commanding officer. UDT men, in these circumstances became adept at begging, stealing, borrowing and improvising. For something like Aqua-Lungs an expensive compressor, funds had to be obtained from higher commands: from COMPHIBLANT or BuSHIPS, for example. Higher commands weren't always enthusiastic about funding the wish lists of unorthodox units such as SUBOPS. It fell to LCDR Fane to find and justify funding sources for special items. At our level in SUBOPS, we didn't always know how he did it, but he was very successful. .

Despite the advent of Aqua-Lungs, research into the physiology of oxygen toxicity was continuing at New London so the visits to the Submarine Base continued. On one of these visits, Fane and several of the most experienced SUBOPS men undertook a grueling series of experiments in the large compression chamber at the foot of the 100' tower. The purpose of these experiments was twofold: first, to test the swimmer's endurance on pure oxygen at increasing increments of pressure; second, to try to get blood samples from swimmers who were just at the threshold of acute oxygen toxicity so that the German physiologist, Dr. Schaefer, could conduct blood analyses. The pressure chamber was filled with about three feet of water. Air pressure in the chamber was then increased until it equaled the hydrostatic pressure of sea water at the desired depth. With appropriate air pressure in the chamber, swimming in three feet of water was physiologically the same as swimming at 10 feet, 20 feet, whatever the selected test depth. The swimmers, wearing LARUs and breathing pure oxygen, were to swim laps around the tank continuously until they began to experience adverse symptoms or until the test at that depth was halted. This became a very boring and, as the air and water in the tank warmed under increased pressure, tiring procedure. There is nothing like swimming around in tight, little ovals (the chamber was probably about 10' x20') for several hours on end. The test started at a simulated depth of ten feet and increased in ten foot increments. In addition to the chamber operators from the tower staff, UDT's medic, HMC Drane, was at one corner of the tank observing each swimmer as he passed, trying to detect any sign of a possible problem. Nothing happened until we had been working for some time at, I believe, the 40' level. Once again, I was the first to go.

My experience provided an excellent example of the insidiousness of oxygen toxicity. Dr. Schaefer had talked to the swimmers time and again about euphoria being one of the very first symptoms of oxygen toxicity.¹¹

I was rounding the corner at Chief Drane's end of the tank, feeling very strong. I saw Drane stick his head under water to check me out and I gave Drane a thumb up. Then, I realized that I had been laughing as I signalled Drane and, an instant later, I felt the characteristic twitching of a muscle in the calf of my right leg. I knew instantly that I was just at the threshold of acute toxicity. I can still remember that I felt very good, even sort of proud, because I was certain that I was right on the threshold but wasn't going out. Doc Schaeffer was going to love my blood. I immediately stood up, closed my supply valve, ripped off my face mask and took a deep breath of ambient air, still thinking that I was fine. Then I felt myself tipping over backwards and starting to floating up into the air.

My experience might have demonstrated another aspect of oxygen toxicity. Oxygen toxicity was thought to be intimately related to CO2 levels; it was thought that increased levels of CO2 lowered the threshold of oxygen toxicity, Although I probably would have convulsed anyway -- once you detect symptoms, you are usually gone -- I didn't go fully out until I removed my face mask and took that first full breath of ambient air. It turned out that the air in the chamber hadn't been recirculated for some minutes and there very likely was a relatively high concentration of CO2 in the chamber. It is possible that I might have been a good subject for Dr. Schaefer until that first breath of CO2 laced air kicked me over into a full-scale epileptiform convulsion.

¹¹ We were always amused by the Herr Doktor's rich, rolling, Germanic pronunciation of what we called "youFORia" -- he pronounced it, "oyphorEEa."

I knew nothing else until I woke up momentarily in the lobby of the Base Dispensary where some idiot was tickling the sole of my foot and asking me stupid questions: what was my name, where was I, what month and day of the week was it? I apparently answered all of his questions correctly until he asked me what year it was. I told him, "1789" and the next things I knew was when I woke up in a Dispensary bed several hours later feeling as if I had just finished 60 minutes of football with the Chicago Bears. I also began to feel quite depressed because I figured that my days in UDT were over. Fane would never put up with an officer so weak as to have suffered epileptiform seizures on two occasions. About then, I heard incoherent noises from the bed next to mine. My sense of depression passed when I rolled over to look and saw Fane lying there, muttering, "Where am I?" I was released from the Dispensary the next morning, with a permanent entry in my Medical Record that read, "LTJG Bruce Dunning was released from the Dispensary, U.S. Navy Submarine Base, New London this date with a minimum of mental confusion."

Following these deep tests, it was decided that we should run some simple endurance tests in shallow water. This time, the swimmers were to swim laps in the Base Swimming Pool, wearing LARUs, of course. This was simply a control test to determine if oxygen toxicity could be induced at shallow depths by fatigue alone, or if depth and its accompanying pressure was the crucial factor. With the convulsive experience in mind, Fane made sure that each swimmer was willing to participate. Although I doubt that any of us were excited by the prospect of swimming endless laps in a swimming pool all of the SUBOPS men agreed. One officer and two or three enlisted men who were not regularly assigned to SUBOPS opted out. In any event, we swam for probably a couple of hours with no one experiencing any symptoms. The only results were a bunch of tired swimmers. While this exercise didn't prove anything, it supported the hypothesis that pressure was the villain in oxygen toxicity.

I think that both the work on oxygen with the old LARUs and the advent of Aqua-Lungs have had curiously intertwined effects which we didn't recognize in those days. Much of the equipment that present-day SEALs, for example, have available simply hadn't been developed. Except for UDT and a few pioneers such as E.R.F. Johnson and Dr. Lambertsen, skin diving in those days consisted mostly of a few people equipped with swim fins, face masks and "schnorkels" which had been brought to the public's attention when UDT's wartime exploits began to be publicized. Cousteau's development and the Aqua-Lung changed all that, starting the skin-diving rage and a subsequent increase in research and development of underwater equipment. I suspect that the rapid increase in the public's interest in the underwater environment also stimulated the Navy's growing interest in exploiting that environment with combat swimmers. In any event, new equipment which combined the relative safety advantages of the Aqua-Lungs with the concealment advantages of closed systems were soon to appear. However, I may be speaking out of turn: the mixed-gas systems now available to SEALs appeared after my time in UDT and I have only the vaguest knowledge of them. But I would like to think that the work that we did back in the late 40's, with both types of breathing apparatuses, contributed not only to the development of modern equipment for combat swimmers but also to the recreational revolution which made "SCUBA-diving" available to almost anyone.

UDT at Little Creek was in almost constant demand for demonstrations, sometimes carrying out their usual reconnaissance and demolition missions during amphibious landings

conducted for the public, sometimes providing both static displays and dynamic demonstrations at special events. These demonstrations were so popular that, at one point, the Secretary of the Navy personally “requested” that UDT provide both a static display and a dynamic demonstration during all-Service demonstrations at the Ordnance Manufacturers’ Association Convention at Selfridge Air Force Base near Detroit. The Secretary’s request specified that we should include the use of explosives. Needless to say, UDT complied. But with only three days warning, the UDT detachment had to hustle to get to Detroit with both a static display and explosives for a dynamic , beach-clearance demonstration. The request from SECNAV came on a Sunday by a telephone call from the Secretary’s Military Assistant. I happened to be the UDT Duty Officer that morning and had to get things rolling so that a good part of the detachment lined up for the show came from SUBOPS. Sam Bailey and George Kudravitz took off early on Monday with explosives loaded in a truck pried out of Little Creek’s Base Motor Pool. We tapped “Dusty” Rhodes to go along as coxswain of whatever kind of boat we could borrow from the Air Force at Selfridge. Sam Bailey, Foster and Devine got the rest of the crew moving putting together whatever material they thought might be useful in a static display as well as fabricating dummy obstacles out of Celotex. The rest of us flew to Detroit just in time to get set up for the show. The static display in an Air Force hangar attracted considerable interest but the payoff came with a dynamic demonstration of a beach clearance mission on Lake St. Clair before a crowd of several thousand people. Actually, our show was pretty routine: cast of swimmers from an Air Force rescue skimmer, placement of charges on dummy obstacles, recovery of swimmers, then a second boat run to snatch the fuse puller from the water seconds before the scheduled detonation. (The charges actually were fired electrically by Foster and Devine, hidden under the grandstand..) But the “fuse puller” that day was GM2 Hugh Peddy who, I emphasized in my commentary, was born and raised in Hamtramck. The crowd loved it. Because of Peddy, the next day’s press coverage of the day’s demonstration was dominated by UDT’s part, much to the chagrin of the Air Force.

There was a continuing effort to think up new and more dramatic ways to demonstrate UDT capabilities. Desire to spice up static displays and SUBOPS’ search for a way to display their capabilities led to a new SUBOPS project. Some of the SUBOPS men had served as underwater observers while landing craft were run at full speed into beach obstacles as part of joint Army-Navy tests of beach obstacle designs. Commanding Officer, Construction Battalion 2, based at Little Creek was the Navy coordinator of these tests. The CB commander had taken advantage of SUBOPS’ performance during these tests to stress on his Army and Marine Corps counterparts the versatility of the Navy. He owed SUBOPS one. So, the CBs delivered one of their modular pontoon sections to The Brig. This was a heavy-steel cube, approximately 7’x7’x7’. SUBOPS men , with John Dolan as lead welder, first cut out the top of the cube, then cut a large window, about 6’x6’ in one side. Using materials begged from various sources, they devised a frame and gasket system to hold a 1/2” tempered glass window over the opening so that the assembly was watertight. Unfortunately, the glass had to be purchased with team funds and it didn’t come cheap. Even more unfortunately, the glass window cracked the first time we tried to tighten down the frame. The project almost came a cropper at that point. But someone got the idea of using Plexiglass. A sheet of very heavy Plexiglass was obtained by some unreported means. With the Plexiglass in place, the men started to fill the tank with water. It was a dicey half-hour or so while the tank filled because, if the Plexiglass were to break, that much water would come out with explosive force. The Plexiglass held. From then on the tank was used

in displays for a good many years. Swimmers wearing lungs cavorted in the tank, waved to spectators, showed off in all sorts of ways. A bunch of hams. One of the favorite ploys was to put two men into the tank for a game of checkers using a checkerboard of steel plate, with painted washers as checkers.

But the demand for UDT participation in demonstrations was to lead to a major tragedy. During a good many demonstration amphibious landings, UDT was required to simulate the explosions on the beach of gunfire from Navy ships offshore as well as bombs and machine-gun fire from supporting aircraft. UDT men became quite proficient at using controlled explosives Hollywood-style to simulate naval gunfire and air bombardment preparation of landing beaches. But higher authorities always wanted more realistic simulations. One of the demands was for simulated anti-aircraft fire, supposedly from defending forces on the beach. The 4th-of-July type Roman candles the UDT men usually used weren't very convincing. Mac McStay came up with the idea of using a Ship's Emergency Identification Signal (SEIS) and modified SEIS projectiles to simulate the airbursts of anti-aircraft fire.

SEIS projectiles were aluminum canisters containing a small propelling charge, a bursting charge and a pyrotechnic element attached to a parachute. On being dropped into the mortar-like SEIS tube, the projectile was propelled about 150 feet into the air at which point the canister was burst, the parachute deployed and the brightly-burning pyrotechnic element floated down. McStay taped a M3A3 hand-grenade detonator into the detonator well of a 1/2 pound block of TNT, replaced the pyrotechnic element of the SEIS projectile with the primed TNT block and attached the parachute to the TNT block. To fire a charge, the pin was first pulled from the hand-grenade detonator. But with the actuating lever of the grenade detonator held tightly within the SEIS canister, the TNT theoretically could not detonate until the projectile was dropped into the mortar tube and propelled into the air, at which point the bursting charge would fire. Bursting of the canister released the actuating handle of the grenade, initiating the three-second delay of the M3A3 detonator. The TNT block would then float down on the parachute until it detonated at an altitude of about 90 feet. Test shots at Little Creek apparently worked perfectly.

In late August of 1949, UDT 2 deployed on an LST to participate in a demonstration landing at Atlantic City, New Jersey while the Miss America contest was being held there. UDT's part in the Atlantic City demonstration was fairly routine: cast and recovery of reconnaissance swimmers, destruction of dummy obstacles and use of controlled explosives on the beach to simulate both friendly naval gunfire and enemy fire. SUBOPS was ashore throughout D-1 afternoon and night, setting up the beach. It would have been a boring operation were it not for Miss America activities and the presence of numerous sightseers on the Boardwalk. Frank Hale recalled standing on the Boardwalk watching a Miss America photo-op session when a little old lady walked up to him and said, "If someone hit you on the head with an ax, little, hairy things would come flying out." Then she walked off. It takes all kinds. Bored, cold and hungry after a night spent on the beach with only a catnap under the Boardwalk and a little resentful of all those people sleeping comfortably in luxury hotels, I held 6:00 a.m. reveille by firing a two-pound block of tetrytol. It got the public's attention.

After the Atlantic City demonstration, the amphibious task group proceeded on to Boston

where a battalion-sized amphibious landing was scheduled to be held on Carson's Beach, a large public beach and park in South Boston. The landing was to be a feature of a convention of the Marine Corps League and interest from the highest levels of the Marine Corps and Navy was strong. McStay decided to use his "anti-aircraft" mortar there. Additionally, a large and complex field of controlled explosives was planned. The day before landing was devoted to laying in the controlled-explosive fields. Several SUBOPS men were working with McStay on the beach. Most of the rest of us from SUBOPS were responsible for about half of the park inland from Carson's Beach itself while other men from UDT 2 were working the other half of the hinterland. The whole operation got off to a bad start on D-1 Day when the Boston Police suddenly and without warning withdrew their security perimeter around the park at midafternoon and the area was immediately overrun with homebound school children. Before we could get the situation in hand, a dozen or so 1/2 pound blocks of TNT were stolen. The blocks were unprimed and, by themselves relatively harmless. Nonetheless, the possession of explosives by any number of unidentified persons caused Navy and Boston authorities grave concern. The public was not yet aware of this development. Then, shortly after the demonstration landing started on the following day, one of McStay's anti-aircraft charges exploded in the mortar tube. Exactly what went wrong in the tube of the mortar has never been fully explained, but the shattered mortar threw shrapnel directly into a crowd of Navy personnel and press representatives at the center of the beach. McStay had apparently spotted something wrong and tried to throw himself across the mortar but a piece of shrapnel struck Morris Fineberg, a highly-respected Boston news photographer, in the head killing him instantly. One other bystander, a Navy officer, received a non-life-threatening flesh wound. Mac McStay himself received severe shrapnel wounds in the abdominal area. UDT's HMC Drane was at Mc Stay's side immediately but despite all of his efforts, McStay's condition was grave when he reached a hospital a few minutes later. LTJG McStay died of his wounds a few days later. It is likely that McStay's effort to cover the mortar prevented many more casualties.

Those of us on controlled-explosives detail inland from the beach got a clue that something had happened when we heard Fane's voice come over the public address system. Fane prevented possible public panic when he grabbed the microphone away from the hysterical assigned narrator and, ad-libbing, continued the narration of the show's events. That something serious had happened was confirmed to us in our fire-control point when a UDT man from the beach passed at a dead run on his way to summon an ambulance parked at the perimeter of the park and shouted to us that the mortar had exploded.

The tragedy inflamed public opinion, made worse when news of the missing explosives became known. Then, the affair became embroiled in Boston politics at a time when Mayor Curley was fighting to retain office in what was to mark the end of his political career. The affair received front-page coverage in the news media, of course, and the media were assiduous in covering related developments for some time. However, I was impressed by the fairness of reporters when, on several occasions, they asked me for explanations of apparently contradictory statements before they rushed stories into print.

A deeply saddened UDT2 returned to Little Creek from Boston, less several officers and a number of men who remained in Boston during a long and ultimately inconclusive Court of Inquiry convened by Commander, First Naval District. After the inquiry, a detail from SUBOPS

remained in Boston for several more weeks searching Carson's Beach and the park, even covering the bottom of Boston Harbor with a Naval Shipyard designed "plow" towed by a yard tug. All that plow achieved was to stop the tug dead in its tracks as the plow buried itself in the bottom muck. The men patrolling the beach did recover one water shot, a 2 lb. block of tetrytol which floated ashore. That was the only primed charge missing during the operation. It was in the hands of a SUBOPS man within a minute of being found by a boy. As I recall, few if any of the unprimed TNT blocks missing from the Park on D-1 afternoon were ever recovered.

Back in Little Creek, UDT and its SUBOPS element tried to put Boston behind them and get on with their work. The first opportunity to give Aqua-Lungs a rigorous, operational test came in December, 1949 when CINCLANTFLT asked UDT to attempt to clear a wreck lying in 60 feet of water in Chesapeake Bay. Conventional divers had been unable to make much progress in removing the menace to navigation because of swift tidal currents which limited their dives to short periods of slack tide. Fane led a detail of SUBOPS men on Aqua-Lung dives to the wreck to place explosive charges while the ubiquitous Fen Johnson photographed the proceedings. Working under extremely severe conditions for a number of days, Fane and his crew were able to demolish the wreck. Fane, Johnson, Devine, Foster, Bailey, Piotrowski, Petway and Kappesser received Letters of Commendation from CINCLANTFLT for their work. The knowledge of the men who had gone to deep-sea diving school was especially valuable during this operation since they were well-trained in the limits of diving stay-time as well as in the use of decompression tables, absolute necessities in sustained air dives with the Aqua-Lung

I played no part in this operation.

In early 1950, it was off to St. Thomas again for SUBOPS. The deployment was marked at the outset by a typical hassle with "conventional forces." The SUBOPS detachment, along with a large amount of equipment and half-a-ton of explosives was transported from Norfolk to Roosevelt Roads, P.R. in an AKA which also carried a large contingent of Marine service troops. From there, a LCU was to take SUBOPS and the gear to St. Thomas. On arrival at Rosie Roads, I found the LCU beached on a ramp several hundred yards from the AKA's berth. That night, I contacted the Marine captain who was CO of a transportation company and got his promise to provide a 6x6 truck to transfer the explosives and gear from shipside to the LCU on the following morning. As soon as the explosives and gear were offloaded from the AKA, the UDT men started loading the truck provided by the Marine captain. The truck was about half loaded when an irate Marine colonel appeared on the scene screaming that we had no authority to "commandeer" a Marine vehicle. I tried to explain that I had requested and received permission to use the truck for one trip and turned to the CO of the Transportation Company for confirmation. That sterling officer promptly denied that he had ever given such permission and denied ever talking to me. Threatened with court-martial and ordered by the still raging colonel to unload the truck, the men started doing so, piling it on the pier and covering it with a tarpaulin. More for appearance's sake than urgent need, the men started wetting down the tarp with buckets of water. Hauling all that material to the LCU on foot would have taken days. So I went aboard the AKA, found the Executive Officer, told him there was half-a-ton of explosives sitting on the pier next to the ship's side in imminent danger of "cooking off" (a gross exaggeration) and that transportation was urgently needed. The Exec found his Captain who immediately rushed to the pier to find the Marine colonel. After lengthy negotiations, the still incensed colonel relented, but

only after making it clear to me that any recurrence of the affair would mark the end of my career and extracting a promise that the truck would be returned in 15 minutes. Of course, it took over an hour to load the truck, move it to the LCU and unload it. Either the colonel forgot about the time or couldn't find us and we were soon off on a slow, pleasant cruise to St. Thomas. I must add that the case of the purloined truck was an aberration: UDT and Marines, especially Marine reconnaissance units, often worked together and enjoyed considerable mutual respect.

It was probably during this deployment that Al Jones and I were ordered to use explosives to turn a rocky shoreline into a sandy beach. A former Navy hospital at the edge of a small bay near Charlotte Amalie had been turned into a hotel. The hotel owner didn't have a nice sand beach for his guests and he wanted one. Fane negotiated a deal to exchange our transformation of the beach for a steak dinner for the UDT men. We worked for a couple of days but succeeded only in making slightly smaller chunks of coral out of very large reefs -- no sand. (I learned there that "mud-capping" doesn't work with sand.) Fane came by to inspect our progress and, seeing none, directed us to use larger charges. The operation ended when, under the influence of increasingly large charges, a crack appeared in the concrete-block front of the hotel from eave to foundation. Fane must have been persuasive, though, because we got our steak dinner anyway.

With fleet exercises commencing, the SUBOPS crew again embarked in a submarine at the St. Thomas pier and headed for Viecques to conduct reconnaissance on Red Beach. I believe that it was during this operation that a 7-man rubber boat lashed on the afterdeck of the submarine broke loose as the submarine approached the objective area at periscope depth. The skipper, using his periscope, suddenly saw a rubber boat flapping around in the current. Both Fane and the submarine's skipper were understandably incensed at this example of sloppy seamanship. The submarine surfaced so that a crew could go on deck to secure the boat. Moderately rough seas were running and fairly large waves smashed over the deck of the nearly awash submarine. The crew trying to corral the boat took quite a beating. Hale was battered when he got caught between the lurching boat and the after part of the conning tower. I had gone forward of the conning tower to retrieve something and was slammed into an ammunition locker, jamming my leg between the handle on the hatch and the hatch itself. When the boat was secured and we returned below, I found a 3/4", bone deep split in the flesh of my shin. Joe DiMartino and I had been scheduled to make a two-mile swim later that night to the small islet off the center of Red Beach, there to remain throughout the next day, observing and photographing the beach. On the next night, we were to swim back out to sea to be picked up by the submarine. I wasn't wildly enthusiastic about the prospect of two long night-swims and even less enthusiastic about spending a full day sitting under a hot sun on top of a treeless, guano-caked rock. Besides, we had no good way of waterproofing the 35 mm. camera we were to use; we didn't have one of Johnson's waterproofed cameras. I don't really know but I think Di Martino was just about as unenthusiastic as I was. In any event, I chickened out and used my "wound" to get Fane to cancel our mission.

Not long after SUBOPS returned to Little Creek, LCDR F.D. Fane was transferred to the West Coast teams where he continued his pioneering work in underwater operations. Most of the SUBOPS men were busy training yet another Replacement Training Class when CDR Raymond A. Hundevadt, USN (now deceased) arrived to take over as COMUDTLANT and CO, UDT 4.

At about the same time, LCDR L.L. Hoyt, USN, a recent RTC graduate, assumed command of UDT 2

As the Summer of 1950 approached, so did big changes for UDT and SUBOPS. With the burgeoning of popularity of the Aqua-Lung, public interest increased Navy interest in underwater operations and, along with that interest, increased willingness to support research and development aimed at improving the capabilities and expanding the missions of the Navy's combat swimmers. The British Royal Navy's X-7, the submersible which had sunk the German pocket battleship TIRPITZ, was scheduled to visit Little Creek for combined operations with SUBOPS. And, although the UDT men had no foreknowledge of it, the Korean War would start in June. Ultimately, Fane and a good many UDT men would see combat action in Korea where they chalked up a remarkable record of achievements.

About a week after the North Koreans invaded South Korea, I received orders to report to USS NEWPORT NEWS (CA 148) for duty. At that time, most of us in SUBOPS were sure that we would be on our way to the Pacific within days and we were busy getting equipment into top shape. If this was to be the case, I wanted to be with them. I called the LTJG Detailer at BuPers to beg him for a year's extension of my tour of duty in UDT, to no avail.

LTJG Philip Clark relieved me as SUBOPS Platoon Officer. Subsequently, after Phil Clark left for duty in Washington, Lieutenants William Huckenpoehler (now deceased,) A.A. Moore and Robert Fay (killed in action in Vietnam in 1966,) among others served as SUBOPS officers.

There were things happening at the upper reaches of the Navy's hierarchy in Washington of which BuPers apparently wasn't aware. NEWPORT NEWS was good duty and a very valuable experience for me. But in early 1951 I was plucked off after three or four months and sent to Ft. Benning, Georgia for a four-month, joint-Services training course including, among other things, qualification in the Army's Basic Airborne Course. Al Jones, Bill Thede from a West Coast Team, and several others followed me through that course. Qualification as parachutists wasn't as yet part of UDT's training or mission but, we were selected for the training at Fort Benning precisely because we had been UDT officers. BuPers got their hooks into me again, however,. When I returned to Washington and BuPers for reassignment after I left Ft. Benning, I found myself facing the same Detailer who had refused to extend me in UDT. When he discovered, apparently for the first time, that I had been jumping out of airplanes instead of standing watches on the bridge of a combatant ship, he went ballistic and ordered me straight back to USS NEWPORT NEWS. However, thanks to a contact I had made at Ft. Benning, I was again plucked off the NEWS after several months, to report for duty elsewhere. Even so, I didn't make it to Korea until I did an interesting four-month tour there in 1953.

This is what I now remember. I know that I have left much out which should be included and have undoubtedly got the facts wrong more than once. I know that I have failed to give credit where credit is due.

I apologize to those I have unintentionally short-changed. This story is simply one version of what

really happened. I offer it in the hope that it will stimulate others to correct my errors, fill the gaps I have left, add their recollections to an important period in the history of combat swimming and Navy Special Warfare.

The one thing that I do know beyond any doubt is that being associated with the men of UDT during those years, most especially being associated with the superb men of SUBOPS who took UDT underwater and, I truly believe, laid the groundwork for the future development of Navy Special Warfare, was one of the greatest privileges of my life.

*May 29, 2003
Fairfax, Virginia*

UNDERSEA & HYPERBARIC MEDICAL SOCIETY

ORAL HISTORY OF THE MAJOR PARTICIPANTS
IN U.S. NAVY UNDERSEA TECHNICAL DEVELOPMENTS

INTERVIEW OF CAPTAIN BRYAN BARRETT (RN)

PROCEEDINGS

MR. BARRETT: Hello. This is Brian Barrett. I was born in the United Kingdom, in England, in the town of Swindon.

INTERVIEWER: Brian, where did you go to school?

MR. BARRETT: After high school in the U.K., I went to Dartmouth, which is the Naval Academy in England, the equivalent of the U.S. Naval Academy, Annapolis. I joined in 1958 as a midshipman, and graduated from there. I went off to sea to finish my training in 1961.

INTERVIEWER: Since you gravitated to diving, I'm very curious as to whether you ever participated in any extracurricular sports activities while you were in school?

MR. BARRETT: I'd been interested in diving and underwater things, in general. I had always been interested in the water, in swimming and sailing, and those types of things. Those had always been principal interests of mine. It was fairly natural for me, once I was able to start the process, to qualify as a diver in the Navy.

INTERVIEWER: What influenced you to take up the Navy as a career?

MR. BARRETT: My father was in the Navy. Indeed, my great-uncle was in the Navy, so we'd always been in the service. My father was a submariner during World War II. He was a career submariner. He was at Dartmouth. It was fairly natural that I would just follow in my father's footsteps, go to Dartmouth and have a career as a naval officer.

INTERVIEWER: After leaving school, how long did you wait until you went into diving, or had dive training?

MR. BARRETT: In the Royal Navy, there are various levels of training as a diver, as is the case in the U.S. Navy. I started pretty much as soon as I could, once I finished my training, and that included my first 18 months or so at sea. I was the navigating officer of a minesweeper in the

Mediterranean in the early 1960s. Then, I qualified and went to training for what they called a 'shallow water diver,' which was really a skips diver, who did ship hull inspections, just as a sort of part-time specialization, if you like. I was a diving officer on a couple of ships before that. I then qualified full-time as a diver, and I started in 1961.

INTERVIEWER: Where did you do your dive training?

MR. BARRETT: My first lot of dive training was done in Portsmouth on what was then the *HMS Vernon*, which was sort of the home station facility for diving training in the U.K. I then did a further course, if memory serves me, in about 1962 or possibly 1963. It was in Plymouth at the Navy diving school. In those days, it was in Devonport. Then, I did a tour on an aircraft carrier as, among other things, diving officer in the Far East. I was a line officer, seaman specialist, and an 'executive officer,' as they're called in the Royal Navy. As a young lieutenant, you had the choice of specializing in a form of warfare specialization. In those days, there was a specialization called 'clearance diving,' which was a fairly small branch. Since then, it has changed slightly. I applied rather early to see if I could qualify to get a chance to specialize as a clearance diver. Indeed, I was selected to the course in 1965. It was a one-year course. They just had one entry of officers each year, and I was in the 1965 clearance diving officer's school. That was on the *HMS Vernon*.

INTERVIEWER: When you were the diving officer aboard the aircraft carrier, did you have enlisted divers for whom you had responsibility?

MR. BARRETT: Yes, absolutely. I had a team of divers. I actually had a chief petty officer, Clarence Syler, CD-1, who was the senior enlisted man working for me, running the dive team. We had, for example, search and rescue (SAR) helicopter divers who were part of the air group, and they came under my responsibility, at least as far as the diving side of their work was

concerned. We had ship diving team, as I recall. Maybe a dozen or so were like myself had other specializations, but we were also divers on the side, doing routine maintenance tasks and so forth.

INTERVIEWER: I'm very curious. Since it was a large ship that you were on, did it happen to have a small treatment chamber?

MR. BARRETT: No. We had none. Really, we would call them 'SCUBA divers.' It was self-contained, shallow water work. It wasn't anything very elaborate, from that point of view. It was clearing fowl screws and such. We kind of had a war going on with Indonesia back in the early 1960s in the Far East. We were doing hull searches and hull inspections and those types of things in Singapore, a hostile environment.

INTERVIEWER: Did you have a hard time getting the ship to shut off intakes and everything?

MR. BARRETT: That was always a battle, although we were able to do a lot of maintenance jobs in support of the engineer. Often, it involved closing off an intake from the outside lane to work on machinery inside and so on. They realized that we actually had a lot to contribute to the running of the ship. Generally, they were pretty much on our side.

INTERVIEWER: They listened to you.

MR. BARRETT: But it was an issue.

INTERVIEWER: Since your father was probably not a diver, I'm curious as to what motivated you to go into diving.

MR. BARRETT: Well, when I first joined the Navy it had been my intention to go into submarines so as to sort of follow in his footsteps. When I was still at the Naval Academy, I did a summer vacation tour. We went for a cruise for about a month or so on board one of the A-class submarines, a late World War II diesel boat. That was actually enough to persuade me that

I didn't want to do this for a career. Diving had always been something that fascinated me. As soon as I started my training in diving, I realized it was something I had a real affinity for and a real love of.

INTERVIEWER: I know that in the U.S. Navy, especially for a Naval Academy graduate to select it as his primary vocation in the Navy, diving is sometimes a very short track, as far as promotion is concerned. It's almost like cutting your throat.

MR. BARRETT: That's right. It's interesting you say that. In the Royal Navy, that was exactly the case. Indeed, I remember my father doing his utmost to dissuade me from doing it, and other senior officers said that it was not a good career move and so on. However, I'd say that in the Royal Navy, the promotion system is slightly different from the way it is in the States. In the States, the jump between commander to captain is sort of the big step. In the U.K., the big step is probably from lieutenant commander to commander, because you enter a zone in your year group. That zone is seven years long, and at each six-month interval along that zone, one or two people are picked out of your year group until after the seven years is up. If you haven't been selected by the end of the seven years, you're passed over and you'll never make commander. I entered the zone for promotion to lieutenant commander along with, I don't know, a hundred or so senior officers of my year group. I was actually the first one to be selected. I was selected at my first available shot at the age of 33, which was very young for promotion to commander. I think that vindicated my decision. I might say that my selection to commander was exactly at the time in the middle of my tour, when I was working with the U.S. Navy, and I'm sure we'll talk a little bit about that in due course.

INTERVIEWER: I'm looking back in history to see if there was something in the undersea world that the Navy felt was important enough to have some qualified people in the field of diving. I

just wonder if there was anything going on at that time that prompted your navy to say, “Well, we need some well-trained people in this field.”

MR. BARRETT: I don't think there was anything specific. I think there was always a very small number of people trickling into the branch. When I qualified in 1965 as a clearance diver, there were only four of us. In fact, eight of us started the course and four fell by the wayside. I actually graduated as the top student of the CD course of 1965. That was typical. Another year there might be three, four or five, or just very few people, because the branch was a very small one. I might say it has subsequently gotten much larger and we can talk about why that is in the course of the last twenty years. Back in those days, it was a very small specialization and still focused on explosive ordnance disposal, deep diving, and to some extent, sort of special operations work. But the sort of mainstream people undoubtedly viewed it as somewhat para-radical.

INTERVIEWER: That was kind of like the U.S. Navy.

MR. BARRETT: Yes, exactly. Generally, they had a very good reputation for getting the job done and for having good hands at work. Perhaps that was not the case in the mainstream. I like to think that I was one of the first officers, and there were many that followed, to bring the diving world back into the mainstream. In fact, I not only succeeded but also actually beat most of my generalist compatriots in the promotion stakes, with the sorts of jobs that I had. I went back onto the staff of the Naval Academy at Dartmouth as a divisional officer. I think that vindicated the decision that I made.

INTERVIEWER: Sure. Did you know John Harter at all?

MR. BARRETT: Yes. Yes, I did. I remember the name.

INTERVIEWER: I was going to say, because he was a Naval Academy graduate, had been at the Experimental Diving Unit (EDU), and was a diving officer there. Then, the Navy decided to send

him off as a commanding officer. The U.S. Navy wasn't really placing a great deal of importance on his specialized training. It was at that point that he got out of the Navy.

MR. BARRETT: Oh, sure. I remember the name. Our navy is much smaller. The jobs I had as a lieutenant and as a lieutenant commander were varied. I did a tour at the naval college at Dartmouth as a divisional officer. I was the executive officer of a destroyer. I worked at the Admiralty Underwater Weapons Research Establishment as an application officer. I had what were considered pretty good jobs. Then, I also had the tour with the U.S. Navy as an exchange officer. In fact, during my entire career as a lieutenant commander I only did a job and a half. I was picked up very early for commander.

INTERVIEWER: You were good.

MR. BARRETT: Yes, I was good. Then, having done a tour in the States, I went to our equivalent of the Pentagon, the naval staff. When I got back I was sent to a sea command and after that. I was picked up for captain. I was pretty much on the fast track.

INTERVIEWER: You mentioned having a duty here in the U.S. I noted that it was at the Experimental Diving Unit.

MR. BARRETT: Yes.

INTERVIEWER: I'm very curious to know what you thought about that tour of duty. Was it beneficial? Were there any lessons learned or any special cooperative tasks that were good for both navies?

MR. BARRETT: My naval career lasted 23 years because I chose to leave at the first available opportunity, once I was qualified for retirement, at the age of forty. I look back on my career and the absolute highlight of it was my tour with the U.S. Navy. I was asked if I wanted my name put up for that position, that job. Of course, I absolutely jumped at it immediately. I thought it was a

wonderful opportunity. At that time, I had not been involved in the sort of deep experimental saturation diving. All my diving had been as an EOD diver, in reasonably shallow water for explosive ordnance disposal. I was the executive officer of a mine hunter. I was on an operational diving team. Of course, it was an absolutely wonderful opportunity for me. I came over in 1973. It was the first time I'd ever been to the States. I'd never had actually set foot on the continent before. I traveled widely all over the Far East and in the Mediterranean and so forth, but I'd never had a chance to come to the States.

In those days, the EDU was, of course, in the Washington Navy Yard. The first year and half or so, or maybe the first two years of my tour, as I recall, was spent at the Washington Navy Yard. I was enjoying myself and enjoying the job so much that I applied to extend my time. Again, there were cries of "Oh, it's not going to be good for career. You need to get back into the mainstream." But EDU was scheduled to relocate to Panama City. I'd already had a lot of work in Panama City while I was working in Washington, and really wanted to get a chance to work at the Ocean Simulation Facility. Indeed, I was granted a third year of my tour. It was just at that time that I was surprised, and it surprised me more than anybody else, to be picked up for commander at that very early stage.

Anyway, I think it had gone on before the early 1970s, but certainly at the time that I was working at EDU, I had never come across such a close-knit international program as the one between the U.S. and the U.K., between the Royal Navy and U.S. Navy. This was how it was symbolized best for me. In 1975, when I was down at Panama City, we had the Mark I deep dive system, the HCU-1 from Norfolk. It was in Panama City, at the lab, doing what in those days was an open-sea world record dive. It was a 1,300-foot dive or something. The CO of the diving unit was a Brit on exchange, Bob Lusty. We had bunch of guys from the Admiralty Experimental

Diving Unit (AEDU) come over to provide some divers for the experiment. Their diving officer was an American, Stan Quiglensky, who was on exchange over there. We had a U.S. Navy diving medical officer who was on exchange at the AEDU.

INTERVIEWER: Who was that?

MR. BARRETT: I've actually forgotten who it was. The chief diver in the harbor clearance unit was another Brit on exchange. There we had a completely integrated structure of U.S. and Royal Navy Divers, all of whom were making a great contribution to their own navy and to the other navy. In a general sense, it was for the advancement of diving technologies and techniques. It was a really outstanding cooperative program. The superintendent of diving in the U.K. at the time was Guy Worsley, whom, of course, you know. Here in the States, it might have been Colin Jones. I've actually forgotten who was there, but the CO of the unit down in Panama City was Jack Ringleberg. The leadership of those people, who all of them were very supportive of this international exchange program under the information exchange program, was great. It was really most successful.

INTERVIEWER: I know that as far as the exchange of medical officers goes, it has just been a wonderful experience, and a major benefit to the U.S. Navy. The Royal Navy medical officers who came over here all undertook unusual research tasks and completed them.

MR. BARRETT: Yes.

INTERVIEWER: The U.S. Navy, in many cases, did not have the kind of background that some of these people had. For the U.S. Navy, it was a plus.

MR. BARRETT: I'm sure it was. Of course, we took back a huge amount of experience and knowledge. I like to think that I made a contribution to the EDU while I was there. I was the program manager, as well as a diving officer for the Ocean Simulation Facility and the saturation

diving program. Bill Spaur, our senior medical officer was running it, of course. I started actually a program for the development of a push-pull breathing system for work on the Mark II deep diving systems in San Diego. I initiated that program. I got it funded by NAVSEA and was the program manager for it both here in Washington and while I was down in Panama City. I know that I made a substantial contribution to the Mark XIV system.

INTERVIEWER: Were there any diving people in the Royal Navy who in some way influenced your career in diving, or was it all self-motivated?

MR. BARRETT: That's interesting. I think there were people who influenced me to some extent. You hit, right in the beginning, the career prospects for diving officers. To some extent, some of those who influenced most when I was young lieutenant under training were probably the people who tried to dissuade me from doing it in the first place. I'd always had a great deal of respect for some of the senior members of the diving branch. I received encouragement from some. I received a lot of encouragement as I got more involved in it and the more I read about experimental diving and saturation deep diving, the more and more I became fascinated by it. I supposed the person who encourages me and gave me the most influence was John Rawlins.

INTERVIEWER: I was going to ask you when you two met up.

MR. BARRETT: When I was first became a diver, he was a legendary figure. He was an enormously well known, well-respected and well-loved figure. You would be talking more about him, I'm sure, in your book, as a medical officer, but not as a clearance diver, or even as aviation medicine specialist for years and years. He knew every single person in the clearance diving branch. He knew every able seaman, every E-2, by nickname and who the seaman was, and where the seaman was working. He was absolutely phenomenal. He was a sort of father figure to many of us in the branch. I sort of got to know him before I became a clearance diver. Then,

once I was CD, I sort of came across him quite a lot. Indeed, I did some experimental dives with him in the chamber with him in Alverstoke at the Admiralty Experimental Diving Unit (AEDU). I'd always had a huge regard for him and still do. I think that of the people in the branch, he was probably the one that had most influence on me.

INTERVIEWER: Did you come across David Elliott?

MR. BARRETT: Yes, I did. I didn't work much with him. He was across at AEDU. I was more involved with the sort of operational Navy, so I didn't see that much of him.

INTERVIEWER: You never had duty at RNPL?

MR. BARRETT: No. I didn't. In fact, the only tour I did that was strictly in experimental diving was here in the States. Before I came here, I did about six months attached to the *HMS Vernon*, working at RMPL and AEDU, really learning a bit about saturation diving. I did a couple of saturation dives there to really to get my feet wet, as it were, so that when I came out here I'd at least have some understanding. In fact, at that time there were two U.S. officers on exchange with whom I worked. One was Quiglensky. The other was Jim Vorosmarti. I worked with Jim and Stan Quiglensky a bit.

INTERVIEWER: I forgot that Jim had duty down there.

MR. BARRETT: Yes. Jim was the medical officer there. It was about 1972 or 1973, about the time just before I came to the States.

INTERVIEWER: Did the carrier have any medical officers who had any diver medicine training?

MR. BARRETT: No. There were none whatsoever. There were a lot with aviation medicine training. We had a pretty big medical staff, as I recall, with full operating theaters and everything else. But, no, there was nobody like that there.

INTERVIEWER: They depended on you for correct diagnoses if you did have a problem?

MR. BARRETT: Oh, sure, absolutely. I had a chief petty officer clearance diver working for me. Between the two of us we managed the diving program. It went very well. We did a lot of ship support and ship maintenance during the couple years I was there.

INTERVIEWER: I can remember very well the most trying part of mine, but what was the toughest part of your diver training?

MR. BARRETT: The whole thing was an absolute nightmare. It was a bit like sort of BUDS program over here for the SEAL's. The first six weeks was meant to simply break your spirits as a diver and to stress one to the absolute limit. It was tough. Do you know the set up at Horsey Island?

INTERVIEWER: Oh, yes.

MR. BARRETT: I remember one of the weeks we were swimming and swimming and running in the mud, carrying logs around, diving or jumping off heights and heaven knows what. It was an exhausting week. In those days we were still using the pure oxygen re-breather. It got to Friday and we would get out there at the crack of dawn and swim up and down Horsey Lake, which is 2,000 yards. That was a nine and a half mile swim down and back. Then we got out, recharged our equipment, and went back in again. That was like the start before lunch, as it were. Then, you always had to run across the mud flats around the old sunken submarines. Do you remember that at Horsey?

INTERVIEWER: Yes.

MR. BARRETT: There is nothing worse than running through mud up to your thighs. It's absolute agony. Anyway, eventually, we got through the day and were sort of cursing under our breath as the chief petty officer was putting us through this nightmare. By that time it was like

four in the afternoon. We were looking forward to getting the truck, which would come out and truck us back to *Vernon*. He said, "Right, it's four. Swim back." This was from Horsey Island back to *Vernon*. We trudged out across the mud flats into the water and started to swim the whole length of Portsmouth Harbor, even with all the ships and everything around there.

INTERVIEWER: There was a ferry running across, too.

MR. BARRETT: That's right, exactly. About halfway back, there was an old aircraft carrier that was anchored by the reserve fleet. We got up to level with it and the chief petty officer was in a little Z-boat beside us. He said, "Right, there's a rope hanging down from the fantail on the quarter deck of the carrier. Climb up that to the flight deck and when you get up to the deck, look over and I'll tell you what to do next." We went forty feet up a little rope. We were exhausted by this time. Eventually, we found our way up to the flight deck.

INTERVIEWER: It was a ladder or just a rope?

MR. BARRETT: It was just a rope, a thin rope.

INTERVIEWER: Did you take your gear off? Did you have your gear on?

MR. BARRETT: We were just in fins with our rubber bags and neck rings. We were in surface gear. Then, he said, "Okay. On the flight deck, you see the gun sponson, which is three decks up. Go up to there." We went up there. He said, "Right, jump off." It was 75 feet. We did that. Then, we had to swim, as I recall, about three times around that circuit and then back to the *Vernon*. We got back at like eleven at night or something.

INTERVIEWER: Perhaps he was a masochist.

MR. BARRETT: Yes. It was the worse day of my life. We also never had anything to eat that day. We had no chance to stop for food. We were ravenously hungry and absolutely exhausted.

We'd already gone from eight to six people on the course, as I recall. Two people dropped out that day. I'll never forget that day. It was the worst day of my life from a training point of view.

I think once I got through that, though, I could get through anything. Of course, once you had six weeks of that type of stuff, at the end of it you just knew that, you and the enlisted guys who had gone through it could pretty much take on anything.

INTERVIEWER: In the U.S. Navy, when I went through diver training, we began our training with Mark V, or the hard hat. Then, we went into SCUBA gear after that. Was it the same in the RN?

MR. BARRETT: No. It wasn't, because the orientation in the U.K. had much less to do with salvage, and much more to do with EOD and special warfare. Most of our work was swimming, rather than diving, I would say. We started with an O₂ re-breather, which was almost like Emerson-type equipment. We used closed circuit oxygen equipment for shallow water assault work and long swims. We would start with that and then go on to mixed gas, and I don't mean oxygen-helium gas. We used enriched 60/40, 32 1/2 or 67 1/2 mixes for work to 180 feet. The work was all EOD oriented. We were also doing demolitions. We were blowing up stuff and locating mines and countermining. The orientation was much more toward the EOD, special warfare and mine warfare, rather than the diving and salvage. It was all non-magnetic equipment. It was that type of stuff.

INTERVIEWER: What areas in diving equipment, and even diving physiology, do think need support in the service?

MR. BARRETT: Unfortunately, I'm so long out of that business.

INTERVIEWER: How about looking backward?

MR. BARRETT: At the time, there were no doubts. That was at the time the Mark X system was just coming in. The whole sort of PO₂ controlled systems, just having a diluent gas and the oxygen in separate containers, was in the early days. That is now, of course routinely done. I suppose the other major area that needed improvement was the whole sort of thermal-management of diver heating and inspired gas heating. When I came to the States, my orientation changed entirely for shallow water EOD, because I immediately got involved in the deep saturation work. As I said, I was the program manager for the push-pull system. That was for very deep work. There we were, looking at inspired gas heating, retrieval and reprocessing of the helium in the bell.

INTERVIEWER: What about communications?

MR. BARRETT: At that time, everything was hard wire. There were no through-water comms. I remember doing some trails with the SEAL's in Roosevelt Roads on some rather crude through-water communications. But in those days, concentration was mostly on hard wire. Again, the programs that I was involved in always had umbilicals. You were always tethered. It was no problem to have a hard wire. The problem was helium unscrambling.

INTERVIEWER: That's what I think.

MR. BARRETT: Yes. In general, most of us who had spent much time either in the bell or topside generally found that you did better without the unscrambler than with it. You had the chief diver, who had done so many saturation dives that he could understand it without any problem whatsoever. I think that generally, I didn't find the unscramblers were that much use.

INTERVIEWER: Did you have any dangerous or life-threatening experiences? I know you mentioned one experience with John Rawlins.

MR. BARRETT: Yes. John and I were in the chamber in Alverstoke. We were doing, and I don't even remember why, some 300-foot air dives in the wet port, and swimming on a swim machine. Of course, air at 300 feet is really thick to breathe. John and I were in the chamber and he'd gone down and done his half-hour on the swim machine or something and come out. I went down and did mine, and I fell unconscious. I just blacked out. It's horrible to breathe at that depth. Anyway, Rawlins pulled me out of the water and got my equipment off. I pretty well came quickly to. The only reaction I got from Rawlins, as far as sympathy went was, "That was really interesting Brian. Will you go down and see if you can do that again?"

INTERVIEWER: Good Rawlins science.

MR. BARRETT: That's right. In general, knock on wood, I wouldn't say I had many hairy diving experiences. I spent a lot of time in a Zodiac in the middle of the North Sea in the winter, diving on crashed aircraft in pretty bad weather and pretty strong tides, in very small boats. That sort of stuff was potentially hazardous. But the training and people we had on the clearance diving branch were extremely professional. My life was in their hands on many occasions, as was theirs in mine. I never had anything other than confidence in the outcome. They were very good people.

INTERVIEWER: People here in the U.S. Navy are often very pessimistic about military diving and the future of it. I'm just wondering what kind of feelings you have about that, as far as the Royal Navy is concerned.

MR. BARRETT: Again, I've been over here for so many years and I'm not closely in touch with the feelings in the RN. I think I can throw a little light on that. Back in the late 1960s in the U.K., I indeed went through a conversion from being a clearance diving officer to a mine warfare and clearance diving officer. The clearing diving branch, which was called the CD branch, became

the MCD branch. We'd always had EOD as part of our skill set. We adopted all aspects of mine warfare, mine countermeasures, mine hunting, minesweeping, and mine laying as logical things to add to the clearance diving skill. That coincided with the introduction into the Royal Navy a couple of new classes of mine countermeasure vessels. Each ship carried its own EOD and its own clearance diving team. It was absolutely logical to expand the interest of the branch and its area of responsibility to include all aspects of mine warfare. The role of diving is, in a sense, looking at in the Royal Navy's view a little bit too narrowly, because the mine warfare and clearance diving branches have extremely important roles. In fact, whereas in my day, we were qualifying two or three or four times a year, nowadays, it's a dozen a year, even though the navy is, in total, smaller. Every mine countermeasure ship normally has the commanding officer and at least one or two other clearance diving officers on board. Normally, the commander officer of the ship and one other are on board, out of a ship's four or five officers.

The role that they play is one that is not just diving, but also the other aspects of mine warfare. It gave the branch a bigger responsibility. It's not a very much recognized as a good, worthwhile career. People are being promoted to captain and commodore and so on within it, though, and it's doing very well.

INTERVIEWER: Would you recommend it to any young officer just graduating from your naval academy if he asked, "What kind of future there is for me in diving?"

MR. BARRETT: Yes, I would, very much so. It will always retain tremendous challenge, excitement and interest as a career. But I think the addition of mine warfare means that it could move back into, if you like the mainstream of naval activity, ships to command. My last job was commanding a squadron of mine countermeasures. I was the commodore of the first mine countermeasures squadron. I had ten MCM under my command. It was a perfectly normal kind

of senior officer's job. Again, I'm a little bit out of touch with it, but my understanding is that there's much less orientation toward deep diving, saturation work and experimental work than what we were involved in back in the 1970s. I guess it is for good reasons. It's not really part of their real requirements.

INTERVIEWER: There is submarine rescue, though. You do need a corps of people trained in that kind of deep diving, even though there are now rescue vessels. Sometimes they do need divers.

MR. BARRETT: Yes. I don't think one could expect a navy as small as the Royal Navy on its own to have specialists whom are simply waiting for a submarine rescue problem to arrive. It contributes to the whole international submarine rescue consortium, which includes the deep submergence rescue vehicle, Pisces Five and so forth. I do think that is justification for a diving branch. But having said that, the diving branch has oriented itself more solidly toward the field of mine warfare and clearance diving, and is certainly a very go-ahead and on-going program.

I think that a couple of people around my time and I were extremely lucky. In the late 1960s and early 1970s there were just a few of us who were lucky enough to work in the United States during the SeaLab experiments and subsequently in the experimental deep program. I was just lucky enough to be selected to do that.

INTERVIEWER: It was good timing.

MR. BARRETT: It was. It was a unique experience and one that I have always been grateful for having had the chance to do. Not many people had that chance.

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UNDERSEA & HYPERBARIC MEDICAL SOCIETY

ORAL HISTORY OF THE MAJOR PARTICIPANTS
IN U.S. NAVY UNDERSEA TECHNICAL DEVELOPMENTS

INTERVIEW OF
ALLEN CARL BRYSON

PROCEEDINGS

MR. BRYSON: My name is Allen Carlyle Bryson, but I'm known as 'Carl.' My records use 'Carl.'

INTERVIEWER: Where were you born, Carl?

MR. BRYSON: I was born near Greenville, South Carolina.

INTERVIEWER: When were you born?

MR. BRYSON: On the 30th of October in 1917.

INTERVIEWER: Wow. You told me that you always wanted to go into the Navy.

MR. BRYSON: Yes. I wanted to get into the Navy from the time I was about 13 years old.

INTERVIEWER: What prompted you?

MR. BRYSON: I was big enough, but, of course, I couldn't get in the Navy at 13. In fact, I ran away from home to join the Navy when I was 13 years old.

INTERVIEWER: How come you were interested in the Navy?

MR. BRYSON: Well, I knew some people who were retired from the Navy.

INTERVIEWER: Were they family members?

MR. BRYSON: Well, they were related, yes. I thought the Navy was a real opportunity for an education, to learn a trade, and also would be a good career.

INTERVIEWER: Yes. In those days, it certainly was.

MR. BRYSON: Well, you have to remember, this was in the early 1930s, in the beginning of the Depression. Where we lived, the Depression was really a difficult time.

INTERVIEWER: Were your family farmers?

MR. BRYSON: No. All my family worked. My grandfather was a peddler. We called him 'Teamster' because he had a teaming route between Waynesville, North Carolina and Folsom,

South Carolina. We lived near Greenville. He would stop with us. From about the time I was three or four years old, I used to go on the wagon with him. That was a week's trip in and out of the mountains.

My uncle was also a peddler. He would buy fruit and produce. For example, we'd go to Georgia and buy a load of peaches and take them to North Carolina around Montreat and the Black Mountain area and sell them. We'd buy them for twenty cents a bushel on the tree. We'd pick them. We'd sell them for three or four dollars a bushel at Montreat. Apples were the same. We'd haul apples out. My family made the bulk of its money on chestnuts. But all the chestnut trees died about 1927, so that dried up the real source of income.

There were roads in and out of the mountains and they had cars in the town, but you couldn't drive a car in and out of the mountains. It was a wagon road. As soon as they built roads you could drive cars or trucks on, my uncle went into the trucking business. My grandfather never did. He stayed in the teaming business until about 1932.

INTERVIEWER: You said you had a friend who was in the Navy, and that was how you entered.

MR. BRYSON: I guess he was a distant cousin. But he retired at \$104 a month after twenty years, and a number one mechanic made \$25 a week in those days. Twenty-five dollars a week was a good income.

INTERVIEWER: That was enough to raise a family.

MR. BRYSON: Yes.

INTERVIEWER: What about your schooling? Did you finish high school?

MR. BRYSON: No. I finished grade school. I went to St. John's. I went to high school for a while in Greenville. But I had to work because I lived in town when I went to high school. I'd go

to school in the morning, get out of school at three and go work at four, and work until one in the morning. On Saturdays and Sundays, I worked from seven in the morning until one in the morning. One semester was enough for me. I quit that.

I joined the Civilian Conservation Corps (CCC). I went to Port Oglethorpe, Georgia. Oglethorpe was the home of the Sixth Cavalry Unit. They had about 2,000 horses and 4,000 men there. We were a labor battalion for months there. We worked for the sergeant or corporal, or whomever they detailed you to work for. We lived in tents and wore Army uniforms. We had a captain who was in charge of the company.

We worked there for months until we built a barracks on Lookout Mountain. Then, we moved up there and worked in a rock quarry, and we quarried stone and built roads. We built the road that's now known as 'Government Road.' It goes from Lookout Mountain Cave around the mountain to the base of the cliff. It's a good road.

INTERVIEWER: You were 17 about that time, weren't you?

MR. BRYSON: No, I was 15 then.

INTERVIEWER: You were 15?

MR. BRYSON: I had to wait until I was 17 years old to get in the Navy. I went down to Chattanooga to the recruiting station. The recruiter gave me an examination. He gave me the test and everything, and he said, "You can get in the Navy, but you have to be 17 years old. You have to have a birth certificate, and you have to go into the Navy through the nearest recruiting station to your home. I can tell you where that is if you don't know." I said, "I don't know." He said, "It's in Greenwood, South Carolina." Well, Greenwood is about 53 miles from Greenville.

When I was 17, I got a discharge from CCC, and I went home to join the Navy. I went to Greenwood. There was a fellow by the name of Luke Dirkin. His widow still lives in San Diego.

Luke was a recruiter there. He was a first class machinist. I went because I was ready to go. I thought I was going in the Navy.

When he finished the examination, he said, "Well, I'll let you know." I got the drift that I wasn't going. I said to him, "I'm ready to go." He said, "Oh, I can't send you there. I have a waiting list." I said, "How many are on the waiting list?" He said, "There are about 300." I said, "Well, how many do you send a day?" He said, "Oh, I send two or three a week." Well, you didn't have to be a mathematician to figure that out. I'd be aged before I got in the Navy. He said, "You go ahead home and get a job. I'll get you in the Navy." I went home and got a job with Scurry-Nixon riding a motorcycle. I rode a motorcycle eleven hours a day, six days a week.

INTERVIEWER: What were you doing?

MR. BRYSON: I was delivering small parts and taking orders out and things like that. I was getting receipts signed and collecting money and whatever had to be done.

INTERVIEWER: You had finished high school, though, hadn't you?

MR. BRYSON: No. I didn't finish high school. I only finished the first semester of high school. I didn't finish high school until I was 28 years old.

INTERVIEWER: Oh, wow.

MR. BRYSON: I took all kinds of exams. I took the general equivalency degree (GED) test. I passed the GED test for high school and for the first year and second years of college. But when I wanted to go to the University of Illinois, a GED didn't suffice. I had to graduate from high school, so I went to Moline High School, and I graduated along with all the kids. I had to go before the board of regents just like they did.

INTERVIEWER: You were an old man.

MR. BRYSON: Yes. I was an old man at 28 years old. I worked for Scurry-Nixon in 1934. In 1935, in July, I had a telegram come in. I was going into the Navy. My grandfather was in the hospital and dying. I loved him better than any man I ever knew, and so I wouldn't go. He died on the 6th of August. Then, I had to wait until I was 18 years old to get in the Navy. I would have been going in as a minority when I was 17. I had to wait until I was 18 years old.

I didn't get in the Navy until the 5th of January in 1936. It was an interesting thing. Luke shipped me into the Navy. He went back to sea and I went to school. I was very well read anyhow, because I read hundreds of books. We took examinations, and if you placed high on the examination, you had a chance to go to service school. I asked the chief to which service school I could go. He said, "You can go to any service school in Folsom that you want to go to."

I had just been in the hospital with mumps after I got into the Navy, and I was there 28 days. That was before they had sulfur drugs and all the magic drugs. That was the year that they had the spinal meningitis epidemic in the fleet. They used to bring these people in on one side. I was in the contagious section. They'd bring these guys in on one side and take the bodies out the other. I was going to go to pharmacy base school. I decided I didn't want to go to pharmacy base school, so I told them I wanted to go to machinist base school.

I went to machinist base school and then, I rode the USS *Henderson* from Norfolk to the west coast. I went to the USS *Medusa*, and I was in a machine shop on the *Medusa* for about six months. That was in San Pedro. Then I went to the USS *Mississippi*. The *Mississippi* had been converted or modernized in 1932 or 1933. The machine shop was beautiful. Everything was new and it had a complete shop. It had a good chief by the name of Tommy Ford. Carl Banker from Norwich was first class. They had a second class named 'Buzzy' Blue. There was a fireman in

there by the name of 'Sink.' I think his name was Sink. Anyhow, I was on the *Mississippi* for about a year and I then put in for submarine school.

INTERVIEWER: Did you do that for more pay?

MR. BRYSON: Well, Luke was a submarine man, and my company commander, when I went through recruit training, was a submarine man, and I thought I'd like to go to the submarine program. I'd gone to see the fireman. I didn't know anything about deck.

INTERVIEWER: That was ordnance, a fireman in those days.

MR. BRYSON: No. A fireman was a black gang. You were in engineering.

INTERVIEWER: Do you mean that literally?

MR. BRYSON: Yes, it was literally that way. I went aboard the USS *Barry*, the *DD-248*, and I had to make a cruise out to French Frigate Shoals, then we came into San Francisco with a '65 midshipman from the University of California. What a miserable trip that was. When I left the *Barry*, I left with two other people to go to submarine school, Poncho Black and another fellow. I don't remember his name, but Poncho was a good friend of mine.

We went into San Francisco, and we went aboard the *Henderson*. They had to ride with the passengers, but I went back with the crew. I lived in the machine shop because on the *Henderson* before, I had been in the machine shop. I spent the whole time there, and when I say the 'whole time,' you've got to remember that the *Henderson* did about six or eight knots.

We went down through the Panama Canal and up the east coast, so we were on the ship for a long time. A chief engineer asked me if I could insulate the steam valve for him. I told him sure. In those days, you'd take the asbestos and you mix it with water and get it in your nose and everything. You mixed the asbestos up and put it on the valve, and then you'd take canvas and

wrap the canvass and cut it. Then, you'd take a sail palm and needle and sew it. So, I did this, and it was a pretty neat job.

He came by and said, "Man, how about doing some other valves and piping for me?" Instead of working the machine job, I spent the whole time either playing poker or insulating the steam valves and the steam piping for him. We got into Norfolk and lay there for a while. We had a lot of experiences in Norfolk.

INTERVIEWER: Now, were they female experiences?

MR. BRYSON: No, not exactly that, but we had some interesting naval experiences there. You've got to remember that people had just come back from China, so we had some very interesting people.

INTERVIEWER: I know they developed certain characteristics over there.

MR. BRYSON: Oh, they did. You bet, they developed all kinds of characteristics. Anyhow, it was interesting, the things that happened there. Those people were just waiting to get out of the Navy. They weren't like Poncho and me. We were going to submarine school. Those people had come back from China and they were going out of the Navy. They didn't care anything about regulations. They didn't have full sea bags or anything like that. The inspections they had were fascinating. You had one guy with boondockers, and his pants would be cut off and ragged.

INTERVIEWER: I understand a lot of those guys who were over at the China stations got spoiled.

MR. BRYSON: Life was entirely different in China in those days. We had people there who were on the Yangtze River patrol. In fact, I worked for Leidenhorn, and he was on one of those riverboats up there. You probably remember the Panai River.

INTERVIEWER: Oh, yes, very well.

MR. BRYSON: The lieutenant who got shot in the neck or hit with shrapnel in the neck on the Panai was on the *Mississippi*. I was on deck the day that they decorated him for that. He stood OD watches on the *Mississippi*. He had the deck the day that I left.

Poncho and I rode the dollar line from Norfolk to New York. Then, we rode the Hartford-New Haven Railroad up to New London. Finally, we got to submarine school. When I got out of submarine school, I went to submarine diesel school. The first person I met was Luke Dirkin. He had gone back to sea and made chief, and he was an instructor.

He was doing shore duty at the submarine base. He said to me, "Carl, I don't mind shipping you in the Navy, but I'm not going to do your twenty for you." I said, "You just make like you don't know me, and everything will be fine." Luke's life was interesting. He was a fine man. He wrote letters to me from the time I went into the Navy until I was a chief on recruiting duty after the war, and Luke is still writing instructions on how to conduct myself. He said, "I never lied to you, and don't you lie to any of these boys." I said, "Luke, I don't lie to either you or them."

Anyhow, Luke's life and mine crossed because Luke put the USS *Runner* in commission. I was married at the time. That was when I was on the flag in New London. I was an instructor at the training tank. Premo Baba and Joe Charters were very close friends of mine, and they were on the R-14 with me. I went to the R-14 when I got off the USS *Squalus*. They were on the *Runner*. Galvin was on the *Squalus* with me. Luke was the chief machinist's mate on the *Runner*.

Well, I wanted to go on the *Runner*. I went down to see Luke, and I was first class at the time. Luke said, "I don't want you on here, Carl." I asked, "Why not?" He said, "You're a first class. You shouldn't be first class. You haven't even got eight years in the Navy." I asked,

“What's that got to do with it, Luke?” He said, “Well, you're going to want to go up for chief pretty soon, and I won't put you up for chief.” I asked, “What does that have to do with it?” He said, ‘Carl, there's another reason I don't want you up here. You have a good job. You've got a better job than I have. You've got a better job than the captain on this ship has. Don't get any romantic ideas about this war. This is a filthy war. Those Japanese are mad. You stay right here as long as you can. You're married. You're going to want to go up for chief. You've got a good life here. You stay right here.’”

Well, the *Runner* went out. Luke made two runs and stayed in to get his teeth out. Luke was getting along in years. He stayed in to get his teeth out, and the *Runner* went down on the third run. Of course, Premo Baba and Joe Charters and Galvin were all on the *Runner*. Luke survived the war and made lieutenant. He should have. He was a very qualified person. But it's strange how your life will intertwine. I get letters from Hilda occasionally. She's in San Diego. She and Judd were pretty good friends. When I talked to Judd, I always asked him if he would give my regards to Hilda.

INTERVIEWER: Hilda was who?

MR. BRYSON: Hilda Dirkin was Luke Dirkin's wife. I'd write to her once or twice a year.

INTERVIEWER: Maybe I'll give her a call when I get to San Diego.

MR. BRYSON: Give her a call. Well, when I came here to the submarine school, we came up here from Norfolk. Before I got out of the submarine school, they had the hurricane of 1938 here.

INTERVIEWER: I remember.

MR. BRYSON: That was a real experience. That was a hurricane, believe me. I had bought an A-model Ford. It was flooded down in the parking lot. O.B. Ross was a very good friend of mine. He's dead now. O.B. and I were on Saber Team together. We got my car floated out. We

were just pushing the car ahead of all kinds of accidents. We got the car started, and we got over to the gate, and we were in our blues, and a Marine said, "Park the car over there and get in this truck." I said, "Hey, we're going on liberty." He said, "Liberty is canceled. New London's on fire and you're in the fire party. Park that car over there and get in this truck." That's what we did.

INTERVIEWER: You did that in your blues, huh?

MR. BRYSON: We fought five of them, from that afternoon until about two in the morning, when we got relieved. Then, they herded us upstairs in the police station to keep us just in case they needed us.

INTERVIEWER: There were fires because of the hurricane?

MR. BRYSON: Oh, yes. The embers were blowing all the way over into Groton. New London didn't have any electricity for two or three weeks. They had gas service. Our bootlegger at the Manhattan was a fellow by the name of Louie. After a certain hour in New London, you couldn't get a drink, so we'd always go to the Manhattan. He still had gaslights. It was the only restaurant in New London still in business. We went down there and had some coffee after they herded us up to the police station.

When I got out of school, I went to the R-4. There were six R-boats that never went out of commission. The rest of them were out of commission, along with the O-boats. I went to the R-4 and thought, "This is great, because I've got leave." I went home. I was home on leave. I was home two days and got a telegram to come back to the ship.

INTERVIEWER: That would have been the first of 1939.

MR. BRYSON: It was the first of 1939, yes. I had taken the examination for second class. When I went there, second class came through. I made second class. When the ship was commissioned, I was a second class machinist's mate. When I first went into the Navy, going to school held me

up because you didn't get rated then in those days. There was a time that when you graduated from that school, you graduated as a second class petty officer. But that was not the case while I was there. It held me up a little bit on rates, but I never missed a rate after that. I missed one quarter, but I didn't miss it on the examination. I missed it because of the difference of opinion between the officer and myself.

When I got up there to put the *Squalus* into commission, we had a couple of guys from my submarine school class. Casey was a close friend of mine. Casey and I were stationed in the forward engine room. Admiral Doyle had been in the Navy yard as a member of the staff that was constructing submarines. When the *Squalus* went into commission, they assigned him to it as the executive officer and the engineer officer. Ensign Patterson was a junior officer in the engineering department.

Anyhow, I did all the ordering of engineering stores of spare parts. In effect, I was the engineer officer's storekeeper. Not wanting to waste any of my time, my dive station was in the forward battery, which turned out to be really fortunate for me because nobody got out of the forward engine room.

INTERVIEWER: Yes. That's true.

MR. BRYSON: I don't remember how many test dives we really did, but historically, we were on our 19th test dive. We were loaded with spare parts and supplies. We were ready to leave. The USS *Sculpin* was a week ahead of us. It would have been our last sea operation before shoving off on our shakedown cruise. That year, the World's Fair was held in New York and San Francisco. Were going to make it to both World Fairs. Everybody was happy about that. Needless to say, we didn't make it to either one.

The day that we went out, we had not been in to the base. We had been anchored off the point. On the weekend, Teeter Savage was hit in the eye with a baseball. We were having a softball game and it hit him in the eye. He was in the hospital, and he was a first-class machinist, so he didn't go out on the ship.

That morning, O'Hara came aboard. That was his first trip out on a submarine, and less than an hour later, it was sunk. We got off the shoals on a dive. I had the sound powered phones on, and I heard Casey in the forward engine room say, "Take her up, the induction's open." The induction valve was a big 36-inch, mushroom-type valve. We had a ship's air induction which was, I think, 24 inches in diameter, also. But with the engine air induction, the air came down a huge pipe and went down outside the surface, and then outside the hull. At each engine room you had a flapper valve that was operated by a worm and sector mechanism. You had to stand right under where the air was coming in to shut the valve.

INTERVIEWER: You had to do that mechanically.

MR. BRYSON: Yes, it was done mechanically. It took about three and a half minutes to shut down because we weren't too smart. You have to remember, most of the people came off of R and S boats, and everybody had to study the boat. School of the boat was a daily operation. All in all, there was a shortage of people who knew fleet-type submarines.

INTERVIEWER: That was a state-of-the-art boat at the time.

MR. BRYSON: Oh, you bet it was. If we had been smart we would have had the packing oiled and loosened up so that he could spin that valve. As a result of the sinking, they put a trip mechanism on those valves, and it probably saved some ships after that because you just had to trip that. They had a big lever that was about three feet long. You tripped it and the valve would

fall shut. Then, you took a level and dogged it. That dogged that hull flapper valve. That was done on all the ships.

INTERVIEWER: Now, Judd told me that a friend of his brother's was on another boat. I don't know if it was the *Sculpin* or not, but they had that same problem.

MR. BRYSON: You're talking about Gainer. Gainer's brother was on a boat that had a similar incident occur. It had happened prior to the *Squalus*' accident. You have to remember that information flows very slowly in a bureaucracy, and the Navy was a bureaucracy. Hindsight is really good. I can go back into history of my experiences in the Navy and just point out mistake after mistake by people in the bureaucracy, and those mistakes have domino effects. You put out an ALNAV to do something and it was done throughout the Navy. Everybody did it. If it was wrong, everybody did it wrong. Information never got to the right people. Even if the information got to the right people, if they don't take any action on it, the information was useless. You can know something, but what good does it do if you don't take action on it?

INTERVIEWER: You said it took three minutes to close that valve, but you were on a less than sixty-second dive.

MR. BRYSON: The thing was that you had to stand right under the water that was coming in. If air was coming in, it took three and a half minutes to shut it because it was ----. Casey was standing under the water. When the ship was brought up, his body was still standing over by that valve.

I heard Casey say, "Take her up. The induction's open." That was the last thing I heard. By then, the water was coming in. Everything happened very suddenly. The engine air induction, the air and the water, went to the engine room. On a ship's air induction, the air went through the ship's ventilation system. There were two lines going through each bulkhead, forward to the

torpedo room, and then to each compartment. We got a shot of water and air. You had bulkhead flapper valves on the ventilation system. Of course, when that happened, the first thing we did was shut the bulkhead flappers.

It was obvious that we were in trouble. McLees was standing in the battery well. I remember it so well. That means that it was up over his knees. He was standing on the walk in the battery well. He climbed out of the battery well and went forward to the torpedo room door. When he shut the door, he was in the torpedo room. I was in the compartment with Jacobs and the two Filipino mess boys, Galvin and Elvito. Galvin and Elvito spoke poor English, and jiminy crickets, when they got excited, they hardly spoke English at all. Jacobs was in there. He was the radioman. Later, Jacobs committed suicide.

INTERVIEWER: I wonder why?

MR. BRYSON: I don't know. Luke Gainer was in there with me. Luke was a well-qualified submarine man. He was the chief electrician's mate. He went down into the battery. I think Luke said they were pulling several thousand amps or something like that. Anyhow, they were putting such a load on the battery that the heat from the cells was making fire sputter from the heat. Luke knew that we were on the verge of an explosion. He went back aft to throw the battery disconnect switches, which were against the bulkhead in the aft. It was dark down there. He went down and threw the first battery disconnect switch. The arc carried the circuit, so it didn't break the circuit. When he threw the second one, it broke the circuit. I wouldn't have known to do it. It was a good thing Gainer was in there, because if he hadn't done that, there wouldn't have been any survivors to rescue.

INTERVIEWER: It would have blown up.

MR. BRYSON: Yes. It affected his eyes. Gainer was blind when he died.

INTERVIEWER: It was a big arc.

MR. BRYSON: Yes. It was the arc from the battery disconnect switches when he threw the switches to open the circuit. Anyhow, he did that. We had fresh water coming in, and we stopped that. We didn't know where the water was coming from, but there was salt water getting into the battery compartment. When salt water mixes with sulfuric acid, you have chlorine gas. We had a little chlorine gas in the lower compartment. We dug the hatch down too, but nobody knew where the water was coming from. Afterward, we found that there was a tiny capillary tube that connected the after battery to the forward battery, and there was no valve in that. That was another issue that came out of the accident.

We asked the captain if we could go in the forward torpedo room, and he said, "Yes. Go ahead in." Well, we went up, and they wouldn't open the door for us. We finally prevailed, got them to open the door, and we went in the forward torpedo room. We stayed in the forward torpedo room until the first bell. It was very cold and very dark. It was about 28 degrees in there. Wherever there was condensation, there was ice. Everybody was being very still to conserve oxygen. We didn't have oxygen on the boat in those days like they have today. We had a couple cylinders of oxygen and a bunch of CO2 absorbent. We were in there. We couldn't hear anything. We had released the forward buoy with the telephone in it, which was a marker buoy that meant a submarine is sunk here. We heard the *Sculpin's* screws. That was the first sound we heard. We were sending up smoke signals also. We had a signal gun. They spotted one of the smoke flares, and they went over and picked up the buoy on the deck to the submarine. That buoy cable didn't make a good anchor chain. The captain on the *Sculpin* and Naquin had time to exchange a few words, and then the cable snapped.

We were without communication until the USS *Wandank* came. They had an oscillator. They could send signals that we picked up because we could hear the oscillator. But for us to send a signal that they could hear, we had to pound on the hull with a hammer. It was one stroke for a dot and two for a dash. Well, that was rather tiring, and they couldn't understand some of the signals, and we had to send it over again.

To make a long story short, it was a poor communication set-up. I don't know what all the communications were. The captain, I think, kept a log of it. Finally, the USS *Falcon* came up from New London. It was a steamship. They were doing maintenance work. They put the engine and everything back together and got underway, and they got up to where we were.

INTERVIEWER: They came with the bell.

MR. BRYSON: They came with the bell. The first diver down was Savitsky. Somebody had hooked into the ship with an anchor or something. It had a cable on it. It dragged into the ship. When Savitsky came down, he came down the cable and landed his feet right on the deck, within six feet of the hatch. Savitsky was a huge man, a marvelous diver and marvelous person. He landed there. Preseco and I went up into the trunk, and we could hear him talking. We could understand what he was saying because it was so quiet down there.

INTERVIEWER: I understand he was cussing, too.

MR. BRYSON: I never heard him cussing. Savitsky was not much of a profanity man. He was a very, very clean person.

INTERVIEWER: Didn't he get a Congressional Medal?

MR. BRYSON: No. He got a Navy Cross. But he was so huge that his number three suit, which was the largest suit, had to have the arms on it cut and an extension in the arm put on so that he could work. They couldn't do anything about his feet because that was a difficult thing to patch

into, so his toes were always drawn up. Anyhow, it was a good thing he came down because he was a great diver. The cable from the marker buoy had fallen down on deck when it was parted, and it was over the hatch. Well, he had the presence of mind to take that cable and get it clear of the hatch because the bell had a seat ---- on the bell seat, around the hatch. Then, he attached the down-haul cable, and to me, that was the Savitsky's greatest feat in the rescue.

INTERVIEWER: You were down at 240 feet.

MR. BRYSON: Yes.

INTERVIEWER: Visibility must have been almost zero.

MR. BRYSON: I don't think that was the case at 240 feet. It was dark there, of course. I don't think that, at that latitude and at that time of year, during the daytime, the visibility was that bad.

INTERVIEWER: It was May.

MR. BRYSON: Yes. It was the latter part of May, and the daylight hours were not so dark that he couldn't see down there. When Lesker made the dive on the 09, that was 470 feet or so. That's dark. Of course, when the *Thresher* went down, she was down 8700 feet. That's very dark. You have to have a light. But Savitsky did a really good job. On the first bell trip, Mr. Nichols was in the forward torpedo room. He went up because the captain wanted an officer representative on the topside. Mr. Nichols was chosen to go up.

INTERVIEWER: He wasn't the executive officer.

MR. BRYSON: He was the gunnery officer. Doyle was a lieutenant. He was the executive officer and the battery officer.

INTERVIEWER: I'm surprised Doyle didn't go up first.

MR. BRYSON: As far as I know, when the first bell trip went off, Doyle was still in the control room. When the bell got there, it brought down a five-gallon milk thing full of soup, and they

ventilated the best they could while they were there. I think McLees went up on the first bell trip. I don't know why he went up on the first bell trip. I didn't expect to go up on the first one.

After the first bell trip, the captain had been in and out of the compartment. They took lungs back there so that they didn't have to breathe the air. After the first bell trip, everybody in the control room came up into the forward torpedo room.

INTERVIEWER: How many hours were you down before the first bell?

MR. BRYSON: Well, we went down at about 8:30 in the morning. Early the next afternoon was when I think the first bell trip occurred.

INTERVIEWER: It was about 30 hours, then.

MR. BRYSON: I would say, yes, it was about that. I came up on the fourth bell trip. I think we were in the bell for about three hours or so because the downhaul cable jammed. I think it was after midnight. Of course, I had been there all that time. We were frozen. Everybody was frozen. I remember it very well. I was watching Mike Coloski in the lower compartment of the bell. When he put the downhaul cable over the ship, he didn't pull the faring over it. But I wasn't bell operator. I didn't say anything about that. Anyway, we dropped a few feet and the downhaul cable jammed. They couldn't free it, so they sent a man down and finally cut the downhaul cable.

INTERVIEWER: That was the last trip, and Naquin was with you.

MR. BRYSON: Yes.

INTERVIEWER: You were on the last bell trip.

MR. BRYSON: Yes. Cravens, Pierce, Persico, Naquin were on it, too. I think eight or nine of us were in the last bell trip. They started to haul the bell up and it had negative buoyancy. The bell had positive buoyancy until the downhaul cable jammed. To avoid it popping up when they were going to cut the cable, they flooded it a little bit. We had a little negative buoyancy, so they

started to haul us up with the up-haul cable. They got it up a few feet found that several strands of the nine-strand cable had parted, so they dropped us back down in the mud. We were sitting down there waiting for everybody to decide what to do. They were afraid to blow the lower compartment to give us positive buoyancy, because we would have shot up like a rocket and hit the ship, maybe even sinking the ship.

Finally, they decided they would blow the lower compartment a little bit. They blew it, and they blew it a little more. They kept pulling it by hand up there to see if they could pull the bell up. They blew the lower compartment a little bit more until they could pull it by hand. If it had parted that cable, it would have parted the air hose and the ---- cable, and that would have been the end of the people in the bell. They were pulling on it by hand. Of course, you couldn't keep adjusting the lower compartment. As we went up, the pressure around it decreased and the air inside expanded, so we got lighter and lighter until we got up to about 150 feet. Then, we went up like a rocket. I mean, zip, we were on the surface. With the great speed of air expansion, it was just like a rocket. We shot right up to the surface.

INTERVIEWER: The story I understood was that the cable was still attached to the *Squalus* on the fourth trip. You started out, and you got jammed, and then they cut that cable. But I didn't know they lowered you back down under the blue mud.

MR. BRYSON: They did. When they started to haul us up and found the up-haul cable was almost parted, they had to lower us down because if that parted, that was the end.

INTERVIEWER: They brought down another cable?

MR. BRYSON: They tried to send down another cable, but that got fouled, and they didn't do that.

INTERVIEWER: You were sort of a cork floating down.

MR. BRYSON: No. We were sitting on the bottom. We swung around a little bit when they first cut the cable.

INTERVIEWER: Then, they lowered you down to the bottom.

MR. BRYSON: Yes. When they decided that they would cut the cable, they had to adjust the balance so that we had negative buoyancy instead of positive.

INTERVIEWER: That was the downhaul cable.

MR. BRYSON: Yes.

INTERVIEWER: I didn't realize that part of the story. The communications in the boat were so that every compartment could hear everything? Was there a loud speaker in each compartment?

MR. BRYSON: There was a public address (PA) system. I was the person in the forward battery. They had the sound telephone call. Casey was the person in the forward engine room with a sound ---- telephone call.

INTERVIEWER: Even if people didn't have earphones, they had speakers in every compartment. You could hear everything.

MR. BRYSON: Oh, yes. There was the PA system. I don't know what you mean by 'hear everything,' though.

INTERVIEWER: In other words, I thought maybe they had this talker between the compartments.

MR. BRYSON: No. We had a PA system in the control room, and you could hear the signals. We passed the word over the PA system, but we didn't have any electricity. After he threw the battery disconnect switch, there was no electricity, so we didn't have any communication like that. The sound ---- forward was all that we had.

INTERVIEWER: The instant that you discovered that your compartment was flooding, you still had electricity.

MR. BRYSON: Yes.

INTERVIEWER: I guess you had battle lanterns later.

MR. BRYSON: We had battle lanterns, yes. But the period that we had electricity, after we knew we were sinking, you've got to remember, we are talking about seconds. We're not talking about minutes. Things happen very rapidly in a situation like that.

INTERVIEWER: Judd told me you had no sense of falling. The boat took about a 45-degree angle.

MR. BRYSON: There was no sensation when the stern went down.

INTERVIEWER: It just sort of slowly sunk down.

MR. BRYSON: You didn't have a sensation of anything, except feeling the upward angle becoming acute. That was the sensation. The boat went down by the stern.

INTERVIEWER: I understand that you almost never felt it going into the mud.

MR. BRYSON: If we did, I didn't notice it. I had other things on my mind at that time.

INTERVIEWER: Was hanging on going through your mind?

MR. BRYSON: No I was thinking about trying to keep the water from coming in things like that.

INTERVIEWER: Was there any panic at all?

MR. BRYSON: If you mean if there was any excitement, yes, there was a lot of excitement. If you mean hysteria, I don't remember any hysteria, though a lot of people may have felt hysterical. It was a very, very exciting moment. If you practice for emergencies, which is what people are supposed to do on a submarine, when the emergency occurs, and this was obviously an emergency, things happen very rapidly. Everybody wants to know what you were thinking.

Well, you didn't think about anything except how to solve the problem and see if there was another problem and then solve that.

INTERVIEWER: It was the immediate problem that was going through your head.

MR. BRYSON: You bet.

INTERVIEWER: I understand during the entire time you were down there, Naquin had to just lay down and quit breathing as much as possible.

MR. BRYSON: He not only quit breathing as much as possible, but it was very cold, and people huddled together to keep warm. Body heat was very important to conserve. Also, the old man discouraged conversation and any kind of movement that would burn oxygen. The air was getting very, very bad. In fact, when we left there, the air was terrible. We had put out all the soda lime, which is a carbon dioxide absorber. We had all the oxygen drained into the compartment. But after the people came up from the control room, the air got progressively worse.

INTERVIEWER: Well, Judd said one of the fellows opened the chart drawers and threw soda lime all over the place.

MR. BRYSON: They put soda lime wherever they could.

INTERVIEWER: I understand Naquin stayed completely in control the entire time.

MR. BRYSON: I thought he did. He was a remarkably fine individual. I was the bridge talker and maneuvering, so I was close to the old man. I knew the old man very well. I don't mean socially. I repeated on the phones every order that he gave because when I was bridge talker, I wore the phones on the bridge. If he gave a signal, I repeated that signal to the control room.

I know that once, I got the signals wrong. When you came in to make a landing in Portsmouth, depending on the tide, you had to drive yourself in there. I gave a wrong signal. The

old man held back on one and all ahead on the other. I got it reversed. Then, he said, "All stop." I told them, "All stop." Then, he gave me the signal again, and I gave it correctly that time. He never said anything to me about it. That was the kind of person he was.

INTERVIEWER: Jim Dothe, up in Portsmouth, told me that he has Naquin's log.

MR. BRYSON: Yes. The skipper told me that he was going to give it to Dothe after the 50th anniversary up there.

INTERVIEWER: He did.

MR. BRYSON: He kept it all those years. He gave it to him for the reunion. I think Jim missed a lot of memorabilia from the boat when Fanny Gerber died. Before she died, Fanny told me that she was going to give me all her stuff. She had a lot. She told me that she was going to give it to me, but I didn't go back to Portsmouth that often. When I had two children, I took two of my children by there to see Fanny. I loved Fanny. She was a lovely lady.

INTERVIEWER: What happened?

MR. BRYSON: Fanny and Hank Gerber ran the club cafe. That was where a lot of the guys hung out when they were off the boat. I always hung out there. I thought they were wonderful. Fanny used to plan our weekend parties. In the winter, Jim Trebentan made his camp available. Jim used to go with us. Fanny would make all the arrangements, and we'd go up on Saturday and spend Sunday up there.

INTERVIEWER: What happened to all the *Squalus* artifacts?

MR. BRYSON: Well, a lot of them are around in different places. Different people have different things. I remember that life ring so well, because when you set the watch, you always brought the life ring out hanging up. That was one of the checks that you did. I was a speaker for the northeast regional convention many years ago. Swede Larson and I worked for an electric

boat company after we got out of the Navy. Swede came in with this big bag. After the speech, he said, "Carl, we want you to have this." I couldn't figure out what in the world he was giving me. He took that life ring out, and I immediately recognized it. This guy had that life ring all those years up there in Portsmouth. He decided to give me the life ring because I was the guest speaker.

I'll tell you another thing. Harold Lancaster and I served together in the tank. Harold was on the USS *Falcon* when the *Squalus* went down. Harold sent me a number of things, including lots of pictures. He sent me an airdog off of one of the portholes on the *Squalus*. He had that all those years. He just sent that to me four or five years ago. He sent me a little document with pictures, showing me from where he got the airdog.

The bell is down in one of the fleet naval reserve places. I have a letter from the skipper's daughter, Lorraine Naquin-Tyler. She sent me a letter with a picture of them by the bell. Captain Naquin's son, Chris, is a retired Navy captain. INTERVIEWER: The original bell is still in existence, then.

MR. BRYSON: Yes. It's in a fleet reserve place down in Maryland, I think. It's in Maryland or Pennsylvania. I don't recall.

INTERVIEWER: I understand Captain Naquin had to go down below the floor plates.

MR. BRYSON: Well, the deck and the forward battery made up the communication area. That was where you walked back and forth. When you opened a hatch, you went down the walkway, and in the battery compartment, there were batteries all over. You had a crawlway. There was only two and a half or three feet of clear crawling space to get around the battery. That was what Gainer was doing there. He was up there because we were going to be pulling the load, and he was going to take the gravities on the battery. That was what Jacobs was doing there. He was the

recorder helping. McLees was supposed to be Gainer's helper, as well. When Gainer started looking for McLees, McLees was in the forward torpedo room. He was stuck with me, and I wasn't too smart.

The only assistance that Luke had was from me. I'd been on the R-4 and I had been studying the book therefor a little while, but I wasn't knowledgeable. I wasn't qualified. I don't know if Jacobs was qualified or not. McLees was a qualified submarine man. He was in absentia, as far as we were concerned. He was in the forward torpedo room. Galvin and Elvito would do anything you told them, but they didn't know what to do.

INTERVIEWER: Yes. Judd was the second electrician.

MR. BRYSON: He was a first class electrician's mate, but he was in the control room.

INTERVIEWER: He was in the control room, where he was supposed to be. Judd told me that Naquin wanted Gainer to get a medal, a Navy Cross or something.

MR. BRYSON: Well, I don't know anything about that.

INTERVIEWER: But the admiral said, "Well, that was his job."

MR. BRYSON: That is something that I don't know anything about.

INTERVIEWER: That's all I know. Last night, you said you felt that Gainer was upset or ticked off.

MR. BRYSON: No. I don't think he was ticked off, but he was bitter, and I think he was justifiably so.

INTERVIEWER: Why was he bitter?

MR. BRYSON: He was bitter because of the lack of information, the way in which we lost the ship, the similarity between the problem we encountered and the one his brother had encountered previously, and the lack of communication and getting that information through. Also, Gainer's

loss of eyesight, I think, was directly traceable to his experience in throwing the disconnect switches.

INTERVIEWER: You said he died blind.

MR. BRYSON: Yes. He was essentially blind. This was told to me. I have a couple of Gainer's letters in my possession, official letters. First, I have his official statement at the Board of Inquiry and second, I have the statement he submitted voluntarily. It's quite lengthy and quite detailed. It describes not only the situation in which he was involved on the ship, but also his conclusions and analysis of the lack of communication.

INTERVIEWER: I would assume you would give copies of that to the Portsmouth Museum.

MR. BRYSON: I would not.

INTERVIEWER: Why?

MR. BRYSON: Because the way I came into possession of them, I would not give copies out. I intend to keep those. When I finish writing, I intend to use them as my authentication of what I have to say. I'm writing a book. I don't know if I'll ever finish it or not, but I'm in the first draft now.

INTERVIEWER: Is it a book about your Navy experiences?

MR. BRYSON: Among other things, yes. That was a notable experience in the Navy for me. I had a number of experiences. You don't go through the Navy and have just one experience.

INTERVIEWER: No, especially with a war coming.

MR. BRYSON: Well, I had experiences both before and after the war. I had a lot of experiences in the Navy.

INTERVIEWER: Did you get involved in the salvaging of the ship?

MR. BRYSON: Oh, yes. I was in the hose gang. After we came up, I was frozen. I went in the recompression chamber, not to be decompressed, but because I was cold. Everybody else had gone into the hospital, or at least the first three bell-loads. They kept those of us on the fourth bell trip on the ship until the next morning. They put hot towels on our feet. In about a minute, the towels got cold and they put on more hot towels.

The next morning, everybody who was in the fourth bell cup went aboard the USS *Harriet Lane*, a Coast Guard cutter, and we went to the hospital. I didn't want to go to the hospital. I wanted to go to the Club Café or some other place, but we went to the hospital anyhow. I felt good after I got warmed up and got a bite to eat.

INTERVIEWER: You were still young, too.

MR. BRYSON: Oh, sure. Then, during the salvaging, I worked in the hose gang.

INTERVIEWER: Do you mean after the *Squalus* was brought in?

MR. BRYSON: No. I mean during the salvaging of it. I think there were 28 or so hoses. The hoses had to be made up, and they had to be hooked up by the diver, and then they had to be buoyed off and marked and everything. Then, when they got ready to ----, the hoses from the ship and those that were buoyed off had to be hooked up properly. That was the gang that I worked in. We handled the hoses. I worked out of a boat. I worked on a barge. They had barges alongside. I worked throughout the salvage.

INTERVIEWER: It was three months.

MR. BRYSON: Yes, it was about that long. There were lots and lots of people and very few places to berth. One time, I was berthed aboard the USS *Sacramento*. It had been out in China for years and had come to be decommissioned. They didn't have much coal on it. They had B

and C bunkers, and they had coal only on C bunkers. I was wheelbarrowing the coal from C bunkers across A and B bunkers so that the smart guy could shove it into the firebox.

INTERVIEWER: That was after you came out of the *Squalus*.

MR. BRYSON: Yes.

INTERVIEWER: Naquin told Maderes that he was going to go out.

MR. BRYSON: We didn't know if we were going to have a bell or not. We had planned an escape. The first person to go out had to release a buoy up to the surface, flood the compartment, open the door, and put the line out that had the buoy on it and let it up to the surface. Then, he had to quickly make it clear of the door so that you could open and shut the door. When he had that done, we would make the escape.

The captain selected the Greek because when you see the Greek today, he's a tiny person, but he used to be a powerful man. He was short but very powerful and was a well-qualified person. He was a third-class torpedoman on the ship. But as the Greek said, he made second class so many times that it was a very familiar change.

INTERVIEWER: He kept losing it, huh?

MR. BRYSON: Yes. Anyhow, he was the one who was selected as most capable to do that. I might add that I felt very secure in that because I thought he was most capable, too. But we had grease and everything because of the cold water. All the procedures were understood. The only problem was that, later, the oxygen supply was in question. You had to charge that lung with oxygen.

If we had needed to make the escape and launch, somebody may have made it, but that's academic. It's my personal opinion that it would have been a miracle if anybody had made it. I'm

not saying it would have been impossible, because there was a history of a Greek going down 256 feet and slipping an anchor.

INTERVIEWER: Maderes did that?

MR. BRYSON: No, not *the* Greek, *a* Greek. By the way, Greek Maderes was not a Greek. He was Portuguese. His nickname was Greek.

INTERVIEWER: I understand that in submarines, everybody seemed to have a nickname.

MR. BRYSON: A lot of people had nicknames.

INTERVIEWER: What was yours?

MR. BRYSON: Nobody ever called me by a nickname. They called me 'Bryson' or 'Carl.' If they knew me well, they'd call me 'Carl.'

INTERVIEWER: When the *Squalus* was brought into dry dock, did you get to work on it at all?

MR. BRYSON: Yes. I had to stay there. We had to take everything out. We were fully loaded with engineering supplies and engineering spare parts. We had to take all that stuff off the ship, lay it out in a warehouse, and tag it for the Board of Inspection and Survey to come and survey.

INTERVIEWER: Well, Judd told me it kind of ticked him off that guys were just standing on the dock and weren't doing anything, and you guys who had gone down and come out were doing a lot of the work.

MR. BRYSON: I was never conscious of that.

INTERVIEWER: He also said that in the aft three compartments, the two engine rooms and the torpedo room, bodies were still there after three months.

MR. BRYSON: Yes, sure, all the bodies were still there, except Thompson's.

INTERVIEWER: He got jammed in there.

MR. BRYSON: Well, Thompson's body was never found.

INTERVIEWER: The water was so cold that it preserved the bodies pretty well.

MR. BRYSON: Yes, they said that. They had some of the crew help with the bodies. I was not involved with that.

INTERVIEWER: I thought it was pharmacist mates that had to come down and do that.

MR. BRYSON: I was an escort to Copperhill, Tennessee with Elvin Deal's body because I was the best man at his wedding. My family functioned down in that section. I went with his body to his home. His wife was there when I got there.

INTERVIEWER: That was pretty rough, obviously.

MR. BRYSON: It was rough on his family. They were having a bad situation there in those days anyhow. People were carrying guns and shotguns and everything because it was a copper mining area, and they were having a lot of union trouble.

INTERVIEWER: Do you think we've covered everything?

MR. BRYSON: Well, I think so. When I took Savitsky's job at the tank and the 09 went down, I was in the shower. I had just finished a class. The guy came in and said, "Get your toilet articles and some dungarees together and get on the USS *Chewing*. You're going to Portsmouth." I said, "I'm not getting on the *Chewing*," because Tutt was the master diver on it, and I didn't care much for him or his brother, either. He said, "the 09 is down, the *Falcon* is in a four point over the 09, and Captain McKinsey asked for you by name, so you're going." Ed Baker, three other guys and I went aboard the *Chewing*. We worked all night. We made up three sets of lifeline air hoses out of new hose, put tests on them and stopped them off. We made one of them with three lines. Lifeline air hoses and electric cables that were for electrically heated underwear.

We got up there the next morning and were transferred to the *Falcon* with our gear. There were two or three divers who went down. It was an overcast day. I dressed and tended

without a shirt on, and I got blistered. Metzger made the dive with the heated underwear on. But when he got down, they didn't have enough electric cables. When he got to the bottom, he didn't have any electricity in his electrically heated underwear. He was the one who got down to the boat. They decided there was nothing to be done. They wouldn't try to salvage the boat. That was the end of the operation, when he made his report.

INTERVIEWER: I didn't know there was another ship that went down.

MR. BRYSON: Oh, yes. The 09 went down within five miles of where we were, but they were in 470 feet of water.

INTERVIEWER: What caused it to go down?

MR. BRYSON: Well, there's speculation on that. The 09 had been in Philadelphia for twenty years, and they put it in commission. I figured it was rusted tanks. Maybe a guy hit the bypass a little too heavy with HB air, or maybe the tank just caved in or whatever. It shouldn't have been in deep water that deep, not for testing. Those old boats were all in bad shape. They were rusty.

INTERVIEWER: You said you were working at the tank.

MR. BRYSON: I was an instructor at the submarine escape training tank.

INTERVIEWER: Was that over the tower?

MR. BRYSON: Yes.

INTERVIEWER: That's the famous tower.

MR. BRYSON: Yes. Then, when the *Thresher* went down in 1963, I was the engineer on the USS *Sunbird*. We were standing in from a two-week operation. We got the message. We turned around and it was a 19-hour trip. The USS *Atlantis* and the USS *Skylark* were up there. The seas were building up, and debris was coming up from the *Thresher*. I had the deck mid-watch. If you saw something and you went down, you lost it in the wash, so I told the skipper, "Let's go

upwind and drift through.” We drifted through and picked up lots of personal gear and stuff like that from the *Thresher*.

INTERVIEWER: There's a movie of which I have a copy. It's called *Submarine SI* and was made in New London. Wayne Morris is in it. Were you involved with any of that?

MR. BRYSON: No. I was involved with the movie *Crash Dive*. Jimmy Gleason played the chief of the boat. Tyrone Power was in it. It was made on the USS *Marlin*. I had a picture of Tyrone Power and the crew at the top of the tank. I gave them a copy of that picture up at the submarine escape place. They have a new submarine escape place. It's named after him. It is called 'Morrison Hall.' His son gave the dedication address. I went and gave them a copy of that picture with Tyrone Power. That's my claim to fame.

INTERVIEWER: Did you happen to see that movie, *Submarine SI*?

MR. BRYSON: Years ago, I think I saw it. I don't even remember it.

INTERVIEWER: I was just wandering how accurate it is.

MR. BRYSON: I think that was made on the USS *Dolphin*. Denarksy was on that boat when they made that film. He was a second classman on the 14 boat with me.

(Whereupon, the INTERVIEW was concluded.)

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UNDERSEA & HYPERBARIC MEDICAL SOCIETY

INTERVIEW OF CHARLES W. BEIL

Kensington, Maryland

Thursday, September 4, 2003

PROCEEDINGS

EM1 BEIL: I'm EM1 Charles W. Beil. I've been at Naval Special Clearance (NCS) Team One for about a year.

INTERVIEWER: Where did you come from?

EM1 BEIL: I came from SEAL Team One.

INTERVIEWER: Was that here, in Coronado?

EM1 BEIL: Yes.

INTERVIEWER: You made Special Clearance Team One's first operational funding, to Operation Iraqi Freedom, right?

EM1 BEIL: That's correct.

INTERVIEWER: What was your assignment?

EM1 BEIL: Basically, our mission was to go ahead and defeat mines in the water. Our operating depth was around forty feet.

INTERVIEWER: What dive equipment did you use?

EM1 BEIL: We used the Viper rig.

INTERVIEWER: Was that the Viper VSW?

EM1 BEIL: Yes.

INTERVIEWER: How do you like that rig?

EM1 BEIL: I actually enjoy it quite a bit. There is only really one drawback on the rig and that's the flow rate. Basically, it feeds you 4.5 liters a minute, and it's just too much. It's too much because if you are a combat diver, which is my background, you're always moving, you're always kicking out. You try to make a timeline to meet your goal. It's a little different.

INTERVIEWER: What exactly is different, the civil I-5?

EM1 BEIL: Oh, yes, absolutely. Comparing the Viper to Drager, I prefer the Viper. I prefer the configuration, the way it sits on the back and everything. I find it a lot more comfortable in the water, period. It's just that flow rate, in particular, that I don't like. It's just pumping out so much

that you get the chipmunk cheeks. You're off-gassing terribly. That is about the only drawback. My understanding is that people are trying to work that out to get it turned down.

INTERVIEWER: Yes. I think they are at the experimental level, in fact. You deployed to Operation Iraqi Freedom with Gunnery Sergeant Doss, on his dive platoon?

EM1 BEIL: That's correct.

INTERVIEWER: What did you do?

EM1 BEIL: We went in. Initially, we were prepared to occupy Umm Qasr for four days. That was what we were taking in, everything necessary for four days. We were taking all the bullets, food and water that we would need for four days.

After that, tasking was extended considerably. We ended up being there for just over three weeks. During that time, our dive platoon's mission was force protection. Basically, while the British and the Australians were clearing Umm Qasr, we were making sure there was nothing in the water. We made sure that they slept well at night. That was our job.

INTERVIEWER: Why was that? Doctrinally, you guys were there to dive for mines or dive on mine-like contacts. How did you end up doing force protection?

EM1 BEIL: Well, sir, the way it worked out as a dive platoon, we had, I believe, 17 individuals. The group consisted of five SEALs, nine reconnaissance Marines and three EOD techies. So, with our particular background, coming from reconnaissance teams, we were, by far and away, the most qualified to provide force protection.

INTERVIEWER: But doctrinally, you wouldn't be providing force protection. You are expected to have force protection provided for you, right?

EM1 BEIL: Yes, sir. In a perfect world, it would have been a dive platoon clearing Umm Qasr, the whole port. But it was what it was. With war, things come up.

INTERVIEWER: With your background, you guys had the flexibility to do that?

EM1 BEIL: That's correct.

INTERVIEWER: What did you do, in particular?

EM1 BEIL: Well, I was one of two pig gunners on the M-60. Along with that, we established our perimeter, which was the port itself. It was fairly large but I believe we had five main posts and from that, we worked in two-man teams, just keeping watch, making sure that nobody was getting in. There was a great deal of looting going on throughout Umm Qasr. Naturally, with electricity, food or water as scarce as it was, people were scavenging for anything they could get.

INTERVIEWER: Most of them that were trying to break through your perimeter were looters, you think?

EM1 BEIL: Oh, yes, absolutely. If there had been any weapons, there wouldn't have been any more looters. We'd have taken care of that rather simply. But, yes, as soon as they came around, we just gave them a shout and instantly their arms went into the air. They knew the deal. It was 24/7 for just over three weeks. We did that. It wasn't bad at all. It could have been a lot worse.

INTERVIEWER: What kind of a rotation did you guys get?

EM1 BEIL: Well, it actually varied. For the most part, at first, it was just the Guy Platoon.

INTERVIEWER: That was not a whole lot of guys to spread out for security purposes.

EM1 BEIL: No. I spent the first four days at one post. It was just my buddy and me.

INTERVIEWER: You had to take turns taking naps?

EM1 BEIL: Oh, yes. You had to have 24-hour coverage.

INTERVIEWER: How did you get re-supplied with food and things like that?

EM1 BEIL: Well, Gunny Doss was, naturally, in a supervisory role. He and the leading petty officer at the time, Michael Groman, set up the rotation so that they would come around to the posts and re-supply us with food and water, as needed.

INTERVIEWER: How long were you actually in Umm Qasr, then?

EM1 BEIL: I want to say it was about three and a half weeks.

INTERVIEWER: Then, you went back to the USS *Gunston Hall*? Was that the ship you were on?

EM1 BEIL: That's correct.

INTERVIEWER: Was that it, when you guys went back to the *Gunston Hall*, or did you go on to the the other port?

EM1 BEIL: No. Actually, the Guy Platoon didn't go on. We were called back to the *Gunston Hall* and we went.

INTERVIEWER: Did you get to dive at all when you were there?

EM1 BEIL: Personally, no. Some of the guys in the platoon did dive. It was the real world, so you treat it as such. You just never know. You never know. But it ended up that the guys didn't find anything. That was good, too.

INTERVIEWER: You were there to verify the state. Were it unclear, then you would have cleared it.

EM1 BEIL: Yes, absolutely.

INTERVIEWER: Can you tell me about your interaction with the British and Australians? Did you have any interaction with those guys?

EM1 BEIL: Personally, it was quite limited.

INTERVIEWER: Was that because you were on security posts?

EM1 BEIL: That's right, but we had a British ship pull in. They were nice enough to accommodate us a few meals. That was definitely a nice change from the old meal-ready-to-eat. That was quite nice of them. Yes, the British and the Australians, I believe they provided a barbeque or two, if I remember correctly. That was nice.

Conditions were actually better than I thought they were going to be. I was expecting to go in and find everything just bombed out and destroyed. But the warehouses were nice. They were intact. The weather was not bad. The conditions were really good. The guys in the platoon, the guys who actually did get into the water, they pretty much could go slick. Any gear that you can cut down on will naturally reduce any magnetic signature that you can give off. Naturally, your gear is already low mewed, but the less you have to wear, the better off you are. I'm not sure how the viz was. I wasn't down there. They said that it was okay. The water was nice and warm.

INTERVIEWER: What's your background, as a SEAL?

EM1 BEIL: Let's see. I started out with the Charlie Platoon, Team One. I arrived there in 2000.

INTERVIEWER: Were you fresh out of BUDS?

EM1 BEIL: Oh yes, I was fresh out of BUDS. I hopped into the Charlie Platoon. I did the whole workup and at the last minute, I got picked up for the desert patrol vehicle platoon and deployed to the Middle East, Afghanistan, and did some time over there. I finished up with the deployment, came back to the world and decided that I was going to move on. I came over to NSC Team One and in four months I was in Iraq. But I have absolutely no complaints. It's been really good.

INTERVIEWER: You've done a year here and you will stay here for another year or so?

EM1 BEIL: That depends. My clock is ticking away. My clock is ticking down and it depends on whether or I get a school that I've been requesting. I keep getting a handshake and a promise. These guys are pretty good about it.

I'm confident that I'll get my free fall, plus I really do like the command. There are some great guys with whom I'm working. When I first arrived here, I was a little skeptical about that. I thought reconnaissance Marines were all going to be 'belt babies,' just robots. But these guys are very professional. They've got their acts together. They are great to work with.

INTERVIEWER: Do you think working in a hybrid unit like this is a good thing?

EM1 BEIL: Oh, my viewpoint on it is that I think everybody should do it at least once. You learn a lot. I had no idea what a reconnaissance Marine was. Now, I'm impressed.

INTERVIEWER: Is there anything that we didn't talk about that I should have asked about? Is there anything else that you want to discuss?

EM1 BEIL: I'm trying to think of points on the Viper itself. Like I said, aside from the flow rate, I don't see anything wrong with the rig. No, nothing really comes to mind.

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UNDERSEA & HYPERBARIC MEDICAL SOCIETY

INTERVIEW OF CHRISTIAN J. LAMBERTSEN

Kensington, Maryland

April 2003

PROCEEDINGS

INTERVIEWER: We're going to start way back. Where were you born, DR. LAMBERTSEN?

DR. LAMBERTSEN: That would be May 15, 1917. Did you mean when?

INTERVIEWER: Where were you born?

DR. LAMBERTSEN: In a small New Jersey town called Westfield. It is up in the northern part of New Jersey. Very shortly after that, we moved to a town called Scotch Plains in New Jersey, which is a tiny town of about 3,000 people.

INTERVIEWER: What about your schooling? What do you remember about that?

DR. LAMBERTSEN: Well, I certainly remember that. As I began, because it was a small town, the schools were small. However, the elementary school at that point in time was very new and looked large. The principal in the school was once the teacher of my father. It's that kind of a relationship that I remember. I know there was no high school in the territory. I remember when it was built and the big impact that had on the community.

INTERVIEWER: Were there teachers that you really remember as having influenced you?

DR. LAMBERTSEN: I know that there were two important ones, in high school, especially. I'm not going to be remembering back who might have influenced me in elementary school. I wouldn't remember their names now. In high school, there was an English teacher who was very imaginative and a big help in stimulating my constructive writing, I also remember well a mathematics teacher who was extremely fine. All of them were positive characters who took an interest in the students.

INTERVIEWER: From there, did you go on to college?

DR. LAMBERTSEN: I did. It may help, and I think it might be of some interest, that this was now the middle of the Great Depression. The high school class had about a hundred students and I think I was the only one, out of the whole class, who then was able to go on to college after

graduating. I think that is important because things in those days were so absolutely out of control, financially, for everyone, as you can probably imagine. I now remember, as you ask the question, that I didn't go right on to college.

I went to an institution that was established to help situations of my sort, a nighttime junior college. I went for two years there. It was about twenty miles away. I had a job during the day and went to the junior college at night. I was their top student at the end of two years of junior college.

The faculty at the junior college was made up of moonlighters from Rutgers, Princeton and Columbia Universities who were teaching at night at the junior college and in their own schools during the day to try to help the situation that existed at that time. The situation, in which people were unable to manage to get into college, is what I mean. At the end of two years, as their top student, the teachers took me under their wings and went up to Rutgers with me and insisted that I be admitted in spite of my not having been part of their system. I was admitted into the first year of Rutgers after two years of junior college and graduated at the end of my sophomore year.

INTERVIEWER: Were you focusing your interest at this point toward medicine or medical research?

DR. LAMBERTSEN: At the time, I was about as ignorant as you can imagine. In a small town, there was no great awareness of what medicine was, other than what the local practitioners practiced. There was no concept of research, either. In my mind, purely the thought of going down the medical pathway had been ingrained early and it never occurred to me to do anything but proceed.

In the course of the college work, whether it was the junior college or not, it was clear that there was great general interest in the sciences. At Rutgers, in my two years there, I worked

in laboratories of different disciplines, like genetics. We had genetics in those days, too, as you know. I also worked in botany laboratories and in biology generally, so I had a lot of laboratory experience in just two years. Rutgers really stimulated that interest and I applied to medical school afterward, but only to one school. It didn't occur to me that one ought to apply to more than one school and no one bothered to tell me that. By the way, I was, indeed, commuting during the time and didn't get the chance to live on the college campus. That was part of life in those days. You did whatever you had to do. I worked as a carpenter, helping to build houses during the day. I think that led to my ability to use time well, because study time was not very plentiful.

I still came out very high, scholastically, at Rutgers, as I had in junior college. I applied to the University of Pennsylvania (Penn) and went for an interview. When you interviewed at a medical school, your goal was to get the interviewer to treat you well in the selection process thereafter so that you would be chosen. I didn't know even that. I was so unaware, coming from a small town.

When I finished the interview, I simply asked the dean whether I would be accepted and he said yes. That was the beginning of a very fine situation because the medical school at Penn was a great experience right from the beginning. Again, no one had any great financial capabilities. Tuitions were low, but they existed. This was the period of time from approximately 1939 through the next four years, or the tail end of depression. A very fine situation occurred in the country. The Progress Administration evolved and there were dozens of tiny jobs at 25 cents an hour, of which I had a half dozen. Those jobs helped me get through the first part of medical school. I then got the one scholarship that existed at the medical school and then the whole situation was under control.

INTERVIEWER: Were you beginning to focus your interests in research, in the breathing

apparatus?

DR. LAMBERTSEN: I did, yes. This story may not have much relevance, but in the course of remembering where we were, you stimulated it. There wasn't much time in those days. There was a lot of action, and yet, it felt loose and easy because everybody was so constructive in the course of backing up whatever was going on. The interest in what you call 'research' came out of the fact that the courses that we had were, in themselves, so stimulating. The teachers in those days were focused on teaching and dealing with the students, as opposed to chasing after graduates, and there weren't any graduates to go after at that point, that close identification occurred between teachers and some students. I was one of those who had a lot of close identification with different teachers.

INTERVIEWER: Were some of those professors that you really enjoyed?

DR. LAMBERTSEN: Yes. There were quite a few, but in particular, an Englishman who was probably near retirement age but incredibly dedicated. For instance, when we had a laboratory situation in the medical school, in physiology, he joined in those experiments. He was right there, helping to design experiments with the students. As a result, it wasn't just a routine experience. We invented things to accomplish.

INTERVIEWER: Was he Cockburt Bazet?

DR. LAMBERTSEN: Yes, he was. He was Henry Cockburt Bazet. I think that out of that was where the pattern of thought of a heavy outdoor life really began for me. I did enjoy swimming and did develop a heavy breath holding capability, which was extreme when I was in an athletic situation. This was not formal, but this was in the course of doing things in the medical school.

That meant that coming into the physiology laboratory there was suddenly an interest in learning about breathing and respiration. That opened up ways to make things happen in the student laboratory that hadn't happened before. It wasn't research. It was just doing experiments.

One of those experiments was to breathe oxygen and hyperventilate to reduce the carbon dioxide pressure in the body. This was a conceptual thing that, when done severely, allowed me to hold my breath for ten minutes. That was a big step in our laboratory, the student laboratory, and that's because it took a lot of time for the carbon dioxide to build up again. The oxygen was there. Now, there came a point at which that teacher and I began to have even more stimulating interactions and I had priority access to any materials, parts, equipment and so forth in the teaching laboratory, after hours. That was what the relationship was like. Other relationships I had were good, as well. I think the relationship with Bazet was one that was such a focus. It went on for the full four years afterward.

INTERVIEWER: Were you then beginning to focus on this research that Bazet was encouraging you to do on a breathing apparatus?

DR. LAMBERTSEN: Yes. That is exactly right. It was on human breathing and why people breathe like they do. There are reasons and they were largely unknowns at the time. The physiology of the human system made it obvious that there should be ways to capture an atmosphere and re-breathe that atmosphere.

INTERVIEWER: You mentioned earlier that you have had many professions, one of which was a carpenter. Were you good with your hands? Did you have access to the necessary parts and materials?

DR. LAMBERTSEN: I was good with my hands. I was mechanically oriented and conceptually mechanically oriented. The material to which I had access was laboratory junk. Nobody bought new equipment in those days and there were old, used breathing bags and old odds and ends of tubing and whatever. Doctor Bazet, however, was so imaginative that when I began to do something, he could see that I needed more equipment. Therefore, he thought he would write to the head of an anesthesia company and communicate that he would like to have one of his

students get some parts so that the student could go on with a development that had been started.

That led to the next step.

INTERVIEWER: Was there any direction toward developing something of a practical nature?

He was an Englishman, and with the tenuous situation in Europe at the time, was the idea in his mind, or in yours?

DR. LAMBERTSEN: Yes, it was. That came up very early because Doctor Bazel was not only a great citizen of the United States at that time, but his connections were strong. His awareness of what was happening in England was strong. Can you picture France in 1940? France was finished and the Battle of Dunkirk had just happened. Since that was the situation and Europe was really overrun, across the board, and the regions around the Mediterranean were also being overrun, Bazel knew, as I did, that Britain was really in a severe difficulty.

I don't know whether he influenced me or not. I don't think he did, but radio did. Radio was our source for what was going on every day, here and across the ocean. I'm sure that as I began to put the system together, I didn't think that it might have a military application.

That was the beginning. I built and tested it at my base of operations, a summer job with the Ohio Chemical and Manufacturing Company. That was the same company that Bazel had written to for parts. The president wrote back and said to send me out. He said that they would give me a job for the summer. That was where I put a system together. Once it worked, it was obvious that it should have military application.

INTERVIEWER: Was it the re-breathing mask on which you were working?

DR. LAMBERTSEN: It was a re-breathing system that provided pure oxygen and removed the carbon dioxide in a small canister, allowing you to do rather severe exercise for about half an hour underwater and swim neutrally buoyant. That means you weren't a diver walking on the bottom but a free-swimming diver, and it worked like a charm just from the very beginning.

INTERVIEWER: Could you describe what that unit looked like?

DR. LAMBERTSEN: It was pretty flimsy. I had to make it happen in such a short time because it took only a few weeks to construct a good, working system that summer and trying to improve upon it. Imagine two breathing bags, one behind each shoulder, connected by tubing used in anesthesia machines. That tubing led to a container that had sodalime in it and an alkali material that removed carbon dioxide, and a single tube from that canister up to a mask. The mask was one of the first aviation masks ever built. Coming from the pipe stem to the mask was a step in aviation.

They used to simply stick a wooden pipe stem in the mouth and take oxygen while flying at high altitudes. No full-face mask was used, just one that covered just nose and mouth. Goggles were made with a welding system that allowed you to seal the goggles against the water outside, and a bit of lead to counter-balance it so that it was neutrally blended. There were no swim fins.

INTERVIEWER: Were you influenced by any of the diving literature by other researchers who were doing work like this?

DR. LAMBERTSEN: I'm sure I was heavily influenced by, first of all, the USS *Squalus* event and the fact that there was a submarine escape apparatus that seemed sensible. It was, as you probably know, something that was useable to come up from the depths, but not to go down into them. It was not a diving system, but an escape unit.

I was stimulated by some of the more popular books. I don't even recall the name of the author now, but there was one book, *Danger Is My Business*. It was obviously the sort of thing I read with great interest in diving.

I think it was obvious that it was a different situation. It wasn't the big hard hat diving with the big suits and the 200 pounds of weight and walking with hoses to the surface. You were a free agent and that was very different.

INTERVIEWER: Was it the prototype that you had made?

DR. LAMBERTSEN: It was originally intended to be a life saving apparatus to be put on, quickly, by lifeguards if someone went down in the water. It was to be able to be put it on within approximately two minutes. A lifeguard would get in the water and be able to stay there to recover that person. That was its initial purpose. Once it worked well, and with the unfolding events in the world, the concept evolved toward having a military use.

INTERVIEWER: Were you still working, as you said, with a shoestring budget?

DR. LAMBERTSEN: Still, I had other jobs, yes.

INTERVIEWER: Did the Ohio Chemical and Manufacturing Company provide you with the materials?

DR. LAMBERTSEN: They gave me a summer job. I don't even recall whether there was any reimbursement, but that job allowed me to do what I wanted to do with their materials.

INTERVIEWER: Did you graduate from medical school in 1940?

DR. LAMBERTSEN: I graduated in the early spring of 1943.

INTERVIEWER: There was a military obligation on everyone at that point. What did you do?

DR. LAMBERTSEN: Well, mine was easy, because I made a commitment while I was a freshman in medical school and saw what was going on. I just signed up with the reserves at that point.

INTERVIEWER: Was that in the Navy?

DR. LAMBERTSEN: No, it was not. I'll tell a story that you will enjoy. I tried to join the Army Reserves. In the Navy Reserves, you had to go through a medical exam. They asked a simple question: "Do you have any medical problems?" I mentioned hay fever, and that disqualified me from joining the Navy. It was not sensible, but the medical examiner at that point was not very aware. I just switched over and joined the Army.

INTERVIEWER: Did you become an Army medical officer in the Reserves?

DR. LAMBERTSEN: Eventually, I became an army medical officer, yes.

INTERVIEWER: What was that experience like? What was your obligation there?

DR. LAMBERTSEN: After the first year of medical school, I was connected with the Office of Strategic Services (OSS), which was evolving. In 1940, I built and tested an apparatus, and then demonstrated it to the Navy. After having demonstrated it to the Navy, they concluded that there was no sensible application for it in the Navy's system. It was 1941 and Pearl Harbor hadn't happened yet. We weren't yet at war and we weren't really doing a lot to help on the other side because there was a bit of resistance in the country to getting involved in the conflict.

The OSS had its seed planted by General Donovan's mission to Britain to learn how likely it was that Britain would be able to sustain itself against imminent invasion. Paris was gone and the British forces were driven out of Europe, so there was an extreme situation in the world. On that basis, I made another visit to the Navy, at which time the fledgling OSS personnel, the few that existed, caught on quickly and decided that we would join forces. I became an unofficial component of the OSS as a sophomore in medical school.

INTERVIEWER: Were they particularly interested in your breathing apparatus?

DR. LAMBERTSEN: They were interested in the concept of having men to be able to do what they felt was needed, namely unconventional warfare, and that included sabotage.

INTERVIEWER: Did you ever meet with General Donovan?

DR. LAMBERTSEN: I did, yes, but it was a very simple kind of meeting. He didn't come to demonstrations. He was much too occupied for that. I don't recall much about it. It would have been in an office. The commitment that the OSS be formed was not really acted upon until 1941, until the months before Pearl Harbor. The OSS was officially formed by then, though, and that meant that once Pearl Harbor happened, the U.S. was in the war, and my role began to

accelerate. It accelerated in terms of training people, because the OSS had recruited individuals into teams of swimmers and trained them as individuals capable of handling almost anything in the water.

INTERVIEWER: Were they trained as operatives?

DR. LAMBERTSEN: Yes. They were trained as operatives, in all but the final training section on underwater activity, and I conducted that. I carried that out as a civilian, initially for the first group, and, since I was a reserve army officer, I was forced to continue medical school, because the medical department would not allow students to do anything but finish medical school. I had to work with the OSS while I was completing medical school.

INTERVIEWER: That was a very odd arrangement, wasn't it?

DR. LAMBERTSEN: It wasn't an arrangement. It was simply what people did. Nothing was arranged. I just did whatever they needed me to do.

INTERVIEWER: Did they call you?

DR. LAMBERTSEN: I went, and my dean wrote a letter to the faculty, directing them that I had his permission to do whatever I felt like doing when I wanted to.

INTERVIEWER: Did you have, being in medical school and then getting out of medical school, an obligation to go for Army training?

DR. LAMBERTSEN: Yes. I had to, but as a medical ROTC student, I went to field training during the course of one summer. That was part of it, and as I left the medical school, I went into the Army and had to go through both field training again and through a period of hospital training. They were a few months at a time. During that time, I continued to work with the OSS.

INTERVIEWER: Where was the training?

DR. LAMBERTSEN: Field training was in Carlisle, Pennsylvania. The hospital training was in Santa Barbara, California. How does one continue to work while going through training? I was

redesigning the apparatus and making an improved one that would stand up under military conditions.

INTERVIEWER: You were affiliated with the OSS at that point. Was it was a really top secret operation?

DR. LAMBERTSEN: It was, indeed.

INTERVIEWER: Did you then go down to the Caribbean with the OSS group, to train?

DR. LAMBERTSEN: My obligations to the medical department of the Army were finished. My orders were already cut to go to the OSS. I reported into Washington, D.C. and immediately went on with an assignment.

I went into the headquarters of the OSS, which had a maritime unit with a unit head. The head of the maritime unit was the former mayor of Providence, Rhode Island, and a Navy lieutenant. He was the head of a large maritime unit by that time.

Men were recruited and had their primary training during that past year. As I reported to that office, I asked the head of the maritime unit what he would like me to do. He replied that I ought to tell them what I wanted to do. We agreed that I should go out to the Ohio Chemical Company for a couple of weeks and put the advanced equipment into production.

INTERVIEWER: Did you have only one prototype unit at this point?

DR. LAMBERTSEN: Yes. That is correct.

INTERVIEWER: How many people needed the equipment?

DR. LAMBERTSEN: There would have been, by this time, some fifty or more, but not hundreds. At that point it was about fifty, but they recruited another group after that. The total number in training was about a hundred and the total number of pieces of equipment built was about 250. My main point is that the first task I had to do was to convert a prototype that I had made by hand. In three weeks it was in production.

INTERVIEWER: Were there any modifications in the production model?

DR. LAMBERTSEN: Oh, yes, of course. They were improved in the quality of their materials and in the construction of the mask. We couldn't make new things. We had to adapt to existing things. There wasn't time to do what is done now. We could not spend ten years designing a mask. I took a sand blaster's mask and rebuilt it in order to give it better vision and mounted valves, allowing you to choose whether to breathe air while the mask was on. It also allowed you to drain water from it if you got water in the mask and to shut it off so that if the mask came off or you took it off, you didn't sink. You could float on your breathing bag. All those things were done within a three-week period with good machinists and people in the anesthesia company. They were not diving equipment manufacturers.

INTERVIEWER: You weren't really concerned with the monetary arrangements? Did the OSS take care of that?

DR. LAMBERTSEN: There were none. It wasn't worth talking about. The monetary arrangements were never even considered. The first purchase of equipment was four units of the pre-final apparatus and couldn't be afforded by the OSS because the OSS had no budget. They split the cost with the British. The British paid for two and the OSS paid for two at something like \$150 each. That's why finances were not something that got in the way.

INTERVIEWER: Did the British have an interest in this because they were having a problem with what was called 'shallow water blackout'?

DR. LAMBERTSEN: Yes. The British had gotten from me, and then from the OSS, the message that there was something that they would be interested in. My professor helped with that back in 1940. In the fall of 1940, he wrote a letter to the person I think was called the 'Director of Scientific Research and Experiment,' and the admiralty. That letter announced our message to the British and they were hungry for everything because they had needs of the same nature.

They sent a couple of British medical officers to here by boat to talk about shallow water blackout. They were losing men with their primitive diving systems. The reason was inadequate training, not the equipment proper. The problem was with the lack of oxygen when they did not remove the nitrogen from the breathing system as a routine task.

INTERVIEWER: Did they have an interest all along? Is that why they partnered with you?

DR. LAMBERTSEN: We had close communication all along, yes. In the beginning of 1944 we had promptly sent a team of swimmers using the primitive equipment at an OSS maritime station in England. That was before the final model was sent over to England, and they had only a total of four units to prepare for missions on submarines, which they never got to do.

INTERVIEWER: General Donovan, as I understand, was developing a doctrine for the OSS and this maritime unit was going to be the way that doctrine was carried out. What was that doctrine, as you remember it?

DR. LAMBERTSEN: I do know that the knowledge that led to the doctrine was that the need existed to help surgeons in the resistance in occupied countries. That force was not going to be able to do it under the circumstances of near total completion of a conquest. Entering by air was a one way street but entering by sea was a two-way situation. His doctrine, and the reason for ultimately establishing a maritime unit, was that he wanted full use of that sea entry for delivering agents, for recovering agents and for sabotage.

INTERVIEWER: Did you provide him with the tool he needed?

DR. LAMBERTSEN: It was such a strong part of the maritime concept that it became almost a focal point for building other kinds of concepts around it. That was why when it became sensible to think in terms of longer-range activity that a swimmer could do on his own there was a rapid acceptance of the concept of incorporating Britain's submersible canoe that it had developed. The swimmers with whom I had developed the tool and brought together under the maritime unit

allowed us to have a swimmer delivery capability, by which individuals could go for long distances, become swimmers and then come back as swimmers and come back the long distance. We expanded the concept in flight. It all happened in months.

INTERVIEWER: Was Dennis Roberts the head of the maritime unit?

DR. LAMBERTSEN: Yes.

INTERVIEWER: What do you remember about your relationship with him?

DR. LAMBERTSEN: I remember him very well. He was good, honest, and a tremendously positive person. My knowledge of where he came from came later. I didn't know that he was a great water man. He was a great sailor and boat man. He knew the sea, and he knew a lot about it.

He was a Navy lieutenant in charge of a worldwide operation and it always surprised the Navy that he had Navy commanders around the world and was their boss. They didn't like the thought of that. The current Navy doesn't understand how that can work. As I remember him as a person, he was the one with whom I spoke when I finally came in, a brand new army officer reporting for my functioning assignment. His statement was that we think you ought to tell us what to do.

INTERVIEWER: You were an Army lieutenant at that point, weren't you?

DR. LAMBERTSEN: I was an Army first lieutenant, yes.

INTERVIEWER: Did you have, as an Army lieutenant, a considerable amount of influence over what was happening there?

DR. LAMBERTSEN: From that point on, I had absolute influence over what happened with what we called 'operational swimmer activity training.' As we went to the point at which the equipment was committed, I came back from Ohio Chemical after those few weeks and went down to the Caribbean. On the way down, I very rapidly wrote a manual so that I'd leave

something behind if I disappeared. Having gotten down there, we already had the first big OSS group in training with the prior equipment, which was not, in my judgement, suitable for military operations.

INTERVIEWER: What was that equipment?

DR. LAMBERTSEN: It was my second model, the one that I hardened from the life saving system into what the OSS could see was useable for several hours in the water. It didn't have resistance against corrosion. It didn't have all the life saving features or floatation features that you would have in case of emergencies. It was the first functioning true underwater closed circuit breathing apparatus. That was what it had as its mark, as opposed to breathing in and out of bags. It was a system that let you breathe out through the canister, leaving the CO₂ to be absorbed, breathe the next one out, and have that absorbed. The men who were there were all Navy men, and as I came in, they went out, and they had gotten their training only through a preliminary start of training a couple of their people and, subsequently having them become trainers. That was just breathing system training.

They had already had the ranger training and all of the small boat training, and therefore, were assigned to the Navy. The Navy requested them and assigned them to their new underwater demolition teams. They were assigned to team ten and became the nucleus for that.

When I went down, it was after the first group had gone through less than what I considered thorough training, but there was no choice. I had to make the new system come into being.

INTERVIEWER: What time period was that?

DR. LAMBERTSEN: It would be about the spring of 1944. They were leaving and I was going down there to pick up the training. I had a limited influence on that first group.

INTERVIEWER: Did the first group go out with the Navy?

DR. LAMBERTSEN: They went with the Navy.

INTERVIEWER: Were things developing in the Pacific war, as far as the amphibious operations in the islands? Was that why they needed these people?

DR. LAMBERTSEN: They were doing a great job, all of them. The Navy was doing that. But it began at the same time. In 1943, we were beginning in the OSS, so we started together. Our OSS people went to the heads of the Navy system in Fort Pierce. The head of that was Draper Kaufmann, who was a very famous Navy person and once head of the system here. It was obvious to our OSS people that there was no way that they would be able to be saddled with having to learn how to breathe under water at the same time, because they were going to have to use massive numbers of people and work in daylight.

INTERVIEWER: Was the OSS training you spoke of in the Caribbean out of Fort Pierce?

DR. LAMBERTSEN: Yes. The Navy training was at Fort Pierce. The OSS training was on a very small island about three miles long and one half mile wide, off of Nassau. It was under British jurisdiction then, but the British were not even allowed to fly over the islands. In other words, the British military was not even allowed to fly over the island because of the security of the training. We simply took over that island and used it as a training base, while we lived on the shore and came to the island each morning, back and forth. We had no special facilities.

The nature of the training was that the second group was now under a different training system, and I was named as the trainer. I was the medical officer and the trainer, and it was obvious that I had to become the demolition trainer, as well, because we had no adequate demolitions. We had to design and build the kinds of things we needed to use. We were working in water with systems that would behave and go off when they were supposed to go off, and not just blow things up. As a result, we had to design and build some of the kinds of equipment with time delays that would not be ruined by an accident of moisture. I think the important thing was that the second group of OSS people had the chance to train on the final apparatus, and that

meant their skills were very far above those of the previous groups.

INTERVIEWER: They not only had to be trained as swimmers but also had to be trained to use your mask?

DR. LAMBERTSEN: Yes. That was not hard to do because they were all water oriented and volunteered for something that had to do with water. That was all they did. They didn't know what it was going to be. The training was very specific in terms of how you learned to avoid getting killed in the process. Therefore, they started off with great confidence and had no difficulties.

INTERVIEWER: Were you then involved not only with the mask you were making? You were a demolitions expert also?

DR. LAMBERTSEN: I had to be. I had to do that because it was imagination that was needed. I had to ask myself, "How do you put these things together? How do you make all of this fall into place?" To work at night and to learn how to go from one place to another and not be seen meant we had to devise the navigation system, something that would attach to the breathing system so as to be there, visible, as you were swimming.

They now use an equivalent but hold it in their hands instead. They call it an 'operations board.' Are you familiar with the attack board? The Navy SEALs now use the equivalent, and they use it as a hand held device. We snapped it up in front so that it would come under our faceplates as we were swimming and could hold a course and find the course back. We made things in place in the field to expand the operational capability. We ended up being able to talk to each other underwater, and that was lost instantly after the war. It was thrown away.

INTERVIEWER: How was that done?

DR. LAMBERTSEN: I got earphones from the British air station and took them apart and made them into mouthpieces to mount in the mask. The diaphragm of that earphone became a

transmitter that took the sound waves of voices into the water. Then, the ears themselves were the receivers, and for something to the order of 75 feet or more, we could talk to each other. That was lost right after the war and never came back.

INTERVIEWER: Was that stage of the operation pretty much the way you had been working your whole life to that point? Was there no procurement officer? Was there no way? When you needed something, you found a way to get it?

DR. LAMBERTSEN: That was the first stage. But then, the OSS was evolving. One of the things that evolved was what I remember was called a 'research division,' and it was there to devise things that were needed. When I devised the speaking system and sent the details of it to the OSS, not knowing even that they had it because we were not talking to each other, we were off doing training, and they then immediately provided enough good ones to go around.

INTERVIEWER: What was the island called? Was it Treasure Island?

DR. LAMBERTSEN: Yes. That's right.

INTERVIEWER: What was the administration set-up of this maritime unit, while you were there? Was there an administration set-up?

DR. LAMBERTSEN: You're a very wise man. We had someone who was at a base, even though the base was nothing but a house. Whatever was needed, he got. He was a reserve naval lieutenant commander and had no connection to, or functions with, the training. The next person was called the 'training officer' and was a Marine captain who had been hurt badly in Guadalcanal. He was named Sullivan and was appointed the training officer, but he was not the training officer. He was just named that. He was really the authority over some young characters that were these brand new, young guys from the Coast Guard, the Navy, the Marines, and the Army. They were the swimmers. He was what you would call the 'head of troops,' but there were only about thirty troops.

INTERVIEWER: Did he have any natural ability to do this?

DR. LAMBERTSEN: He had none.

INTERVIEWER: He didn't?

DR. LAMBERTSEN: No. He was a Marine. He had a natural ability but he didn't need it for that. He needed to be that figure and he was. He never took his shoes off, never got them wet, and he never went near the water, but was respected by the guys. Administratively, but organizationally more than administratively, the total of about thirty people was divided into three platoons, such as they may have in the SEALs at this point.

The platoons were not divided in accordance with whether they were Army, Navy, or Coast Guard, but they were Army, Navy, and Coast Guard all together in the same group. Whereas the previous group one was all Navy, that one was a mix. Each of them had a lieutenant junior grade as a head. One had a Marine second lieutenant, one a Coast Guardsman lieutenant junior grade and one was an Army head.

Men of different backgrounds headed the three platoons within this group, but it didn't matter. They were all there because of what they were doing. It had no relevance as to whether they were from the Coast Guard or whatever. They all had heavy water experience beforehand. My roles were multiple and without anybody saying what they were. I was there to make something of the system. I was also medical, so I was also there to take care of any medical problems.

INTERVIEWER: You had no boss?

DR. LAMBERTSEN: I had no boss, no. When the head of the base began to intrude on the training and interfere with what I thought needed doing, all it took was a telephone call and he got the word from headquarters to get out of the way. That was the way it was. I never thought of it that way. There was no officiousness on my part. I was brand new. I was just doing it, and it

worked.

INTERVIEWER: That would never work today.

DR. LAMBERTSEN: No. It wouldn't work today. It would not work at all.

INTERVIEWER: It was a very unique time.

DR. LAMBERTSEN: I think that you get the feeling that this was loose, but purposeful and dedicated, on the part of everybody. Security was so high that I didn't even know what was going on the other side of the world. I didn't even know what the Italians had been doing. I didn't even know that, in spite of the fact that we were generating an equivalent.

The men with whom I worked were very much security conscious and I was very security conscious. We had a big storm once and it washed the whole bloody bunch of us away from land. We were scattered out there but wearing the underwater breathing apparatus, and those people had trained with it and had the equipment that could float them, but only if they used it so that it would float them. One of them got scared and took his equipment off because he knew he could handle himself in the water. He was just plain scared, and it meant that he decided to ditch his equipment, whereas the others did what they had been trained to do, namely turn the valve off and float on your breathing bag. It became a life jacket. I raised so much grief with those characters at the end of that that they all went out and found that equipment.

INTERVIEWER: Was it expensive equipment?

DR. LAMBERTSEN: Well, it wasn't the cost. It was that I didn't want it to be picked up by somebody.

INTERVIEWER: Oh, is that right? The security was that tight?

DR. LAMBERTSEN: Yes, and I gave that guy so much grief that he thought I was the worst guy in the world. He told me he should have drowned himself. You know how it was there. It was a hard wartime situation that caught up everybody. There was no administrative interference from

the OSS. There was absolute commitment from them. However, the real question was when would a group of that sort really be ready? One had been sent out and absorbed in such a way that it was obvious it probably wasn't going to be used, even though the equipment was sent off. The best equipment was sent right off after it. They took the equipment they used for training and had delivered it to Pearl Harbor. This was the advanced equipment that I had finished getting produced.

INTERVIEWER: Was that the Underwater Demolition Team (UDT) group that you're talking about?

DR. LAMBERTSEN: With the one that went into the UDT, we assumed everything was going to be fine, but it was not. They did a great job in bringing swimming into UDTs, and I mean real swimming, because the UDTs did not have much swimming training or guaranteed swimming capability. They were just generating people so fast.

We had some of the world's best swimmers in that first group, Olympics-type swimmers, candidate swimmers. One was called the 'fastest swimmer in the world.' They were the kind of people that we had. They were in the teams out there, such that the head of the Pacific fleet wrote to Donovan to thank him for having given him a chance to have people upgrade the swimming in the UDTs, and that was a great thing. They brought fins into the UDT system, the swimfin, which they hadn't had.

How do you work when there seems to be nobody in charge? One of the things that had to be decided was when those groups would be ready to go. Roberts came down with the headquarters staff of the maritime unit to appraise the situation, more or less. It was not an officious bunch coming down. They were coming down with full confidence that things were okay. I did the obvious thing. I set up a nighttime operation for them and let them be the targets.

INTERVIEWER: Was this that famous incident?

DR. LAMBERTSEN: Yes. You know just what I'm driving at, don't you?

INTERVIEWER: Yes, I do.

DR. LAMBERTSEN: Everybody agreed that there would be a live attack, because there was no point in doing something if it was not real. At that point, it was not a peacetime situation and the need was to get as many people involved as possible, even though ultimately one person may have done a task.

The eighty-foot boat, the only boat we had, with everybody on it as observers, team members and the people visiting from Washington, became the target. The rubber boats were called LCRs then, or landing craft rubber, and paddled by inflatable boats. We paddled about 300 or 400 yards from the boat.

I chose the youngest swimmer in the team to join me as a partner in making this run on the boat. I was going to do it because I surely didn't want it to fail. We stuck together on the way from the rubber boat and hit right on the anchor line of the boat. Our targeting was using compass and having, not anchor line, but the heavy chain anchor. We hit the anchor chain, and I had communications so that I could talk to my partner. I told him to just stay put while I took one half pound of TNT. It wasn't big, but it was big enough, and it had time. What we called 'time pencils' were delay detonators set at a half an hour. The boat had a big, five-gallon bucket over the side with a rope, and everybody was looking for action. They saw nothing of what we did, and time passed, so they assumed it had failed and began to pay little attention until someone pulled up the bucket and found the charge in it. That meant that my partner was sitting on the anchor and waiting for me to come back. It was all moving quickly at that point in time.

I had to get out of the way of the anchor. There we were, and the anchor came up, the bucket came down, and the boat took off like a shot. There were two people under the water in the dark with the rubber boat out there somewhere, not in connection with each other. Darn it if a

fine young fellow didn't just keep calling through the water, "Oh Doctor, where are you?" over and over and over again, and I honed in on it. I honed in on his voice, and we swam back, and that was the end of that. Roberts decided we were okay.

INTERVIEWER: You were ready?

DR. LAMBERTSEN: We were ready. That was readiness. It was a live charge that went off. We swam far enough away to get out of the way of the blast. That solved the problem of readiness, so we were immediately able to wrap up and proceed.

INTERVIEWER: Where did you go from there? Where did the team go?

DR. LAMBERTSEN: We went back, quickly back. We broke up into two teams. I know that our primary task was to go to Guantanamo Bay to very carefully arrange things between the head of the OSS and the Navy to use our trained swimmers to help judge the security of the bay's defenses. It was a well-planned Navy operation in which we joined the Navy and that meant joining them at Guantanamo.

But the techniques of what was done were techniques that we decided upon together. I was delayed only a bit in getting there because I had gotten a hand infection, and we got some of the first penicillin that had been made to cure that infection, so I joined them at the beginning of the Guantanamo operation. Are you interested in knowing what the nature of the operation was?

INTERVIEWER: Yes. That was going to be my next question.

DR. LAMBERTSEN: That was when I thought that it would be wise to point out two separate things. One was a full-scale attack on the harbor as though it was an operation similar to what we did with the 80-foot boat, and it was done. We had the benefit of a submarine that time, but I don't remember its name.

They approached within about a mile or two of a secondary submarine, offloaded the rubber boats, and the swimmers, in their rubber boats, were able to get over and through the nets

with those boats. They then entered the harbor. It's a big harbor, of course. They had designated targets within it. They were derelict targets, so that they could actually make limpet attacks on the targets, and they did that successfully.

That was kind of an all night mission. There were boats, Navy and otherwise, observing other boats. The second part of it was a multi-day thing that went on probably for almost two weeks during which the swimmers were demonstrating what they could do as individuals to the net defenses themselves, as opposed to planting charges on shipping vessels. It was astounding what could be done because of the way in which we were able to use charges. It usually involved linking charges using primacord, which is an explosive cord that once it's set off by a cap, the explosion instantly travels down that cord, no matter where it is and how it's laid. We were able to drop torpedo nets right out of existence simply by having swimmers put lumps of plastic explosive, like composition C, which was an original plastic explosive, in the shackle like fittings. After having run primacord through them so that the primacord flashed through in a fraction of a second, each explosion went off, the torpedo nets disappeared, and it was a mess getting them up off the bottom thereafter. Nevertheless, that was one example of the kinds of things that they did.

They even went so far as to try to prevent the gauge from opening by rigging systems that linked the two giant gauge systems so that they at least had to not do as they were supposed to do. I don't know whether they could have been broken open or not, but nevertheless, the trials were made. That could be done. Torpedo nets could be raised from the bottom by a sort of block and tackle. They could raise whole sections so that you could take people and get them underneath the nets if you couldn't get through them. I think it was that kind of multiple tasks that then made the ordnance that the senior Navy group was involved with it. I have a good story about their security, which was beautifully documented and put away so tightly that it didn't

come out until about four years ago.

INTERVIEWER: It came out recently?

DR. LAMBERTSEN: Oh, yes. It was a very tight report. I did not see it until it was finally released about four years ago. It was hidden in all of these archives under much security so that it was not released. That's why I never saw the results of it until just a few years ago.

INTERVIEWER: You had a two-fold out of it? This operation also showed the offensive capabilities of this new system?

DR. LAMBERTSEN: Yes, but it was designed to show defensive faults and it didn't.

DR. LAMBERTSEN: That, at the beginning and middle of a war, is not the sort of thing that anybody wants floating around. The Navy did a proper job. They did a beautiful job of managing that effort, backing it up, and the OSS people came in to be actors in the scene. I consider that a Navy operation.

INTERVIEWER: The people were trained. They were using your unit. They were well trained and they were ready. Were they ready to go to war at this point?

DR. LAMBERTSEN: Yes. Yes, they were.

INTERVIEWER: Where did they go?

DR. LAMBERTSEN: You have to realize how ignorant a first lieutenant in the Army was when the world was geared around secrecy. The OSS had to make things happen and let you know what was sensible to let you know, as a first lieutenant, even if I had to make the whole system work. All I knew was that we were going to be going over to what was called the 'southeast Asia command,' and the word was that it was a base in what was not a war zone. It turned out that Donovan had come to an agreement that we could use this group. That was the key element. We were going to join the system. I never knew anything about that.

We split. The men were put in their pathway for being sent over, and I had to stay put for

a couple of weeks anyway, in order to get some more documentation into the system so as to not just walk away and leave things out of control. I'm trying to picture now how they went, and I have a hunch that some may have gone by ship. I don't know how they went, because I was delayed in getting over there due to the fact that I had to ultimately pack up the equivalent of what I would need for almost two years and create medical support. My block was there because I was on another track. I generated containers that were tough containers, field-like containers full of whatever I thought I would need, medically, in a remote region to back up the people where there was no one else to help in any way. I went so far as to pack sterilizing equipment, instruments, things that you would not think of, in terms of ordinary odd medical backup for something, drug supplies, and tropical medical. I had to invent this by myself.

There was no one in the OSS who said, "Well, there's the stuff you ought to take." I had to create not only the equipment requirements for the swimmers, but also the medical support requirement at the same time. That was where the block came. I was then off on my own without any of this business, since it had gone with the swimmers.

I traveled from Washington, had to wait for transport, and that took some weeks. That was the disconnect that I mentioned. I left New York and flew to the Azores and then on my own across Africa and India to get to Calcutta, and then I kept on moving down into Burma.

INTERVIEWER: What was that trip like? That must have been a tremendous trip.

DR. LAMBERTSEN: It was on the very fine aircraft called a C-47, which was a two-engine plane with bucket seats. That was what you did in those days. The air transport command existed. They were the kinds of planes that flew the hump over Burma and China then. I had to realize how it was that I was disconnected, and it was because I had to find my own way to where the system was, and as a medical back-up for the swimmer group, I had to be there, and that was it.

Now, at the final stages, the travel was with troops who were going down the coast on foot and by jeep to get to a point where we then took off for an amphibious landing, which my crews were already loaded up for. I joined those people in their landing, and we ended up as backup in the last part of his campaign.

When that was under control, I left, came back and picked up the training of the swimmers and submersibles into swimmer submersibles or what we called 'swimmer delivery techniques and tactics.'

INTERVIEWER: The British had something called the 'Sleeping Beauty,' as I recall?

DR. LAMBERTSEN: Yes. That's the one I'm talking about.

INTERVIEWER: What was that like?

DR. LAMBERTSEN: The British had an equivalent unit, which was a Sleeping Beauty. It was a one-man submersible that was indeed like a steel canoe. It had buoyancy chambers for and aft so that you could let those chambers be filled with water or with air and float, sink or become neutrally buoyant. There were something like four batteries of the sort that we'd put in an automobile, a motor to drive a propeller, and the planes on the stern would allow you to go up or down with the Sleeping Beauty. As you sat in it, you were a breathing apparatus. The British used that system. They had planned to use it heavily in that whole Southeast Asia region against the Japanese there. They had it all. They didn't have the chance to do it, but they, again, had problems with losing people in training.

That same early process that I had to go through with British officers was showing them how to avoid hypoxia. I had to do it all over again in southeast Asia when the SRS knew that we were finally over there, and together we made contact in the head of that system. I then had a proper liaison with their Sleeping Beauty efforts. They turned over a couple of Sleeping Beauties to us, and I used them to teach our swimmers how to become their pilots.

At the same time, they were already expert swimmers, and for that reason, we had almost immediately swimmer delivery capability. The SRS retained their Sleeping Beauty non-swimmer capability, as they did not have the ability to truly swim outside.

INTERVIEWER: The British had a different concept of the swimmer submersible than we did?

DR. LAMBERTSEN: They had the concept that the submersible and the pilot were a unit resistance factor, of which, of course, I knew nothing. We were considered part of the OSS, and it was something that existed without even my understanding what it was when the first contacts began, because they were just direct contacts with people, a Marine captain or a Navy lieutenant at a swimming pool, for example. That was the OSS, as far as I was then concerned. I then learned that there was an office behind it, meaning some people were there. It was a secretary and a Navy lieutenant who seemed to be in charge, and as a medical student, I got to think they were perfectly fine people. They kept in close touch with me.

Then, as it opened up, I don't believe I saw any real change in the way they acted over the following several years. They kept that personal communication approach and never seemed to be in a hurry. I'm sure they had a lot going on. It got to be touchy only when we were in a remote place in another part of the world. My memory tells me that when I showed up at the Southeast Asia command, having gone through the system and then come back up through, I discovered that people there lived a different, disconnected life.

The medical officer at the OSS headquarters was in a town called Candy and had decided that he was now on the OSS staff. I had to disconnect myself from the clutches of the OSS medical department that was so pleased to finally have another medical officer.

INTERVIEWER: But you had another agenda?

DR. LAMBERTSEN: I was still absolutely inexperienced in terms of what was going on in the background because I was focused on doing what we were making happen, and to extricate took

a little bit of time, but it was done. I just wasn't going to do it.

INTERVIEWER: The British had a different concept of the relationship between swimmer and submersible than we did?

DR. LAMBERTSEN: Yes.

INTERVIEWER: What was that difference?

DR. LAMBERTSEN: The difference was very sharp. I think Britain never developed real underwater swimmers. It developed great divers for going up and down because it had the big explosive ordnance disposal, and therefore, their equipment, if you couldn't swim with it, didn't make any difference because you were going to be going down and walking around on the bottom. When you were in the Sleeping Beauty, their concept was that you were in it until you reached your target, and then, if you had to get out, you got out. You had a lanyard connecting back to the Sleeping Beauty so that you were never really a free agent, whereas the OSS groups began as long-range underwater swimmers who could find their way and do things and come back again and find their way back without that transport. Once we got to use the Sleeping Beauty, we had the advantage of the ability to go without wearing the swimmer out and still have additional reserves of swimmers.

INTERVIEWER: At some point, you introduced this method, this new philosophy, if you will, that you had developed to the Navy. When did that happen?

DR. LAMBERTSEN: That was very definite. The war had ended, and now I think the OSS had ceased. As we won victory over Japan and the atomic bomb was dropped, and I believe, without concern over that date exactly, it was close on to the fall of 1945.

INTERVIEWER: I'm concerned over whether it was on my birthday. I was born on that day.

DR. LAMBERTSEN: When was it? What was the date?

INTERVIEWER: It was August the sixth.

DR. LAMBERTSEN: On September 20th, Truman wrote the letter to Donovan that thanked him for his service and terminated the OSS. Can you almost picture that anyone like me would think that was a very bad thing to do? It was obvious that if you were the President, you were not going to want an OSS laundering around inside the country with the kinds of situations that it had built into itself, and therefore, it was not too surprising to me later on. What was necessary was to somehow keep from losing what we had done, and so contacts were made with the Navy.

You asked about when the Navy picked up the swimmer delivery concept and made it part of its own activities. Put aside the fact that there was Army people in there and the Coast Guard, as well. The whole aim was to salvage the concept by broadcasting it. I got to the office of the maritime unit, a physical office in Washington, and it was tearing itself apart; packing up its papers, throwing them away, burning them and doing whatever. When I came in from a long trip back from the west coast I discovered that at that point the OSS was finished.

I was able to get the Navy lieutenant administrator of that maritime unit office, a John Moran, to simply type and sign a secret clearance to open the underwater apparatus and use it, right then and there, in an office, with nobody else there but Moran and myself. That meant I could go and, for the first time, discuss it and talk to someone about it.

I chose to go to the head of the Army engineers, a Lieutenant General Wheeler, I think his name was, and the Commandant of the Coast Guard, and to the head of a few ships that still had a diving section. By going there, I left equipment with each one and managed to obtain equipment from Washington storehouses. The store was clean. I actually got a sergeant and a truck and went and loaded the equipment onto the truck and went to each of the headquarters and deposited two sets of equipment with each one along with the manuals that I had generated before going over. Moran had all of this material. Then, I had to report for duty as a medical officer because I was no longer part of the OSS. I was an Army medical officer at that point.

There was no OSS, so I reported back into the medical system.

It took almost two years before the Navy picked up on the fact that they had been given the open equipment, unclassified, and to have any of it filtered through to anyone in the Navy, such as the amphibious forces, who might have been interested in it. I didn't know that there was such a point of contact.

INTERVIEWER: This Moran fellow, in the OSS, and you just decided it needed to be declassified?

DR. LAMBERTSEN: We did it.

INTERVIEWER: That was it?

DR. LAMBERTSEN: Yes. There may have been some background instructions he had, general instructions, but it was a really catastrophic circumstance for the OSS to close and we had to save it at the same time, save and close and preserve.

INTERVIEWER: You knew at that moment that if it wasn't saved at that point, all the work would have been right out the window?

DR. LAMBERTSEN: At that point, I think the real key was what I didn't know. The swimmers were all in that month it took to get from the OSS closure to my getting back into the report and finding that there was nothing there because there were transportation problems. Moran also had to be the personnel officer for the OSS.

I knew that the men were gone and that meant there was no system at all, and unless something was done, there would be no equipment even. About all I knew was that there was a storehouse in which we had kept the supplies for the OSS.

INTERVIEWER: You went and delivered the units to the Coast Guard, the Army, and the Navy?

DR. LAMBERTSEN: Yes. I simply got a paper receipt, and I've still got the receipt I got from the Navy. It reads, "Ships written, received two Lambertsen units from Captain Lambertsen,

signed somebody.”

INTERVIEWER: But the Navy didn't pick up on it right away? Which of the other services did you have? Was it the Coast Guard and the Army?

DR. LAMBERTSEN: Yes, it was the Coast Guard and the Army. The situation was different. With the Coast Guard, the Commandant was so fascinated by what happened and delivered them right to his office. He took me home, I had dinner with him, and his son was out, so he said, “I've got a bed for you. We'll just talk some more.” That was quick and immediate, and then instantly I was asked, as an officer, to go to the Coast Guard station and set up a training program for the air/sea rescue system at Mayport in Florida.

With the Army, it took a little more time. It took the better part of a year, and then, a system existed. The Army engineer research and development command got the word from Lieutenant General Wheeler's office, “Let's see what you can do to evaluate this potential for...”

INTERVIEWER: But the Navy was the last one to pick it up?

DR. LAMBERTSEN: The Navy was the last one, and it got the word from the Army. The Army informed the Navy, and that led to the head of the amphibious forces, Atlantic, and a Lieutenant Commander Fane, who was the recent head of two underwater demolition teams (UDT), classical underwater beach reconnaissance teams, and he was quick. Once he got notice that there was something going on, he and the Army talked. The end result of that was that I got an invitation to come down and train the Navy UDTs in underwater swimming.

INTERVIEWER: Had the unit changed significantly since they were used during the war at this point?

DR. LAMBERTSEN: Had I changed?

INTERVIEWER: No, had the unit, had the breathing unit change?

DR. LAMBERTSEN: No, not a bit. They were the same. At that point they were the same

stored, original batch. One batch was made and they were exactly the same one that we used during the war. They lasted for almost 15 years.

INTERVIEWER: At that point you were helping to train the UDTs. You were a civilian at this point, were you not?

DR. LAMBERTSEN: At that stage, yes. I had to stay with the Army medical department for about a year because I was a physician and people were hurt, so medical officers stayed on. I managed to get leave of a month or so to go and train the Coast Guard. That training was very fast moving.

Then, I was discharged from the Army and joined Penn. That would have been 1946. It was only a year from the time the atomic bomb dropped. In the fall of 1946, I joined Penn. Within a month or so, I went down and dealt with the Army, and in 1948, the Navy, and stayed with them for ten or more years.

INTERVIEWER: They used your re-breathing apparatus for a number of years as the UDTs' main unit?

DR. LAMBERTSEN: Yes. That's right.

INTERVIEWER: They gave it up at some point, didn't they?

DR. LAMBERTSEN: What they did was very clear. Two things, I think, happened. Leaders changed and therefore, direct communication changed. I think if you picture that if something was made and went through some several years and then some ten more years of working in the field with the Navy, it wears out. Parts wear out. They never bothered to follow up and keep spare parts and things like that.

As things began to get a little lean and the leadership changed, meaning Commander Fane, who was very keen on the whole thing and moved out and began doing other things on the west coast, there wasn't equipment in being, and no manufacturer in being. By no manufacturer

in being, I mean that the Ohio Chemical Company, which had manufactured, for essentially nothing, almost as a gift, these units for the OSS, did not continue to produce them. They knew that their field was not making diving equipment; it was anesthesia equipment and so it was said that it was only sensible that they not make more of them.

There was no such thing as civilian self-contained diving. There were no self-contained civilian divers. I wasn't pushing it because I knew they would get hurt. I purposefully never pushed closed circuit breathing for civilians, and I still don't. What the Navy began to do was scrounge around to try to find what it could use. The aqualung came along, and it was obviously an attractive thing, but it was not useful. It took several years for the Navy to admit that it wasn't useful.

INTERVIEWER: Why wasn't it useful?

DR. LAMBERTSEN: Well, I'm thinking entirely because of the weight and the ability to use extremely heavy equipment. They were used to picking up something with one hand, slapping it on, jumping off the dock, and taking off and that sort of thing. That kind of thing with any duration at all was only a half an hour or so in the course of an ordinary depth run. If you left the bubbles out of it, you dumped every breath as it expanded in the water.

It was not useful for submerged activity. It was not useful for working in and out of a submarine. You couldn't crawl in and out of a submarine lock escape trunk with it. You could get two people in, with difficulty, instead of four people in with ease and all that. It just didn't adapt to any of the things that the closed circuit oxygen breathing adapted. They began to just reach out and try to find what they could get, and they got some old, Italian equipment that had been good for the torpedo men, meaning the charioteers. It did beautifully for them because they were sitting quietly and steering a torpedo. They didn't do any exercise. They were not working.

Its ability to handle the carbon dioxide absorption was not adequate for underwater

swimming. Its positioning, its buoyancy characteristics, were not geared for it. The Drager was a foreign unit that emerged, but it was designed as a submarine escape apparatus and modified to quickly meet a possible market. It became a commercial kind of thing, but was poor, and as a result, there was no source of equipment. So, they played around with it and ended up, more or less, just using the aqualung for a good number of years and lost a lot of the capability. That's the answer. Oh, I neglected one good part, I think. The Army had taken a different approach, and as we finished an evaluation of all existing equipment, it was obvious that it was sensible to go ahead and try to use new materials that were emerging and reconstruct the capability of building an improved, better self-contained diving apparatus. We did it, and I then found a manufacturer, a helper, not for selling it, but for building it. It was named the Emerson Company. It made polio resuscitation equipment.

INTERVIEWER: They made iron lungs?

DR. LAMBERTSEN: They made clearing lungs and those kinds of apparatus. Someone who knew breathing and knew how to put tubing together became a partner with me. We were intellectual partners because I needed someone who could make what I wanted to make. We made a good, new Army apparatus, and yet, by that time, the Navy had begun to try to establish what it would do, and somehow it would not connect with the Army.

The correspondence that went back and forth was beautiful. It was that of how individual naval officers were trying to crack their own problems with their own Navy to try to get communication going where they knew equipment existed. Finally, we just turned the thing around and I said, "Let's now call this new apparatus the 'Emerson equipment,'" and it solved a lot of the problem of people thinking, "It's just the Lambertsen apparatus again." When we did that, it opened the way to a pathway, a long, long run. It took nearly ten years to go from that immediate reconstruction in the Army to getting the Emerson, what's now called the 'Emerson-

Lambertsen; or the 'Lambertsen-Emerson,' or whatever, but then called the 'Emerson,' into the fleet. That ten years was a very poor time because it was a time when the Seal system hadn't emerged in full and the amphibious forces had not any picture of how they would use the UDTs with swimming equipment.

We had a limbo situation. The UDTs had poor equipment and were struggling to get some equipment that would work. The Emerson became that unit in the Navy. The Army and Navy tried to work together temporarily, but then it wasn't worth it, and so the Army went through extreme evaluations and put it aside as something that was just not going to meet its evolving purposes. That kind of equipment couldn't stand the heavy power-shoot operations and that kind of thing. As a result, the Army development was documented in full and put aside, and the Navy evolution occurred through the Emerson into other forms of equipment and finally into the Drager, which is now called a LAR-5. The now conventional Navy oxygen re-breather used by the SEALs is the Drager LAR-5. It's been in operation for almost 15 years now. It's a long period of time we're talking about.

It began as a submarine escape apparatus, but it had a manufacturer that knew how to make that kind of equipment, so it kept going. Finally the Navy slid over, and once we stopped worrying about whether our source of supply would exist if there were another war. We stopped worrying about that and decided it didn't matter what the source was. We took the best we could get where we could get it, and that happened, and the LAR-5 was the best, and it is good.

INTERVIEWER: You were involved in a project with both the USS *Grouper* and the USS *Quillback*. What was that all about?

DR. LAMBERTSEN: First, with the green UDTs, the good surface swimmers who had never dived, I was to make them good underwater breathing apparatus swimmers and self-contained divers. That was done in Little Creek, Virginia. Then, promptly, to make them more operational,

we had the submarine service provide the *Grouper* with which to train them in locking in and out of submarines on the bottom and underway. That was where the *Grouper* came in.

It was in January of 1948 that they got underwater training and their diving training. Immediately we put it to work, and it was always Fane and me doing it together. It was not something in which he was an administrator. He was right in there with them as a swimmer. He was the first trainee and the first everything else. From going from the *Grouper* and having them learn the lock-in, lock-out sort of activity, there was the need to try to have them learn how to work with the *Sleeping Beauty*. That happened in the fall of 1948.

By that time, they had been through a lot of things in the Navy. They were taken up to New London, to the submarine escape tank and used that as a place to train. They were learning how to lock-in and lock-out and practicing so that we didn't have to have a whole submarine. You could run people through again and again and again until they get so used to it that it became so easy that it was natural.

They then went to the *Quillback*. With the *Quillback*, the task was to have them do heavy work on the deck of that submarine. We used it first on the bottom and had them go through handling the *Sleeping Beauty* and learning how to secure it and getting used to the thought of it. Some of them trained a little bit in the use of it as pilots. Some of them trained to become the trainers of the pilots, the maintenance and such things.

Having done that, we had the opportunity to go back to the *Quillback* and do a long run on a straight course in order to demonstrate coming down on the submarine and landing on the it, and having a small two-man deck crew positioned to help secure that submersible and demonstrate that, and then have it take off and demonstrate that. But the key to it was taking two people, Fane being one, and teaching him to be an underwater cameraman, and we had one of the few underwater cameras in existence at the time, I think. The inventor of the underwater

camera was Fenamar Johnson and he was a neighbor of mine. He had been taught to use the SCUBA equipment for the first time while he was down with the submarine.

They sat in the gun chairs of the *Quillback*, and the cradle for the Sleeping Beauty was up forward. Each had cameras, and each had fifty feet of film and a single shot with a line from the bow to a buoy, about a submarine length to a buoy. The requirement was to have the *Quillback* come up and the Sleeping Beauty, which I piloted, come in from the side as the submarine approached. We then had to thread a bowline through a loop in the buoy and hang on for dear life to that bowline while the tanks were vented and by using the diving plains to go down and sweep over the bow over the rail of the craft. We also had to have the help of one of the crew members pulling on the snared line and into the cradle, tying it up quickly, and then untying it and taking off again. That was the *Quillback*. The point I'm making is that the deck crew was the thing that made it work, because even coming over the rail, I lost a stern plane. It hooked on the rail and ripped off.

The main point of all of that was that it demonstrated in one shot with two good guys on the cameras that it had happened. Once that had been done, the film became the message that was sent by Fane and me with reports up into the system that then acknowledged that it existed and that something could be done.

The key guy in that whole thing, I think, was Admiral Fife. The reason he was key was that through all that kind of an operation, with people outside that submarine and all those things happening, that was hard work going on there, and hard work meant more oxygen pulling and more of everything. It was touch and go.

He, on occasion, rode that submarine when things of that sort were happening, not that particular one, but he did that, and he did it with his neck out so far, because there was no communication between the inside of the submarine and the outside of the submarine. Nobody

inside knew what was going on outside. They only knew that the periscope had signaled an okay. The submarines came in from the side, and if they swung around, they wouldn't see it. That was all the information they had. Men could have been swept over, had convulsions, passed out or had equipment troubles. There was just no way to communicate. Those people, the skipper of the submarine, and the admiral, who stuck his neck out, I think, were real characters.

People like Fane were doing that as though it were nothing. We were just doing it, because by that time he was a good expert, confident swimmer like the rest of them. None of them were in any way non-confident, and he, as a person, had his neck out, too, because, after all, he was the skipper of the team. The only one who didn't have his neck out, I guess, was me because I didn't belong to anybody. I know that was all. You asked about the *Quillback* and I gave you a story.

INTERVIEWER: Yes. As far as you were concerned with your career, did you go further with the Navy in doing that kind of work at that point?

DR. LAMBERTSEN: Yes. I went down two paths. One was to stay with the teams on both sides of the country because it had to be transferred over to the west coast. They were two separate things, two separate fleets. Yet, we had the beauty of having west coast people train with the group. The communication was always great with anybody who was in that team. I had free wheeling communication, even though I was back in Philadelphia.

I stayed with them for almost 15 years. At first, helping one skipper of the UDTs after the other with the tasks that they had, I would simply go down as an advisor or an unofficial friend, or whatever. I knew them all. They would come to Philadelphia for communication, as I had a laboratory there. That never disconnected.

Then, the big connection was to try to stimulate the improvement in the ability of the equipment to work and the understanding of what the stresses were on the people so that the

dangers were lessened. I set up laboratory systems to study the kinds of underwater activities. That sort of thing became broader because of the implications that the studies had on other things. It had therapeutic implications, for example, in medicine.

INTERVIEWER: It had implications for hyperbaric medicine, and that type of thing?

DR. LAMBERTSEN: Yes. It had implications for that, anesthesia and aerospace aviation. It became a very broad relationship over a number of years.

INTERVIEWER: Was there really a medical thread that went through everything you did, from the very beginning?

DR. LAMBERTSEN: Yes. That's right.

INTERVIEWER: [Does it extend] all the way to what you're [doing now?]

DR. LAMBERTSEN: That's right. Eventually, it became a very strong one that caused the Navy medical department to begin to send its special submarine medical and diving medical officers to my place for a year or two for joint study. We had a flow of people who were not operators in a UDT or fledgling Seal system, but rather in the medical department. They then carried it back, and I think I had about 15 naval medical officers who came through the last one only about four years ago.

INTERVIEWER: Did you ever do any work with George Bond way back then?

DR. LAMBERTSEN: We had good, normal communication among equals and that kind of thing. I didn't work with him, but we had good communication. He liked to, as I did, talk over these things. I was not on what you would call a team of Navy people working on the initial Navy saturation diving effort. The fact was that once it became a difficulty for them, I had to go through the task of setting up a separate operation at 400 feet and doing a saturation run there with only two people and a very simplified system. That was done together with a person called Edwin Link. He and I joined forces to do that task. As soon as it was over, he forgot we were

involved.

INTERVIEWER: He had a business interest, I believe?

DR. LAMBERTSEN: He had business interest. That's right.

INTERVIEWER: During your work in the 1960s, you stayed at Penn. Was Penn your home and where you did all your work?

DR. LAMBERTSEN: It had to be. I had no choice because once I built the laboratory there, there was nothing else like it in or out of the Navy at that point in time. As a result, I could not walk away from the laboratory and go somewhere else. I did get away for one short period, around 1951 or 1952, for the only sabbatical I've ever had in my life, and that came at a bad time, as far as the Navy under water team evolution went. We got together again.

INTERVIEWER: You had other duties at Penn? You had teaching responsibilities?

DR. LAMBERTSEN: Yes. I was a full-time career person in the university, and it was in the medical school. I taught pharmacology. When you did that, you did it for several months a year, and then you did research for the rest of the year. The research and teaching were interwoven.

INTERVIEWER: You did a lot of work with breathing. Did the National Aeronautics and Space Administration (NASA) really get much from your research, or were they off, starting from scratch on their own? Was there any cooperation between you and NASA?

DR. LAMBERTSEN: Yes, there was. NASA started from scratch. The Navy had been around a long time, and so it built on itself, but NASA had to build from nothing. As it formed it had to reach out and get people who were skilled or experienced. It reached out to the Navy, and first thing you knew, NASA was made up of Navy, Air Force and Army people. Medical officers were one component of it, and there were mathematicians and others, such as astronomers. Those people all knew me well, so we were all partners. Those Army, Navy, Air Force medical officers and I formed an informal group in which I was named as the head of the National

Research Council. It was a space science board and a major unit of the National Research Council, and I was the medical member of the Space Science Board. Therefore, they asked me to form a committee on man in space, and I reached out to and used those skilled external people to generate support for NASA, meaning to generate skilled judgements and information. There's too much of the story there and you don't need all that now.

There were eight panels of eight people each that set up a research program for NASA. That came out of their assumption that if those kinds of personalities could help make undersea work, they ought to be able to help aerospace things work, as well, and it was a good philosophy then.

INTERVIEWER: Doctor, when you talked earlier about some saturation work you did with a pair people at 500 feet, was that before or after the termination of SeaLab III?

DR. LAMBERTSEN: It was before. They had done a 200-foot run successfully. The pressure for doing the 400 foot run was from Link, who was a competitive character and very self-oriented, and he only came to my place for help when he couldn't make it work. Once he came, it seemed sensible at that point, since my laboratories were being torn apart in order to rebuild them. It seemed sensible to go ahead and have a field operation, so I joined forces with him. I didn't initiate that project. We just made it work. By having my people, I was able to get a chamber manufactured specially for the project, and that was the sort of thing that Link loved to see happen. He didn't like to spend his own money.

Since I was a consultant to the union, I was easily able to get them to manufacture a chamber that would allow us to bring up the saturated people from the bottom and tie them into a deck chamber, which I called the 'deck decompression chamber.' That was the first deck decompression chamber, and we chose 400 feet because I couldn't imagine there were any good reasons for not doing it at 400 feet. Helium was helium, and the general point was that it was

necessary to keep control of that operation on someone else's ship, and that led to a very interesting relationship between me and Edwin Link, who was not used to having someone else in charge on his ship.

Yet, if it hadn't happened that way there would have been extreme safety hazards. I actually went and checked out all the equipment and the chambers on his ship, and my crew became the operators and did the studies of the subjects in my laboratory. It was a joint project, but the performance of it was done from Philadelphia from my laboratory, as was the safety aspect and the scientific component. As soon as the operation was over, the words 'University of Pennsylvania' were removed from the National Geographic story. It became a Link operation. That was worth putting down for fun.

INTERVIEWER: Did you consult also with John Craven at the Deep Submergence Systems Program (DSSP)?

DR. LAMBERTSEN: John Craven and I did not consult. We talked to each other. We were kindred spirits and had a lot of communication, because of a lot of, again, mutual respect, I think, and it's still there. You asked why we did it at 400 feet or what?

INTERVIEWER: Yes. What sort of thing did John Craven need from you, based on your experience with breathing and deep submergence?

DR. LAMBERTSEN: What did John Craven need? Are you talking about later on, after the Polaris development and so forth?

INTERVIEWER: Yes.

DR. LAMBERTSEN: You mean under the subversive activity?

INTERVIEWER: Yes.

DR. LAMBERTSEN: I didn't have anything to do with that.

INTERVIEWER: Did you have much to do with any of the SeaLab projects?

DR. LAMBERTSEN: Again, since Doctor Workman was one of my students, and he worked in my laboratory before getting involved with Doctor Bond, it's obvious that we were in a lot of communication, but I had no role, no authority, no direct relationship to the projects. At the end of it, after it had its usual problems, people got called on to be part of a review group. I was part of the Smithsonian's review of the project. That's all.

INTERVIEWER: The 1960s were when the SeaLabs were in operation and a lot of the work that John Craven was working on. What were you working on? What of research had you involved yourself in at Penn?

DR. LAMBERTSEN: I think of the largest thread was on oxygen itself, without regard for what it was used. There was so much time spent on using the oxygen breathing apparatus and studying people as astronauts, in terms of whether they could breathe oxygen at a low pressure that didn't poison them and not have their lungs collapse. All those kinds of applications to operational things were in the background all the time, but so was the use of oxygen as a therapeutic agent and as a substitute for inert gases in high-pressure exposures. That helped extend our ability to dive without decompression or extend the dive without having so much decompression and to prevent the bends. Oxygen is everywhere.

INTERVIEWER: Was it really the chemistry of oxygen you were studying?

DR. LAMBERTSEN: No, it was the many things that oxygen does. It's a physical displacer of other gases in you. It has physiological effects that are not chemical. It has toxic effects that are chemical and may be similar to the physiological mechanisms that they act on. The main thing is that it's a life substance, and as such, no matter what you do in studying oxygen, it's going to last forever, whereas equipment is going to come and go. Any information that's learned about that element in our shared life system, which is the one that is life itself, [is greatly valuable]. That's your life fire, or flame.

Part of it has always been that the fascination with oxygen as an element of living mammals and humans, so most of what we've done is improve the ability to make use of oxygen without harm, how to interrupt the toxic processes so that you can keep going. We've studied and devised means of alternating the use of oxygen and not using it so that you need equipment that allows you to proceed and get the benefit of oxygen without coming up against some ultimate barrier. Then, you try to take all of this information and put it together as a data system so that other people like what you do. You're making a data system of taped conversations. What was necessary, I feel, was to build a data center not of odd papers here and there, but of the fundamentals of this information. They will then be available, permanently, to individuals who aren't able to repeat these experiments, because we're not going to be able to do over again everything we have done in the past. It won't be allowed or it won't be affordable. Saving the data and putting it together such that it can be made use of is a big part of my own life. For some purposes, it's the other end of the extreme, hypoxia, or not having enough oxygen. That's the high altitude.

We've had expeditions on which some of our people have gone to Mount Everest for physiologic reasons. In aerospace work, the emergency in an aerospace system, wherein you may lose gas and not have enough oxygen pressure to stay alive, has to be prepared for. There are things that can be done to try to improve the timeline of that failure so that you may have time to get out from under it again. One of those is fire in a closed system, which is really hell on wheels, as you can imagine, and yet the fire is oxygen burning something. To be able to put out fire in a space in which you are, without putting yourself out at the same time, is a part of the work that we've done.

We're generating ways to use carbon dioxide as something that doesn't just make you breathe more and make you uncomfortable. It makes you breathe more and helps your breathing,

especially making your blood flow in spaces better so that your brain works longer, so you can keep a brain functioning with a little carbon dioxide while your atmosphere doesn't have oxygen enough to sustain you. You are able to think and act and do things. These are related to diving, to aerospace work and to just plain fire fighting. Oxygen is a life substance, and we need it, and sometimes we can help sustain ourselves. At other times, we poison ourselves and disappear.

INTERVIEWER: Do you have any last thoughts? Is there anything that I may have asked you that you didn't think I would?

DR. LAMBERTSEN: How in the world do you get people to not talk so much around the barn when you're trying to find something out? I know this is unusual for me. I don't have much chance to do this kind of talking.

INTERVIEWER: Thank you. Thank you very much for spending time with us.

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UNDERSEA & HYPERBARIC MEDICAL SOCIETY

INTERVIEW OF CLAYTON DECKER

Kensington, Maryland

April 2003

P R O C E E D I N G S

MR. DECKER: My name is Clayton Decker. I was born and raised in Peonia, Colorado. My grandparents had a cattle ranch there, and I was born on December the 12th, 1920.

INTERVIEWER: You were born on a cattle ranch in Colorado. Wow.

MR. DECKER: Yes.

INTERVIEWER: I was raised in Queens in New York City. They didn't have much of that there. Can you tell me what it was like to grow up on a cattle ranch? I haven't the foggiest idea.

MR. DECKER: Well, it was interesting In Colorado we have, you know, the Rocky Mountains running right down through the middle of the state, and so we experience all four seasons fully. As a matter of fact, the little valley in Peonia that I came from is referred to as North Fork Valley. My grandparents settled in that little town in 1882, and there I was. I graduated from high school there and was raised on their cattle ranch. In 1940, I graduated from high school. I married a high school sweetheart right after I graduated. I attended agriculture college in Fort Collins, Colorado, for two years. When the war broke out and Japan bombed Pearl Harbor, like many of the other college students, I wanted to go and fight for my country. I discussed it with my wife, and it was agreeable with her. At that point in time, we had a youngster who was a year old.

Then, I had to make the decision as to what service I should join. I used to think about the Army. I thought, "Well, I like hiking, but I didn't know whether or not I wanted to do that much hiking." The other thing that I had heard about the various services, if you were going to join one of them, was that you had to take two main things into consideration. One was a nice, warm bed, and the other was the chow, and I thought, "Well, now, if I join the Navy, I'm going to have both of them right along with me wherever I go."

I selected the Navy. In Colorado, in Colorado Springs, we have the big air academy there and so forth. I said, "Well, here I am on a cattle ranch." I'd never ever flown in an airplane. The closest I'd ever come to riding in an airplane was a roller coaster ride. I joined the Navy then.

INTERVIEWER: Let me take you back, before we move into the Navy, to your years on the cattle ranch. I'm from New York City and I know what different kinds of asphalt look like, but that's about it. You had just come out of high school, and you were on your cattle ranch. Tell me, what you saw around you; what did it look like?

MR. DECKER: Well, of course, it was beautiful, the country itself. Mount Lamorn looms right there, and then, we ran about 1,000 head of cattle, and a lot of people have asked me, "Well, what did you did with those critters in the winter time?" That was a good question.

Each fall, before winter set in, you shipped cattle, and of 1,000 head of cattle, we would ship around 400 every fall. It still meant you had around 500 or 600 head of cattle that you had to feed all winter long. That was the biggest chore during the winter months. All summer long, we cut hay. We stacked it. The time I was on the cattle ranch was before baling ever came to pass. We'd stack haystacks and have to take it out daily and feed it off what we called 'slips' or 'sleds' because there would be snow on the ground. The other thing was all the chores we had to do on a cattle ranch. I was about three miles outside of town, and went to school in town.

We also milked cows. Unfortunately, my grandparents never knew much about dairy cows, so we'd get those wild range cows. They'd have a calf, and we'd bring them in, and believe me, if you wanted to milk a range cow that didn't want to be milked, you had to almost hobble her. Well, you did hobble her and put a pole along side of her and everything in order to milk her. My chores, morning and night, were milking two cows daily. I got my chores done in the morning, got my books together, and headed for town. Often, I'd have to walk, and it was close

to a three-mile walk. I did have an auntie who was a teacher and I would ride with her occasionally.

It was a great experience. I just turned eighty this last December, but when I look at the experiences that I had as a youngster, I often think, "Oh, how I would love to have had my youngsters grow up in that very same environment." It was slower living, but we had everything. We had a great school system and a hospital about thirty miles away. Delta was the county seat in Delta County. We experienced everything that people did in the big cities, but that country living was great, and I missed it after I left. Now that I'm eighty years old, my present wife and I get over to my old hometown of Peonia every opportunity we get.

INTERVIEWER: In school, were there any teachers you remember who were particularly good, or people who excited you about learning or intrigued you about the larger world?

MR. DECKER: Yes. As a matter of fact, when I was in school, before I went to college, during the last two years of high school in Peonia, Colorado, I decided I wanted to be an animologist. There was a deputy state animologist out of Denver, which is the capital of Colorado. There was a deputy state animologist living in Peonia who ran an experimental orchard to study moths. I thought, "Oh boy, he had me talked into becoming an animologist." He said, "Hey, Clay, you get a degree in animology. You can go to work for Standard Oil Company and you can wind up down in South America at one of these big oil companies as an animologist." Boy, that was for me. I mean, in the little hick town of Peonia, Colorado, the highest paid job in that little valley was a job in one of the two coal mines just up the river about ten miles. The boys who worked in the coal mines made pretty good money.

But during my junior and senior years of high school, I worked for Harry Newton, the deputy state animologist, and we ran moth control traps. In other words, there was the life cycle of a moth and a lot of people wondered when you were to spray fruit to prevent worms from

eating apples or pears. Well, they had to be told, and the state animologist would be the one that would tell them that.

We ran what we called 'traps' through the orchard. Every morning before I'd go to school, I'd go down and run the traps. We'd find out when the moths were flying at their peak. We figured that in about eight days following that peak flight was when they would lay their eggs. They were laying eggs while they were flying and those eggs would hatch. If the farmers or the ranchers on those orchards got that spray on their fruit then, as soon as that worm came out of that egg and took its first bite, it was going to get a bite of poison and it'd be gone. Oh, I thought that was great. I went up to Fort Collins after I graduated from Peonia High School and I did take animology, and there, another person who encouraged me was George Stafford. He was assistant principal, and he was a biology teacher. He really encouraged me to pursue animology, also.

INTERVIEWER: Did your family, your new family, when you married and had your first child, stay on the same farm with your grandparents? Did you work the farm as a family?

MR. DECKER: No, we didn't. The lady I married, the young lady that I married, her father was a coal miner, and they lived up the river about ten miles in the little town of Somerset, Colorado. After we were married, we lived with them. We moved in with them in Somerset. I got two years of college in. But in the summertime then, after I got to college, in order to make some money, I had to mine coal. The only money that really you could make of any consequence came from working in the coal mines. The two summers of the two years that I did intend college, I worked in the coal mine there at Somerset. Of course, fortunately, that was one of the things that helped me get in the submarine service, too. If you work in a coal mine, you certainly can't have claustrophobia. I worked in the coal mines, and, as a matter of fact, our son was born in June of

1941. Back in those days, and people today don't even believe this, you'd call a doctor and he'd make a house call. He'd come to the house, you know.

Well, when my first wife was ready to have this child, he not only came to the house but she had the child on the kitchen table. I helped by giving her the mask over her face. I mean, it's hard to believe, but there again, I'm eighty today, but if you go back a good number of years ago, that very thing still happened.

INTERVIEWER: What's it like inside a coal mine?

MR. DECKER: It's spooky. The job that I had was interesting. I was in the coal mine those two summers that I worked, which were the summers of 1941 and 1942. People don't realize it. In Colorado, they were called 'slope mines.' In the eastern country, they were shaft mines, but in Colorado, they were slope mines. Only four people each night would go in on what we called the 'graveyard shift,' so that meant that I went in around five or six in the afternoon and I got out around one or two in the morning.

The spooky thing about it that a lot of people don't realize, is that at midnight you have, because of the nature of the chemicals and metals and so forth in the mountain itself, the biggest change. It's sort of like the rumbling of an earthquake. Around midnight, the coal mine will do that. We used the term 'bumping.' I mean, it will actually bump and shake, and if you are up on the face where they were digging the coal, often times that coal would fall in front of you. My job was to go to the very bottom, two miles on the slope down in that mountain. The first thing that I'd do was to go clear to the bottom daily. I had charge of the big water pump.

They had a big, huge electric water pump, but the pump itself, of course, was driven by an electric motor. The pump needed a packing lens packed on a daily basis, and my job involved this old rope packing. I'd take the nut off the old rope packing, I'd put new rope back again, put it in and start it back up again. Of course, you wore a light on your cap, or your hat. In some places

in the mine, the ceiling was low. You'd actually have to stoop. Every passageway had a track, so you walked the track. You stayed on the track. So many people have a misconception. They think that in coal mines, because coal is black, everything is black. It is not so.

There were four of us who went in. Another chap was called a 'rock duster.' They used a dust, which we found out later was really bad for your lungs, but they called it 'rock dusting,' and it was white. It looked like flour, like the stuff your mom used to use to bake bread with. You had a paddle you'd put on your hand, and you'd just scoop this rock dust, and you'd throw it against the wall. You'd throw it on the ceiling, and you'd throw it on the deck, or the floor. The reason was that they were feeding air into that mine constantly. That one main passageway, where air was blowing in from outside, had huge big fans, and there was another exit where there was a big fan sucking it out. You had a good flow of air down in there all the time. Well, something happened if they did not put that rock dust on that coal dust. It never happened during the time that I was there, but I was told that a fire could start by spontaneous combustion. You could actually get an explosion if that rock dust got to flying around and igniting itself, so they put on the coal dust so that it did not do that.

They also had what they called a 'shot firer.' That man would come in with us during the graveyard shift and drill a hole. The boys that worked that day, for the last duty of their shift, would drill holes where they wanted the coal blasted. They didn't do any blasting. They would fill the sandbags, those little round bags about as long as a yardstick. He put a stick of dynamite in those holes, tamped it, put in the little bits of paper bags, stuck them in there and tamped them, and backed off a couple hundred yards and actually blasted that face of it for those boys. That coal was all down for them to do their work when they came on shift. He was called the shot firer. There were huge rooms in which they got coal. When they cleared out of a room and pulled

the tracks, as they pulled the track, to hold the ceiling up, instead of having to build fillers, they would leave big pillars of coal. You could reach around them

The last man who went down with us would go in and chop at those pillars. He had one mule. It was called 'stump pulling,' and he'd go in at night and pull the stumps. It was just the four of us who would go in at night.

When I would finish my job packing the lens on the pump down in the bottom, I would come up, and then, since they had electric motors, those electric motors had to be put on charge. It meant that I had to check the batteries, add water to the batteries if needed and put them on charge. Then, if I had any time left, I would go and help the rock duster a little bit to finish off my full eight hours down the mine on my shift.

INTERVIEWER: It sounds like they kept you busy.

MR. DECKER: Yes. It was a great experience, though.

INTERVIEWER: I take it that it was in 1942 that you discussed with your family the prospect of actually going to war?

MR. DECKER: Yes.

INTERVIEWER: Perhaps the warm, dustless bunk and good food attracted you to the Navy, aye? Where did you go to sign up for the Navy?

MR. DECKER: I joined the Navy. Of course, actually, there was a recruiter who came to Peonia, and I joined the Navy with him, but I was sworn in over in Denver. Of course, when I joined with this recruiter, a Navy recruiter, who came to Peonia, there were four of us who joined at the same time. He gave us chips to ride the train, the four of us, into Denver, and we joined after we signed up when we got to Denver. It was Christmas Eve, 1942, when I got on a troop train to go to Farragut, Idaho, to boot camp from Denver.

INTERVIEWER: They picked a bad day, didn't they? Well, it was war, I guess. You went to Farragut, Idaho, to boot camp?

MR. DECKER: It was a brand new camp that they had set up there.

INTERVIEWER: I imagine it would have been.

MR. DECKER: I'm sure you've heard of it.

INTERVIEWER: Tell me what boot camp was like.

MR. DECKER: As a matter of fact, at Farragut, there were actually seven camps in the Farragut complex. The camp that I was in was called 'Benyon.' I don't know who represented it, but probably someone who was a naval officer would be my guess. I can't remember. But I was there for three months.

Then, we were asked, "Have you given any thought about what do you want to be?" If you'll recall, back in those days, right arm ratings pretty much meant activities in the Navy, activities that pertained pretty much just to either boats or ships. I say 'boats' because, if you'll remember, we called submarines boats. Left arm ratings, you know. I just wasn't that well acquainted with it, and I went with the right arm rating and asked to go to torpedo school.

Little did I think, at the time. I didn't understand it well enough. I'll tell you what happened later on. After all, what did a torpedo man do after he got out of the Navy? Who was selling torpedoes or buying torpedoes, you know? I ended up being a left arm rating, but I did select a right arm rating. I selected torpedo school. From Farragut, Idaho, I was sent down to Norfolk, Virginia.

INTERVIEWER: Let me ask you to pause for one second. Getting back to Farragut for a moment, it was just carved out of this little place in Idaho as a training base. What did it look like when you got there? What did the base look like?

MR. DECKER: Well, I came from Denver and the Rocky Mountains. Denver is referred to as the 'Mile High City.' Somebody was telling me to go east, west, or north. Hey, the one thing about it is if you're around Denver or Colorado Springs or what they call a 'front range' and you lose your direction, you look towards the mountain. You know you're looking west if you look up and see the mountains. You can say, "Hey, that's west, sure enough." In Colorado, we have what we call 'foothills.' You leave the plains, but Denver is considered a mile high. I don't know, but the fourteenth step in front of the capital building in Denver is a mile high, and it has a big plaque there that says you're a mile high when you stand there on that step.

If you go west, the first things you encounter are foothills. You start climbing, and then you get up into the high country. Well, at Farragut, that really surprised me, coming from the mountainous country. When you get up in Farragut, the ground is flat, and there's a mountain over there, and it's flat, and then there's the mountain. There are no foothills, no nothing.

I got along fine at Farragut. I was there for three months, and I got some good training. I can remember writing my grandmother a letter back on the cattle ranch. I wrote, "You know, grandma, this place is so neat and so clean, but I didn't realize that I'm the guy that's having to keep it that way." I learned to wash my own clothes, make my own bed, and a lot of things that I hadn't had to do before.

Believe it or not, fellows, I was there for three months and I don't think I saw the sun shine over a half a dozen times. It was kind of depressing, I guess. That's the word. It was kind of depressing to me. Clouds hung low. It was overcast most of the time, and it was, of course, snowy. It has winter months there. There was a little town right by Farragut. The only nearby town of any consequence was Spokane, and if you got a 72-hour liberty pass, you could get into Spokane. They didn't have a USO in Spokane.

I made one trip to Spokane, but again, I was married, had a two-year-old son, and liberties didn't mean as much to me as it did most of the other guys. I was kind of glad to get out of Farragut and head for Norfolk, Virginia, on a troop train, a big troop train.

INTERVIEWER: How old were you then?

MR. DECKER: I was born in 1920, and all this took place from December of 1942 until about the first of March in 1943. That was when we went down to Norfolk.

INTERVIEWER: You were 22 years old. Tell me about going cross-country on a troop train.

MR. DECKER: That was a good experience. I enjoyed that. I really did because, again, I was from in a little cow town like Peonia, Colorado. I was on the train with all these guys and treated royally. We would stop and get lunch, wherever we might stop. Oh, we made one stop overnight in Chicago, coming out of Farragut, going east, of course, and two of the lads who were in the group going to Norfolk had parents in Chicago. They got invites to go with them to their homes, but they didn't. We just pretty much stayed around the train there and spent the night there in Chicago.

Then, we went on to New York City. Again, we had a little delay there. It was the first time I had ever seen any big city like that. The biggest town I had seen up to that point was Grand Junction, Colorado. Well, I had seen Denver also, excuse me. I was familiar with it. But I mean, seeing Chicago and seeing New York was, for this cow town boy, a new experience.

Then, we went on to Norfolk and got involved with the torpedo school and the torpedo class, which was interesting. It really was interesting. There again, we would say, "Hey, we want to do our part." We were at war with Japan. We said, "Let's get with it." Of course, the one thing that I did do that I probably wished I hadn't done in Norfolk was getting one tattoo on each arm. Down the line, I'll tell you that those tattoos worked out favorably for me, and I'll tell you about that experience a little later. While in Norfolk, I got tattooed, one on each arm, and they both

have to do with Navy, except that one of the tattoos, though it doesn't show anymore, has my name, my first wife's name, Lucille, and my oldest son's name, Harry.

By the way, my son, Harry, my oldest son, in June, will be sixty years old. Anyway, the names have faded so that you can hardly read them. But I did get tattooed. The other thing that was exciting for me at Norfolk was that the torpedo class I was in was a class of 26 men, and believe it or not, I came out number one in the class. I had the top score in the class, and that gave me a rating of torpedo man third class from Norfolk.

INTERVIEWER: What sort of things did they teach you about the torpedoes?

MR. DECKER: While we were there, the steam torpedo, the Mark XIV, was the only one that we worked on. I didn't become acquainted with the electric torpedo until after we had made at least one patrol. But the steam torpedo, we learned all about it. We could tear that motor down and put it back together. We learned everything there was to know about that steam torpedo.

INTERVIEWER: How long did the class last?

MR. DECKER: The classes were all day sessions. Of course, there were no classes Saturday, and of course, no classes Sunday. In the Navy, breakfast was beans because, hey, the galley had to get squared away so that we could have parade day. Everybody was in their whites and out on the compound when they were called. Those boys in the galley had to have everything ship-shape for inspection.

Beans for breakfast? You bet. Saturday morning we had beans for breakfast. I enjoyed Norfolk. I made several liberties to town in Norfolk with the boys. Back in those days, you could get one of two things. Most popular in the pubs was either Valentine's Ale or beer. We'd go to town and have our share of that and then back to the base. It was late summer before that class was over. As I said, I was number one in the class, and so I was given a third class rating. Do we want to move on to the next stage, then?

INTERVIEWER: Yes, we do. Where did you head after Norfolk?

MR. DECKER: We were given an opportunity then. The submarine service was strictly voluntary, but we could ask for submarine service, PT boats, Navy air, as far as torpedoes were concerned, and I believe the other option was destroyer duty. Destroyers had torpedo tubes at the time. It was one of the four. Well, there were three other lads with whom I became very well acquainted with both in boot camp and at torpedo school. They and I decided we would volunteer for submarine service, and we did. Of course, that was just the beginning. They sent us from Norfolk, Virginia to New London, Connecticut. It was very interesting.

The very first person who interviewed me at New London, at the submarine base, was this chap who, right off the bat, said, "Why do you think you're qualified for submarine service?" I told him, "Well, maybe I've got a pretty good answer. I worked in a coal mine, and I think that would prove that I don't have claustrophobia." He said, "That's a good thought. That's a good answer."

I found out later that, as a matter of fact, they absolutely did check to find out whether I did, in fact, work in that coal mine. They found out that I did. Anyway, I was accepted. I was accepted into the school to become a submariner.

INTERVIEWER: What was sub school like?

MR. DECKER: I enjoyed every minute of it, I really did.

INTERVIEWER: Was there a lot of classroom time?

MR. DECKER: Yes. There was a lot of classroom time. It's interesting to talk to submariners from back in my era. They can remember the S boats and the R boats pretty well. By golly, when I went to sub school they had the old O boats, and I trained on an old O boat.

INTERVIEWER: Really?

MR. DECKER: We would go out on an O boat about once a week during the time we were going to school at the sub base. One of the lads asked me, "You don't have claustrophobia because you worked in a coal mine, but are you fearful that maybe one day that iron tube will wind up being your tomb?" I said, "Well, absolutely." I think that with every submariner, it has to go through his mind. It certainly did go through my mind that very possibly that that could happen. But my goodness, I really looked forward to my very first experience making the escape at the hundred-foot tower.

INTERVIEWER: I was going to ask you about that. Did you really look forward to that?

MR. DECKER: I could hardly wait to get involved in that. There was an instructor. I'm sorry. I don't remember his name.

INTERVIEWER: That's all right.

MR. DECKER: One name I can remember from the sub base belonged to a man who very interesting, in the days that I was there, and maybe you've heard this name before. He was Spritz, Charles Spritz. We called it 'Spritz's Navy.' Now, he was a Navy man. As a matter of fact, he was one of the divers who went down for the USS *Squalus*. He'd take the new recruits coming in, like us, and he had a battery of Marines. They had a brig and everything else, and believe it, he was a tough one on the young guys. Really, I've thought about it since those days with Spritz, and that man really made men out of a whole lot of young lads like myself, a young man off of cow ranch in Colorado. He really did. He knew what he was doing and how to control men and tell them to get up, brush their teeth, get going and that sort of thing.

INTERVIEWER: Was he a chief?

MR. DECKER: Yes, he was a chief.

INTERVIEWER: Tell me about your escape training for the tower.

MR. DECKER: There was one lad with whom I was with in the barracks at New London. His father, and I'll see if I can get this right, his father was, gee, you know, since I've become older, and I don't think it's Alzheimer's, but names are harder to remember. His dad was one of those guys who, when they built the Holland Tunnel, they called them groundhogs or...

INTERVIEWER: They called them 'hoggers.'

MR. DECKER: He was a hogger.

INTERVIEWER: They were hogs and sand hoggers.

MR. DECKER: His dad was a hogger. It was interesting to him because, if you remember, before they would allow us to actually go in and make the escape, we had to go into a decompression chamber. He used to tell us about his dad being a hogger, and that while working in the Holland Tunnel, they had to do that very same thing before they would go and put in a shift to work down there. The thing that we discovered in going into that decompression chamber was that you got a bang when they put that pressure on you. It's misconceiving to the average layman. You say, "Decompression chamber," but they put pressure *on* you, even though they call it a 'decompression' chamber.

Anyway, when that really got hot and heavy, you looked at somebody else and if they just smiled at you, you thought that was the silliest thing you had ever seen or heard, you know. The other main thing about it was that we were told the reason it was done. Let's say that maybe you went through the procedure just yesterday and overnight you developed a cold or a little ear infection or something like that. It would show up as soon as they put you in that decompression chamber. Well, that told you not to put that man in there and put a hold on him because something was not right. But the training in the chamber itself, man, I have to tell you, was the thing that saved my life, absolutely. The training in that escape chamber was what saved my life. You were standing in that room, in the escape chamber at New London. For those of you who

haven't done it, they dropped in a one hundred-foot column of water. You were standing in water. The thing that dropped down the center was what they called a 'skirt,' and it came down just about chest high. It filled you up with water up to the bottom of that skirt. When they opened the hatch and dropped that column of water, it was a little scary. You were standing there and it came up and then settled back down. It was the same experience as you got up in the escape chamber when you made it on your own.

Even though you built up the pressure outside to exceed the outside pressure by five pounds, when you opened that hatch, that water wanted to come in. The water right there would come up under your chin and settle right back down again. That was kind of a hairy experience.

There was another thing that really fascinated me at the time, and it was the early summer of 1943. I was going through submarine school in New London. There we were, with our lungs on, mouth pieces in, nose clamps on, and we'd wrapped our legs around the line, stopping at every knot, every fathom, every six feet, exhaling, inhaling, as we were told to. You had these lads who were instructors swimming around you, just in their swimming trunks and, if you remember, there were blisters on the side. They could swim into those blisters and get a breath of air and come back. Little did we know then that it was going to be the procedure down the line, the free ascent, or 'blow and go.'

It was interesting to me because, I would be looking up, letting the knots pass through my hand, and I stopped and hesitated and exhaled, and inhaled. Then, there would come one of those instructors right up to me. Of course, when you talk under water, the bubbles just come out. They said, "You're going too fast," or they might have come up and said, "Slow down a little bit." You could hear them. They'd come right up to your ear and then boom, they'd scoot back in for another breath of air, but they'd be right there watching you. It was a great experience, oh my. After my first time, I said, "Hey, let's go again."

INTERVIEWER: How long did it take you to make the full ascent, while you were training, all the way up the tower?

MR. DECKER: On the hundred foot tower?

INTERVIEWER: Yes. How fast do you go?

MR. DECKER: Well, we were told not to go too fast.

INTERVIEWER: Was it seconds or minutes?

MR. DECKER: Oh, it was a matter of a minute or two, I'd say. You hesitated just long enough to exhale and inhale. Now, another thing was that on your lung, initially you charge it. There is something else that I'm going to ask Captain Momsen, too, while we are here visiting. I'm told that after the initial charge, the little canister in that device is soda lime. Is that what it is?

INTERVIEWER: Yes.

MR. DECKER: It was soda lime and it...

INTERVIEWER: It absorbs CO₂.

MR. DECKER: The reaction is that when you exhale carbon dioxide, the soda lime absorbs the free carbon and evolves free oxygen. In reality, after you use that initial charge that they put in the lung, you are truly on the straight oxygen of your own that you've exhaled.

INTERVIEWER: Yes, you're on your own breath. That's right.

MR. DECKER: It is interesting that during the time you're making that ascent, there are bubbles coming up from that exhaust valve all the time. It's because that external pressure is decreasing, so there are bubbles coming up out of it all the time.

INTERVIEWER: How long was sub school in those days? How long did you have to stay in New London?

MR. DECKER: It was a good three months that we were there.

INTERVIEWER: You would go out on one of the O boats or another training boat roughly once a week?

MR. DECKER: About once a week we'd go out on one of the O boats to get the feel of a dive and being down. I remember it happening. On a couple of occasions, even after guys would say that they were accepted, they went out on a boat, on a run like that, and they would come back in and say, "It's not for me." There was one lad, in particular, in the same barracks that I was living in, on the base there at New London. He just said, "Hey, it's just not for me. It's not for me."

After you were in and assigned to a boat and made a patrol, as I've told friends of mine, all you had to do was go to see the chaplain after a run and say, "Hey, mentally, I can't take it." There were no questions asked. You were out.

INTERVIEWER: What did the O boat that you went out on and trained in look like inside?

MR. DECKER: It was pretty, well...it's hard to describe it.

INTERVIEWER: If you compared it to, let's say, the later boats you went on, how did it look different?

MR. DECKER: It was just almost like night and day, really.

INTERVIEWER: It was much smaller, wasn't it?

MR. DECKER: Yes, oh yes.

INTERVIEWER: Did they have any on-boat accommodations? Did they have overnights when you went out?

MR. DECKER: No. There were none to my knowledge. No, we'd go out for a good part of a day and that would be it.

INTERVIEWER: I assume that they put you in the torpedo room and had you take a look at the way they used to do it?

MR. DECKER: Yes and no. On my first assignment, even though I had a third class torpedo-man's rate, from what you heard as an enlisted man, they'd say, "Hey, when you go as an enlisted man, I don't care if you've got a rank or a rating of any kind. You're going to do your share of peeling the potatoes and everything else. You can rest assured that on a first patrol, you're going to do it. Now, that's all there is to it."

I knew that was going to happen when I went aboard the *Tang*. Back in those days there were not very many boats that had Boatswain Mates aboard. They had a Boatswain Mate. We had a first class Boatswain Mate aboard the *Tang*. I went aboard and I met this lad. Remember that I was off of a cattle ranch in Colorado, and I swore that man must have been related to Hitler. He cracked a whip and basically, it was right arm ratings. We not only had a Boatswain Mate but we had a Boatswain Mate striker and he was kind of cocky, also. The first class Boatswain Mate knew the Navy manual and he could quote it. I mean, you'd ask him what was on page so and so, and I think he could tell you. That nice guy was one of the nine survivors, by the way, and we became very close friends. But I did my share of potato peeling. I stayed out of the way of the Boatswain Mates as much as I could, and I didn't ask to get off the *Tang*. But after that first patrol, I asked the executive officer if I could become a seaman first, and go back to the black gang. That Boatswain Mate is a wonderful guy, and we have a great rapport yet today. We e-mail back and forth, and he knows my wife, I know his wife, and he's got a beautiful home up on Palamar Mountain out in California. He stayed in the Navy and retired as a full commander.

Anyway, a very good friend, a very close friend of mine on the *Tang* told me, "Clay, if you break down first class, come on back to the black gang." I broke down, went back in the black gang and learned about Fairbanks Morse diesel engines. The *Tang* had Fairbanks Morse diesel engines. They were beautiful things, beautiful pieces of equipment in both engine rooms.

INTERVIEWER: The *Tang* was your first assignment right after school?

MR. DECKER: That's right.

INTERVIEWER: You put her in commission out of Mare Island?

MR. DECKER: We put her in commission out of Mare Island. She was built on Mare Island, California.

INTERVIEWER: Tell me about the *Tang*, under construction, and your being there as part of the first crew?

MR. DECKER: When I arrived at Mare Island, I couldn't go aboard the *Tang*. She hadn't been commissioned yet. They put us in the barracks and we'd go down, daily, to the *Tang* to do various chores and so forth, and we had oodles and gobs of civilian people. For instance, we had a Westinghouse maneuvering panel, so we had people from Westinghouse there. We had Fairbanks Morse diesel engines, so we had representatives from the Fairbanks Morse. We would just go down on a daily basis and acquaint ourselves with the boats, help wherever we could, stand watch down there and that sort of thing.

The chap who I mentioned to you about changing my rate, that was where I first met him. His name was George Lofkin and he had just completed five runs on the USS *Tunney* before being assigned to the *Tang*, and he was a First Class Motor Machinist Mate. George looked me up in the barracks at Mare Island, and he said, "Clay Decker, I understand you're married and you have a son who is two years old. I have a son who is two years old. Clay, I just bought a home at 67 Stoney Ford Avenue in San Francisco, and it's on one of those steep hills." Today you'd call it a condo, because if you go out to San Francisco and look, you'll see that 67 Stoney Ford is still there, but the house is split between next door with a common wall. A common wall divided this house from that house, and when you stepped out the front door, you were on the sidewalk. It had a back yard about the size of a postage stamp, but it had two bedrooms. He said, "Clay, I bought this house for \$5,200. I don't know how I'm going to pay for it." My wife was

out there in California. She was a secretary to the chief executive officer at the Kaiser Ship Yard, and she had hired a babysitter. He said, "Clay, how about you and I getting together? We're going to go out on the *Tang*. Your wife and your youngster could move in with my wife. We've got two bedrooms. My wife, Martha, is strictly a housewife. She could baby-sit the boys and take care of them. You and I are going to be on the *Tang*. Your wife could be out bringing in some of the beans." Boy, it just worked out perfect, and we did that.

When George and I went to sea on the *Tang*, our wives were living together at 67 Stoney Ford Avenue in San Francisco. Like I said, George was the one who helped me out then, rescued me from the Boatswain Mate, and we laugh about that, we really did. When we got into the prison camp, we got to know one another very well.

Anyway, George asked for this arrangement, and it worked out great, and we put the *Tang* into commission. We were out at Pearl Harbor, at the sub base on Christmas Eve, basking out on the deck of the *Tang*. It was January. I was looking up at the moon and the stars and said, "Gee, back in Colorado there's got to be a foot of snow on the ground, and here I am out here in beautiful Hawaii, on the *Tang*."

INTERVIEWER: Who was your skipper?

MR. DECKER: The *Tang*'s skipper was Richard O'Kane.

INTERVIEWER: Tell me about the first time that you met O'Kane.

MR. DECKER: He called us all topside, even before the commissioning, and chatted with us, because we came from all walks of life. Like I said, George Lofkin already had five runs on the *Tunney*, but he was brand new to O'Kane.

Dick O'Kane, I think, was an officer and a gentleman. There's no question about that. But O'Kane definitely used the chain of command. In other words, he didn't want just everybody coming to him with any problems, you know. He wanted us to go to the chief of the boat or the

executive officer, and rightfully so. I mean, he had enough on his mind. I'm sure that you've heard that Richard Heatherington O'Kane was a Medal of Honor holder, and I don't know where the title came up, how it ever came about or who started it. As a matter of fact, here at the Academy, one of the leading officers said to me the other day, "I'll never forget the first time I met 'Killer' O'Kane." He got the name 'Killer' O'Kane. People ask me about that and I say, "Hey, look, I don't know." They have to mean it jokingly. The man was married just like I was. The man had two youngsters and I had one. He didn't want to die any more than I did, but he was going out there to do a job. He had a job to do. I think we all have to agree that he and the *Tang* did one heck of a job. So many people don't realize it. They stop and analyze it in a minute. *Tang* only made five patrols, but hey, the *Tang* only fired torpedoes on four of them. On our second patrol, the Battle of Truck Island, we didn't sink a ship. In order to get a star and your combat pin you had to sink at least one ship. We never sank any ships on that second patrol, but we picked up 22 flyers out of the water. I didn't bring it with me today. I wish I had. Back at the hotel I have a list from the Navy Department that I've got a picture of them to show you. This year the VA made me a one hundred percent VA patient. The Disabled American Veterans, the DAV, helped do the paperwork for me. The lad who did it said, "Mr. Decker, are you aware of how many medals you're entitled to?" I said, "Well, you know, I have the Silver Star and the Prisoner of War, and when I go to conventions, I wear them on my little vest. I'm proud of them." He said, "You're entitled to 16. If you don't mind now, one of the things that happens when you become a one hundred percent disabled veteran is that the Navy Department will send you a copy of every medal you're entitled to," and they did that. One of them I got, believe it or not, was because of that second patrol, picking up all those flyers. It is black and white. I am a recipient of the Navy Air Medal. Now, how in the world does a submariner get hold of a Navy

Air Medal? But, fellows, I have one. It's there. They tell me I'm entitled to it, and so it's there.

That was interesting.

INTERVIEWER: What was it like being on patrol with O'Kane? What were his manners like? What was the ship routine like?

MR. DECKER: Remember that on my first patrol, I was a Torpedoman and peeler of potatoes, and I did my chores and so forth. On my second patrol, I really saw more of the skipper than I did on the first patrol. Back in the black gang and particularly in forward engine room was where I had my station on second patrol, when I went back to black gang. That was where we had our two water evaporators below decks, in the forward engine room.

During most of the second patrol, I got to the point at which you could blindfold me and I could take one apart, clean it and put it back together. I don't think I ever did have both of them going at the same time, because one of them had to be down to be cleaned and so on and so forth.

That was one of the other things that put me on one hundred percent disability. I'm wearing this oxygen. So many people aren't aware of it, but hey, those World War II boats were just loaded with asbestos. The metal covering around the evaporator, when you pulled it off, showed a thick covering of asbestos around the hummer, you know. I cleaned one at least once a day, but more often twice a day I would clean one.

Anyway, Dick would come back, call a white glove inspection, if you wish, but he noticed things. He would tell you, "Good job, sailor, good job, good job, looks good, sailor, looks good." But he was all business. There was no 'ding donging' around. Never did I see him come into the crew's quarters and sit down in the galley or sit down on the table and just chit-chat. The executive officer, Murray Frazee, did. Bill Ballinger, who was the chief of our boat,

put five runs on the *Tunney* before he came to the *Tang*. Bill was one great guy with the crew. I mean, Bill Ballinger was just one of the greatest, as far as chief was concerned.

On that second patrol, I went to Bill first and told him, “Bill, I really think I want to be a Motor Machinist Mate.” “Okay,” he said, “I’ll get it set up for you to talk to Murray,” and I talked to Murray Frazee.” By the way, on the very first patrol, we took turns at bow planes and stern planes and that sort of thing, for some reason or another. Murray Frazee was executive officer aboard the *Tang* and he made floor patrols with O’Kane, as the executive officer. It was Murray Frazee’s job to select permanent bow planesmen and stern planesmen on the very first patrol. Anytime we were called to battle stations submerged, and it didn’t make any difference where you were or what you were doing, you’d drop what you were doing and go to your battle stations for which you were designated. He selected me. Murray is now retired. He lives in Gettysburg, Pennsylvania.

About four years ago, my wife and I visited him, and I asked him, “Murray, how come you selected me as bow planesman,?” Remember that I came off a cattle ranch, and the term, of course, is ‘catching the bubble,’ and you remember our bubble. We had an arc about as big around as your finger, the glass bubble and, for some reason or another, there I was, off a cattle ranch. He said, “You had the sense before anybody else. When that bubble started getting away from you, you knew to tell the diving officer to ask the man to pop some weight.” You remember the movie *Das Boot*? Remember how they shifted weight and sent men forward or sent men aft. Well, I apparently sensed it more quickly than other guys did. I was not going to be able to catch it with the bow planes. I’d say, “Give me some weight aft or give me some weight forward or whatever.”

I used to know the name of that one sub. You remember seeing pictures of it. It came up out of the water from a dive like that. That would put every man on his can back there on that

load, breaking the surface and taking it out like that. I never did that when I came up while I was on the bow planes.

I told Murray, “Murray, by making me permanent bow planesman on the *Tang*, on that first patrol, you really saved my life.” When we hit that convoy on the fifth patrol, one of the first things that O’Kane called for was for everybody go to battle stations submerged. It was two a.m. in the morning and we were still on the surface and everything. That has been the thing that’s been so confusing to a lot of people. What the heck happened? You were at battle stations submerged but were doing everything on the surface. That was exactly what the situation was. But I told Murray Frazee, “Murray, you saved my life because I was back in the forward engine room on the throttles. I was standing watch on the throttles in the forward engine room.” Word came over to go to battle stations submerged. I turned the throttles over to Zofkin and went forward. There I was, sitting at the bow planes in the control room at the front row seat whenever action took place on the *Tang*. I could open the hatch and go up in the conning tower. The ladder was right here. I could reach out and touch the ladder. There was the chart desk right there in the center of the control room. The Christmas tree was over there. The man on the water manifold was over on the starboard side. I just sat right there like this, not going anywhere. We had not called for a crash dive or anything. I was listening to everything that was going on up there with the fire control party. I knew exactly what they were doing up there. It was a front row seat, it really was, the one I had.

INTERVIEWER: Tell me what it was like to make an attack on the *Tang*.

MR. DECKER: The main people, particularly civilians, asked me, “What if you saw a ship? Would you see a target out there?” The World War II Submarine Veterans Organization, about three years ago, had a lottery-type thing, and I won a picture. It’s a good three feet wide and two feet high. It is a painting made by an ex-submariner, and it shows the sub, and the target was

smoke on the horizon. I mean, before you would ever see a target, why, you'd see smoke, because, remember, most of those ships were either oil burners or coal burners. If they were bending it on at all, boy, they'd give off a smoke stream that you could see for miles. Remember, on the *Tang*, in particular, if you were up topside, up on the periscope or as a look-out, we were told that our distance was seven miles to the horizon. I don't know what it was, as a matter of fact. When I saw the O boats, they looked so nice on the water, on the surface. The new nuclear submarines look like humpback whales to me. Of course, they don't stand topside watches anymore like they used to. Either radar or the boys saw smoke on the horizon. As a matter of fact, on that fifth and final patrol of ours, at two a.m., the targets were picked up on the radar, originally.

Like I said, I was sitting there in a front row seat. They called a fire control party, of course. I had been a Torpedoman, the thing for those of you who are qualified and have your submarine qualifying dolphins. On the O boats we were told that you had a good 5,000 lines, bows, gauges or something. When the qualifying officer went through that boat with you and he pointed to something, you'd have better known what it was. If it was a valve, you need to know what the valve was for and what it did. If it was a line, what went through that line? Was it air, hydraulic oil, water? Fortunately, I was exposed to torpedoes, and the fire control party would go up there and they'd talk about putting the data in the torpedo, "Run so deep and blah, blah, blah." That all meant something to me, probably more so than to a lot of the other guys, having been a Torpedoman.

On the same token, the thing that used to interest me the most was why the fire control party was so concerned about turning the gages until they put data into the torpedo. I didn't understand it until it was really explained to me. Of course, it was a Japanese vessel, or a 'maru,' a one or two-stacker maru with so many people. Understand that what they were doing was

figuring out how much water that vessel drew, because we knew how important it was to try to get the torpedo you sent hit it as close to the keel as it could.

INTERVIEWER: Well, there had been some problems with the torpedoes in the past, hadn't there?

MR. DECKER: Yes, exactly. Oh my, yes. Oh, the torpedoes. What a nightmare we had, really. Only on one patrol did we bring back a torpedo, and it had to be an electric one, too. But we had torpedoes. The sad thing was that on a target, maybe close to shore, the torpedo would go under the target and explode over on the beach. Really, I mean, our immediate boss, who was in charge of the submarine fleet out there was Admiral Lockwood. Remember, Nimitz was in charge of the Pacific fleet, but Lockwood was our immediate boss. Oh, we felt so sorry for him. Boy, he was pulling his hair. If I remember correctly, one of the trips that he used to make pretty frequently was to a torpedo factory. I think they were making torpedoes pretty close to Baltimore at a torpedo factory somewhere.

INTERVIEWER: There was one in Washington, D.C.

MR. DECKER: Is that right?

INTERVIEWER: Yes.

MR. DECKER: Oh my, he'd make trips there. That lad that talked at the dinner last night, Peter Maas, commented about dropping one off a cliff or something and figuring out about that firing pin bit. Anyway, we had our hands full with the torpedoes. But there again, getting back to the fire control party, I was told that when Richard O'Kane was executive officer on the USS *Wahoo* he did most of the periscope searching. He did so aboard the *Tang*. We really took our hats off to Admiral O'Kane. Those destroyers would be coming in right down the throat and he'd hang right in there and lay it to them and blow them out of the water.

INTERVIEWER: I just have a quick question, going back to the torpedo situation. When you arrived on the *Tang*, had the torpedo situation been pretty much cleared up? It was an earlier problem, but when you got there, you didn't have that many problems with torpedoes did you?

MR. DECKER: Oh, yes.

INTERVIEWER: You did still have problems?

MR. DECKER: I sure did, yes. Like I said, on the first patrol, it was not so. We got along pretty well on the first patrol. On the second patrol, remember, at the Battle of Truck, we never fired a torpedo. The third patrol was when we actually brought one torpedo back. Dick O'Kane said, "I'm going to take one back. I want Admiral Lockwood to see this hummer." I can't remember, even when we were in the prison camp, ever asking Dick about it. We called him 'Skipper O'Kane' and 'Admiral O'Kane,' but we got to know one another like Dick O'Kane and Clay Decker. It was interesting.

Many people ask, "Well, how well did you know Admiral O'Kane?" and I say, "Hey, look, the Japanese used to throw us in a tub with a bar of soap once a month. I took baths with him." On that one patrol, we brought that one torpedo back. Lockwood, bless his heart, was a wonderful man. He was a great guy. Admiral Lockwood, our boss, never missed being right at dockside any time we'd come in off patrol. He was right there to greet us, right there to shake hands with every man as he got off that boat.

INTERVIEWER: Tell us about that last patrol, when you encountered the convoy.

MR. DECKER: As you all know, they refer to submarining as the 'silent service,' and rightfully so, I guess. From our standpoint back then, we didn't want anyone, particularly Tokyo Rose, knowing where we were going. But until we cleared the torpedo nets and everything, why, we didn't open the orders to know where we were going.

When they opened the orders, the skipper would come on the intercom and tell us all where we were headed, where we were going on that patrol. He did so, even though we stopped at Midway to top off our tanks before we went on to the Formosa Straits. We were headed for the Formosa Straits. Submariners, back in those days, absolutely hated to patrol the Formosa Straits. Today it's called 'Taiwan' or the 'Taiwanese Straits,' but they were the Formosa Straits back in those days. I tell people, and anyone who knows a little bit about the geography of Pacific knows, that the Formosa Straits has, probably, the shallowest water in the whole Pacific Ocean. We knew, all of us, regardless of our rates or how many patrols we had made and so forth, about the Japanese, as far as their depth charging was concerned. It was just common knowledge. You took a 55-gallon drum, filled it half full of TNT and dumped it out in the water. It took in a little salt water, but it would only gain so much weight, and anything so heavy will only go so deep. They were not self-propelled.

The thing that we were most fearful of, however, whether you remember it or not, involved the pressure hole and flood valves. You had your vent valves on your bow tanks. When you went on patrol, it was not so when you were maneuvering and shaking down and you were back at port and so forth, you would use the flood valve and the vent valve both. But when you went on patrol, flood valves opened and locked open. The thing we feared the most was the depth charge going off below us, blowing those ballast tanks clear out of the water and popping us to the surface like a cork. That was the thing we used to fear most. We didn't mind them, too much, going off to the side or right above and so forth. I want to tell you something. The crew on the *Tang* went through some long, terrible depth charging experiences. We really did.

INTERVIEWER: Did it rattle the entire boat the way Hollywood would have it? Did it rattle the entire boat when they went off?

MR. DECKER: Oh my, yes, you bet. Just before they went off, they went click, click. You could hear them on the sub. They went click, click, and bang. Some people ask, "What did it feel like?" It was though you were in a 55-gallon drum with somebody beating on it on the outside with a hammer. Like I said to you before, there were some guys, who, with depth charging, in particular, just could not take it. They'd get in, go to see the chaplain, and that was the end of it for them. They weren't belittled or anything like that. It was just routine to be able to do it that way.

INTERVIEWER: Let's say you were undergoing an attack and there were people on the boat who maybe shouldn't have been there. What happened? Did you restrain them? What happened when it started?

MR. DECKER: No, there was no panicking or anything. It is so interesting. I haven't had anyone explain this to me, but it's interesting. Last year, in August, that Russian submarine went down on the east coast of Russia. The media got a hold of me immediately and, as a matter of fact, you might have seen me on Tom Brokaw's program. Anyway, you know, they were asking whether those guys were panicking down there. Well, I told them, "Look, if they were trained like we were trained, they weren't panicking." Even in that kind of a situation, they weren't panicking. We didn't panic. But the thing that confused me was that they were talking about those guys freezing to death. In many, many depth charge attacks on the *Tang*, if the bottom was 400, 500 or 600 feet below, we went to the bottom and shut down everything. There would be no air conditioning, no refrigeration, no nothing. Talk about silent running. That was silent running. But you could sit on the edge of a stool and bend over, and the water would run off your nose. It was hot, you bet. The only thing I can come up with is that on the boats that I served on, when we dove, they put pressure in the boat. They don't do that today. Is that the big difference, the fact that they put pressure in the boat? I understood we put pressure in the boat. The *Tang* was

supposed to be called a thick-skinned boat, but I understand it was still less than an inch thick. There was the pressure hole. Pressure in the boat may have been the reason for it. Sure, it was hot. You would think that if you were down there 600 feet, sitting on the bottom, it would be cold. The water would be cold. Well, I'm sure it is outside, but not inside. You just sat there and didn't move a muscle and the water would just run off of you.

INTERVIEWER: Did your boat ever go down that deep, down to 600 feet? Its test depth was 450 feet.

MR. DECKER: Have you read O'Kane's book?

INTERVIEWER: Yes.

MR. DECKER: You go back and re-read that. On our shakedown cruise to San Diego, she got away from us and we went down almost 700 feet. We didn't have any problems, thank God. We had a few little leaky lines and gaskets. It wasn't planned. Hey, as a matter of fact, if you read his book, Murray Frazee comments about it. The chief was our chief cook, or 'commissary chief,' I guess you could call him. I almost said his name. Anyway, we got to San Diego. There was no liberty. I mean, we had civilians aboard, you know. We had Westinghouse people aboard. We got to San Diego and I think we tied up next to the USS *Holland*. I can't remember for sure what ship it was. They didn't have a sub base, per se, back in those days, so we tied up and were there just overnight. No one got liberty or anything, and we went back to Mare Island. That chief, he was going to go over, and he was telling the chief of the boat, "I won't be back because we accidentally went down almost 700 feet." He was going to leave.

Now, you read the book again. Murray Frazee, the executive officer, said, "You'd better be back here tomorrow morning, or I'm going to put you before a firing squad!" He did, and it's in the book. The chief did come back, but that was the only run that he made. He made one

patrol on the *Tang* and got off her. You bet, we sat on the bottom many times and let them just go ahead. Have you ever had the experience of someone telling you about using CO2 absorbent?

INTERVIEWER: Yes.

MR. DECKER: That was a five-gallon can. You opened it, and it was vacuumed just like a can of coffee. You'd get those mattress covers, and excuse me for the Navy expression, 'fart sacks,' get them good and tight, and put that crystalline material on there. Hey, we not only did it once. We not only did it twice. We did it at least a half a dozen times. I mean that air just got so bad that you could just watch it. You spread it out on the mattresses and started to get light yellow, dark yellow, light brown, dark brown, and then you almost turned black. Of course, you could bleed out of your air tanks. You could bleed a little bit of air into the spaces then, which, being a motor machinist mate, was one of the biggest things that we were trained to do. Believe me, it was so bad that George Zofkin never made it because he was a Navy-trained man, and he didn't go to sub school. They needed men so badly that he got aboard submarines without having sub school training. But we were told that standing throttles, a diesel engine and a gasoline engine, needed two things to really function, air and fuel. Of course, ignition on a gasoline engine is a spark plug. Ignition on a diesel engine is compression. It's combustion by compression.

That wasn't in the *Blue Jacket* manual. It wasn't way down to him by any high technicians, but George had a big, heavy ball pin hammer. It was a good eight to ten pound hammer. It was a heavy baby and painted solid red. He fixed a clip on the starboard side, and you were standing, facing forward at the throttles in the forward engine room. Right there was that ball pin hammer.

If you went and checked the Fairbanks Morse diesel engines, the main fuel line going to each one of those engines came right up near where your controls were on your throttles. It came

up and made almost a right angle turn to go down to feed your engines. George had it figured out. Have you ever heard the term 'some diesel engines run away?'

INTERVIEWER: Yes.

MR. DECKER: You had a runaway engine. That was one of the things that we feared. George taught me something. He said, "Clay, I got it figured out. In theory, they either have to have air or fuel to run. If I get a runaway, all I've got to do is grab that ball pin hammer, make one swing this way, and hit its copper tubing. If I hit that baby right there, it will bust it. There's the connection, right there, a right angle connection. If you break that connection, there's no more fuel going to that engine. If you swing that way, and back that way, there will be no more fuel." We had our Christmas tree right up there. Have you seen that main induction back there in the forward engine room?

INTERVIEWER: Yes.

MR. DECKER: Was it about that big around?

INTERVIEWER: Yes.

MR. DECKER: When you worked through there and both those engines were running top speed, it would nearly knock you down. The air was coming in there so strongly. Of course, I belonged to this club. They wear one plug in each ear now, but back in those days we never had earplugs. We never had muffs or anything else. When both of those engines were at top speed, if you came into my engine room and wanted to talk to me, you nearly had to do sign language or get right up to my ear and talk.

Anyway, I was told that it wasn't that Christmas tree. When that diving alarm turned red, and if I didn't have those throttles down right then, each of those engines would only have to make about ten to twelve complete revolutions and they would break every man's eardrums on the boat. It would suck. It would take in that much air with that main induction closed. It would

take so much air to run those engines that it would pull the air out of the boat just like that. We never tried it, believe me. But there was the thoughtfulness of George Zofkin. He said, "Boy, listen. When I go back like this and those babies don't respond, I'm grabbing that hammer and I'm raising heck with those fuel lines." He was a great guy.

INTERVIEWER: At the end of the last patrol, when the boat was lost? What happened?

MR. DECKER: Of course, like I said, we got the orders. We were going to go to the Formosa Straights. None of us were particularly happy about that because of the depth of the water, but as it all turned out, it was, you know, in our favor that the water was as shallow as it was. On the morning of October 24th, 1944, at about two a.m., they picked up tips on the radar screen.

INTERVIEWER: Were you on the surface?

MR. DECKER: We were on the surface. I was a bow planesman, all the time. We attacked during battle stations submerged, and many times, we did it both from underneath and from above. We fired torpedoes, submerged, and we fired torpedoes from the surface, but for the most part, I could really watch everything that was going on when we were on the surface. I was sitting there at the bow planes. In that particular case, the one thing that struck me the most was that in previous convoys that we struck, we'd find two ships abreast. They would 'zig' X number of minutes, 'zag' X number of minutes and, of course, the job for the fire control party was to figure out those zigs and zags and time them, put the information into the torpedo, and send it on its way.

In that particular case, there were 35 targets up there, 35 ships, end to end, and they were all apparently going full blast. I mean, all of them, as I said, were either coal burners or oil burners, and the smoke was just rolling out of their stacks. Well, it was like shooting ducks in a shooting gallery for O'Kane. I was told whenever they'd hit a convoy, they'd fire six tubes forward and four aft. We carried 24 torpedoes when we went on patrol.

When they cleaned out the torpedo tubes, forward and aft, they usually got away from the action. O'Kane did it much differently. He got right in the action and would get close enough to the ships that the boys on the bridge said, after we'd fired all the six torpedoes forward and the four torpedoes aft, that some of those ships in that convoy were firing at each other. There were shells flying back and forth over the top of the *Tang*. Remember that if you go aboard a submarine today, practically all of it is done mechanically, in terms of loading the torpedo tubes.

Back in those days, those boys had to do it with a block and tackle. Be it on the surface or be it submerged, you had to have the boat. You had to give those boys a break. You couldn't be going up angle or down angle or doing a lot of maneuvering because it took them a little while to get those tubes loaded again. When we got in there on that first round, O'Kane decided that the hunting was great. It wound up that in that convoy of 35 ships, we sunk 13 of them. The thirteenth one was a troop transporter.

We found out later, after the war, that the convoy wasn't two abreast and wasn't zigging and zagging. If you check the time data, it was just prior to our landing at Leyte, back in the Philippines. We understood that all of that convoy was heading towards Leyte with supplies and troops, because we had hit that thirteenth ship with a previous torpedo that had been fired. There we were. We had fired all but two torpedoes. We had two torpedoes left in the forward tubes, numbers 23 and 24, and we were on the surface. Dick O'Kane had sunk 12 of the ships, had the 13th one up there in his periscope, and binoculars and the boys on the bridge. It was light enough that they could actually see the targets. It was a big troop transport. He estimated that there were about 5,000 Japanese troops aboard. Normally, as on previous patrols, we'd fire from 1,000, 1,200 or 1,400 yards. Picture yourself, there you were out there. You had this luscious target and two shells left.

You know, I'm a big game hunter out in Colorado and have been since the war, and I just quit big game hunting about three years ago. But I could see myself with one shell left in my gun, and there's a big bull elk trophy. I might even go so far as to lay the barrel of my gun across a tree limb to get a good shot. Dick O'Kane's strategy was to go in about 700 yards of that target, broadside, and he called for an 'all stop.' We talked about it in the prison camp afterwards, and I asked Dick about it. He said, "Well, Clay, yes, that's right. I did call for an all stop." Normally, when we would fire, be it submerged or surfaced, we would have two or three knots on the screws. We were not moving very quickly, but in slow motion.

Anyway, he called for an all-stop. He fired the twenty-third torpedo, and she went hot, straight, and heavy, and she did away with that target. I mean, there were 5,000 Japanese, and without a doubt, 4,000 of them didn't make it. He had two men on the bridge with binoculars verify the twenty-fourth torpedo went out of the tube. They followed the wake. It went out about 300 yards and he said it was like if you were going fishing and caught a fish on your line, and you were pulling the fish out of the water, and it was up dancing. He said, "That torpedo stood on its tail, dropped back into the water, and doing a hard left turned on itself." That was when he started pounding on the bridge, saying "Full speed ahead," pounding. If we had managed a knot or two, we would have made it, but of course, that is hindsight. That torpedo hit us after making that circular run. It came around on our port side. It hit us right at the maneuvering panel, which was located just before you stepped through the hatch into the after torpedo room. We would have had the length of the after torpedo room to have gotten out of its path, had we had any forward motion. But we did not.

Anyway, we had such good success. We sunk all those ships, and the crew was really starting to feel jubilant. We were told that after the fifth patrol we were going in for new construction, stateside. As a matter of fact, we had several members in the crew on that fifth

patrol who were part of the relief crew back at the sub base in Pearl Harbor. They knew that or had heard stories, and boy, they just busted their legs to get aboard the *Tang* because they knew that she was going to be going back.

One of the torpedo men up there said, when he padded that breach and the twenty-fourth torpedo was fired, "Let's head for Mare Island." He said no more than that and boom, that baby hit us. Picture this, if you will. There are so many people who aren't familiar with submarines, when I tell them this story, I say, "You know, you have to picture this." The *Tang* was an example. If you took it out of the water and put it in a football field, the bow would touch one goal post and the stern would touch the other goal post. You were looking at 300 feet. We were in 180 feet of water, so we hit ourselves in the stern and started to sink from the stern. Picture yourself at about a 45-degree angle with the stern resting on the bottom. We knew that the bow was out of the water because we could hear the waves splashing on the hull. There I was, sitting at the bow planes, and they were big planes. Today, operating bow planes is like driving a car. The bulkhead behind me was the portside bulkhead of the radio shack.

I was sitting on the bench in the front of the bow planes' steering wheel, and I didn't move four or five inches. I never got a scratch. I wasn't hurt at all, period. But picture this. Right there to the right of me, toward the forward part of the ship, there was the ladder that went up to the conning tower. You had the man on the Christmas tree. You had the diving officer standing right side of the chart desk, which was, on the *Tang*, in the center of the control room. We also had the gyro look at it just below the chart desk. I qualified and got my submarine dolphins on the second patrol on the *Tang*. That was when my training really came in handy. Picture this now. The torpedo hit us. We were sinking at the stern. The lighting all went out. We lost all hydraulic pressure. I immediately flipped the control for the battery-powered lighting. Because I had completed my training as a qualified submariner on second patrol, I was very familiar with

the fact that immediately above the chart desk in the control room, from the overhead, was the big lever that ran forward to aft. At the aft end of it, there was a pin. If you pulled that pin and let the lever swing down over the top of the chart desk, it opened all the vent valves for the forward part of the boat.

Whether you're aware of it or not, everything we were told and everything that worked hydraulically on a World War II submarine, could also be operated manually. There was a function and you could operate it manually. The chief of the boat was on the Christmas tree. He, the diving officer and the man on the hydraulic manifold that pumped water forward and aft for us were clear over on the starboard side. Those men, when that torpedo hit, were just literally thrown. The chief of the boat wasn't knocked out completely, but when I got the lights on, I got over to him I said, "Chief, let me help you." He knew who I was, but he was really stunned. He was the one who told me, "Clay, here we are now, at a 45-degree angle. We've got to get this boat leveled. There is no way we're going to get that forward torpedo room with this angle." That was the thing that prompted me to then crawl up on the chart desk, roll over on my back, throw my legs up around that lever on the overhead, pull the pin, and drop it down. Immediately, we started lowering. The boys up in the conning tower were thrown around also, but the normal way to come down from the conning tower to the control room was feet first.

Now, if you had seen guys come off a watch, they wouldn't touch a step. They'd come down and put their feet sideways, and just grab the handrails. They'd grab it and slide right down. You've seen firemen do that on fire drills. They can do that. We had two men come down, and they were the first two men to come down out of that conning tower. I was sitting right there. There was the ladder, coming down from the conning tower, and there was the deck right there. Two men came out of that hatch headfirst. They dove for that hatch, and they came down. The first man broke his neck. The other man who came down broke his back. They hit that steel deck,

coming straight down. They never touched a rung on the ladder or anything. They just dove through that hole.

The third man who came down was this little red headed lad. I'd have to look in the book to get his name again. This isn't Alzheimer's. I just can't remember his name. Most all the hatches on the *Tang* that opened upward were spring loaded, so that when you would undog and release it, it would itself go up. It had a lanyard on it, and at the bottom of the lanyard was a piece of wood about as long as my finger and as big around as my thumb. A lot of times you could just grab that lanyard and run the line through it. You'd just grab that and pull the hatch right on down, and then you'd dog it. This lad did that. He came down feet first, and he stepped on the ladder as he came down because he was in a hurry, believe me. He came down and just grabbed the line, and instead of coming down and getting hold of the wood, he just grabbed the line itself. When he grabbed that piece of wood at the end of that line it and pulled the hatch to dog it, it got caught up on the gasket where the hatch came down. Even though he got it down and he got it dogged, we had a stream of water about the size of my wrist coming into the control room. That was the time that I went over and helped the chief. The stern planesman, whose name I can't remember right now, got up and helped the boys who were injured.

We had a man with a broken neck and we had a man with a broken back. We had a man sitting on the helm. We had a helmsman in the control room also. Now, he wasn't doing anything. He was just there in case they wanted to switch from the conning tower down to the control room. He had a broken arm. I opened the vent valves and started to level the boat to take her on down. Unbeknownst to me, during all the firing and everything, just prior to the torpedo hitting us, my buddy, George Zofkin, to whom I turned the throttles over when I went forward to the control room when called to battle stations submerged, turned the throttles over to his oiler. George told me that what happened with him. His oiler was a well-trained lad. Hey, we had sunk

ships. We were going to be out of torpedoes. We were going to be headed home. George went up to the galley for a cup of coffee.

He was standing right at the galley. You stepped through and there was the radio shack and then the control room. He said, "I was standing right there, Clay, when the torpedo hit. The passageway there is fairly shallow. It shook me around a little bit, but I just stepped through and pulled the hatch closed." That closed off from the control room aft. You had the after battery compartment closed off from the control room. I was gone and didn't know that had happened, but later on, I'll tell you a little bit about what happened in that after battery room. Unbeknownst to me, George Zofkin, my buddy with whom I had left my family back in San Francisco, was among the survivors in the control room. I didn't know that until we got up in the forward torpedo room.

By that time, I was getting the chief up and helping him. He was bleeding from his head a little bit and so forth, but he was conscious and knew what he was doing. He said, "Okay, let's all move forward now," knowing that we were going to have to help those boys. We had to carry the boys with the broken back and the broken neck. We had to carry them forward. We went through the officers' quarters and the forward battery compartment. In the wardroom was Ensign Ennis, who was an ensign when we put the boat into commission. I said earlier that he was still an ensign on the fifth patrol, and I figured out that the reason for that was because he had taken a steel waste paper basket. Hey, you know, he was smart. He got all the codebooks. He knew where to go to get the books and everything, and he was folding them up, taking pieces of paper and folding them up a little bit. Then, he touched a match to them. God, he was going to burn them! By that time, Ballinger and I were coming through and saw Ennis do this. We stopped him and said, "Let's not do that." You are all familiar with it. The opening in the wardroom going down to the forward battery compartment was a good size. Of course, there was that opening in

the top of those batteries, and you know what was in there. It was sulfuric acid. If you took a piece of paper, wadded it up like that and put it in there, zoom, it was gone. That sulfuric acid would do a number on it right, so that was what we did. We got all the codebooks, opened up those batteries, and put them right down in that sulfuric acid. We figured if the Japanese ever got to the sub, they wouldn't get the codebooks. We got that done and we moved on forward.

Ennis was on up forward then, and so was another officer. He was Lieutenant J.G. Hank Flannigan, a torpedo officer. As of then, nobody had even started to get groups of four together. In my talk the other day, I mentioned a couple of asinine things that happened. Well, one of those things was Ennis trying to start a fire. That was the last thing we needed. We did not need to burn off our oxygen with a fire. When Ballinger and I got up in the torpedo room, right away the chief said, "Hey, I'm going on this way." Just as he and I got up there, there was a group of guys standing right below the hatch and they were talking. He was a chief Torpedoman, and the other guy was a First Class Motor Machinist Mate, and his name was McMeryl, but I can't think of the name of the Chief Torpedoman right now.

Anyway, Chief Ballinger and I didn't see it, but were told about it. Both McMeryl and the Chief Torpedoman crawled up in the escape chamber, closed the hatch and flooded it down. If you remember, that was how you knew whether that hatch up in the escape chamber was open. There was a lever in the forward torpedo room that, when the hatch opened out to sea, came down. It automatically came down. In other words, it worked like this. The hatch opened, the lever came down, the lever came up, and the hatch closed. That was the way you closed the hatch after the four people escaped. You closed it, pushed it back up and closed that hatch. Then, you drained the water down, let it just go down into the bilges, opened up the hatch, went back up and got four more men up there. Those two dudes got up in there. That was the other asinine thing that happened. Those two dudes got up in there and they never let the buoy out, fortunately

for us. I thought about it many times afterward. It was fortunate for us because we used that buoy and that line. I did, anyway, and they were gone. I'm not sure it is even questionable that, if they went out that way, they would have hit that opening in the deck. Anyway, they were gone. We got the story. Somebody was telling Ballinger about what happened and Ballinger said right away, "Clay, you want to go with me? I'm going to be in the first group." I said, "You bet. I'm going."

That was when I first discovered that George was up there. He rolled over to the side of me. There was George Zofkin. I said, "Hey, George, where did you come from?" He told me then about being there at the galley when the torpedo hit, and he just stepped through. We got the new Momsen lungs out and opened the cellophane. They were in the cellophane pack. I put one on and got the mouthpiece and the nose clamp. George reached down and took the wire clip that was on the rubber exhaust valve. He took that clip off for me and saved my life. I would not have taken that clip off. I was told that later on, when we were in prison camp and after we were out of prison camp. Back at sub school, they once brought a brand new lung into class, because when we'd go through the escape chamber at sub school they had just a rack down there. You'd just grab a lung off the rack, one that somebody may have used just two hours before. It didn't make any difference. You could use it over and over.

Anyway, we had the brand new lungs. Why in the world did they ever have that thing? It was flat rubber. It was like when you were a kid, took a raspberry and made it so that water couldn't get it but air could get out. That was the principal of the thing, because the lung wanted to keep getting big like that. Even when we'd use it on the escape chamber, there were air bubbles constantly coming up from it.

Anyway, George reached down and took that off me. Right away, I grabbed another one and I said to him, "Come on. Let's get this on." Remember that he was my buddy with whom I

left my family back in San Francisco. George said to me, "Clay, I have a confession to make." "God," I thought, "George, why are we talking about confessions? Let's get out of here. What are you talking about, a confession?" He said, "I can't swim." I thought, "Oh gee."

Since then, I've thought about it. I think about when we'd go on rest and relaxation between patrols. We'd go to the Royal Hawaiian Hotel. George and I had roomed together. We'd go out on Waikiki Beach and frolic and everything. I have pictures of us in our swimming trunks and so forth, but George never did ever go in the water. I had never even thought about that before then.

I told him, "George, look, you and I both know if you close that valve properly on that mouthpiece, that thing acts just like a Mae West life preserver. Let's worry about that after we get gone." He said, "Clay, do this. You go with this first wave of four, and I'll come up with the next wave." I thought, "Well, that's fair enough." Ballinger was there and ready to go.

You've seen the escape chamber. It was really 'togetherness.' You had four men standing in there and were allowed maybe a 12-inch step to step out. Remember that when you stepped out, it faced and opened aft. You were looking at the aft of the ship. When you stepped out, you were on top of the pressure hole. You were standing on top of the pressure hole of the submarine. The height of it was about shoulder high. Believe me, Ballinger knew every step that we needed to take. There was no panic. The four of us had our Momsen lungs. You had, in the escape chamber, a gauge giving you the outside pressure of the water.

Fortunately, we didn't have any harm done to our air supply. We had air, which was a very important factor, as you all remember, because on your lung, you initially charge it with an air hose just like you'd fill a bicycle tire. That was the initial charge, and Ballinger was standing next to a lad who's name I can't remember, but who was immediately across from me. There was the hatch, and it opened that way, and I was standing next to it. Ballinger was that way from

me, and the other chap was on my left shoulder. Immediately behind Ballinger was the reel with the buoy and a line attached to it. As I remember, it was about the size of a soccer ball, but maybe not as large as a basketball. It had a lanyard around it that was stapled ever so far so that you could get a handhold on it. Ballinger said to me, "Now, we all have our lungs on." We flooded down with water up to our shoulders. Ballinger opened the air pressure five pounds to exceed the sea pressure. "Now," he said, "Clay, put your mouthpiece in and your nose clamp on and just duck down in the water and try it once in your mouthpiece." I did. I said, "It works well, chief. It works okay." He said, "Okay, good. You're ready. Now, we're going to open the hatch." We did that. I tell people that it was the same situation as the escape chamber. Water did want to come in a little bit. It was a little scary. You opened that hatch and the door swung pretty freely, but the water did want to come in a little bit. It rose up to our chins and settled right back down.

Then, he handed me the buoy and said, "Now, Clay, when you let the buoy out, do this. It's simple mathematics. Count each knot." I did. I was letting the buoy out, and it wanted to go right to the surface. It went right out and straight up and I was counting the knots. I knew when that buoy hit the surface because the line was jumping in my hand. It was riding on the waves. I told him that and he said, "Okay, hold it."

By the way, we had battery lighting in the escape chamber. Outside, it was totally pitch dark black. He said to me, "Clay, let me hold the line." We were loaded. I've forgotten where the Gunner's Mate kept the gun, but whenever you went on topside watch, you'd go and get a .45 from the Gunner's Mate. I've forgotten where the locker was that he kept the .45s in, but he brought some up there.

We knew that we were in shark-infested water. We all had .45s. We each had a shark knife. We tied our pant legs down there because we had sea rations stuck down in our pant legs. Ballinger said, "Now, count the knots," and I did, and it came out right on the nose at 180 feet,

and that was what the gage was reading. Bill just said to me, “Clay, go ahead, put your mouthpiece in and go for it.” He wanted me to cut the line. He said, “Clay, let me hold the line. You reach back over here and cut the line from the spool, but leave enough loose so that you then can take the loose end while I’m still holding the line.”

We were down at the bottom of the ocean and the hatch was open. We had three ladder steps on that escape chamber out there. It was a piece of welded steel not as big around as my thumb. But there were steps, and you came out and get hold of one if you were going to go up. On the *Tang*, the opening in the deck was three feet square, the size of a yardstick. That was the opening immediately above the escape chamber. He said, “Tie that out there for us, Clay.” I don’t know whether I tied a square knot or not, but I can remember I tied about three knots in it. I didn’t want it to get away from us, you know. But I was just reaching out here. I was still inside the chamber and just reaching out there and tying the knots on it. I put my mouthpiece in, my nose clamp on, and proceeded on out myself. I grabbed the line and I followed the line up. It was totally dark. By that time, it was probably six or six-thirty in the morning. It was definitely daylight, because as I started getting toward the surface, I could see the water getting lighter and lighter and lighter.

As I broke out of the surface, my head popped out and immediately I said, “Oh boy. I made it.” Remember that the nose clamp was strictly to keep you from breathing through your nose. I reached up to take my nose clamp off and as I did, I could see that I was bloody. There was the buoy and I was holding on with one hand, and I reached up with my other hand and saw that I was all bloody. I spit that mouthpiece out like that and asked, “Why am I bleeding? I didn’t strike anything coming up. I didn’t get the bends.” But when I was interrogated, after I got out of the prison camp, this lad told me, “Mr. Decker, what happened was probably this. It’s almost like you go to a high altitude. You get a nosebleed or something. You have little superficial blood

vessels in your cheeks. If you came up rapidly enough, they burst, because the bleeding stopped almost immediately.” There was no pain. There was no aching sensation or anything. But the asinine thing that I did was spit that mouthpiece out before I reached down there and turned that valve off. Had I done that before I took the mouthpiece out, it would have acted as the Mae West life preserver. Well, I goofed. The interrogating officer asked, “Well, did you panic, then?” I said, “No. I would not say I panicked. I just didn’t know why I was bleeding. Forget that.”

At about that time, when I was through with all of that, and I hadn't taken the lung off yet, Ballinger came to the surface. He was over from me just a little bit more than arms reach. I could have held on and reached with both arms stretched and grabbed Ballinger. That was what that interrogating officer told me. He was a Navy man, too, but I can't remember names or his rank. I said, “You know, something told me, ‘don't do it.’” Ballinger was drowning. The man was there. His face was bleeding. I could see. He was bloody. He didn’t have his mouthpiece in. He didn’t have his nose clamp on. He was screaming, and water was coming out of his mouth. The man was drowning. The interrogating officer told me, “It's a known fact that a drowning man can pull a horse under the water. If he had have touched any part of you, you would have been with him. You wouldn't be here talking to me today. He was grasping. The man was dying. He was grasping for straws. If he had grabbed you, you would have been down with him.”

Anyway, like I said, something told me not to do it. He was screaming. He was right there, and I did not reach out and grab him. The two bodies of the other two boys never did come to the surface. The only conclusion we could come to, when trying to theorize, was that those two boys, no doubt, when they came out of that hatch, did not get a hold of the line. Remember that it was pitch dark. We were down at the bottom of the ocean there. Picture that. If you were down there, had your lung on and your mouthpiece in but stepped out of the chamber and varied just a little bit, you were going to miss that yard stick square opening in the deck. That was what

we called the 'super structure area.' They wouldn't have known whether to turn right or left or what. Their bodies, no doubt, hung underneath that deck. They certainly panicked and then drowned. It was interesting because in the next wave of four, only one man made it. No other bodies surfaced. There were five waves of fours, and only one man made it out of each wave of those waves. There were five of us up on the surface around this buoy. The sixth man finally showed up. He was a First Class and his name was Larson. He wasn't in as bad a shape as Ballinger appeared to be, but the man was drowning. He wasn't bleeding, but he was spitting water and so on and so forth. Had we had him on a beach, we could have taken Larson and pumped him dry, no question about it. As a matter of fact, we were in the water between four and five hours before we were picked up, the five of us hanging around that buoy. We took turns hanging on to the buoy with one hand and swimming with the other. We took turns holding Larson up because he couldn't do it for himself. He couldn't swim for himself but was still alive. The man was still alive. Two of the youngest lads were named Truckey and Norwanski. Both of them were Torpedomen and both had just come onto the *Tang* for that fifth patrol. They came out of the relief crew. They were the ones who said, "Hey, we're going to go back to the States with this baby."

Anyway, those two young guys told the rest of us that we were right straight off of Fuchow, China. By that time, it was light enough that we could look over and see the Chinese coast. In the morning, the tide was coming out. You've heard the old lesson that you can't swim against the tide. Believe me, you can't swim against the tide. Those two young lads were both young, husky lads. They said, "We're going to try it." They threw their lungs off and started out. They didn't get twenty yards. They were back with us at the buoy. There was no way you could swim against that tide.

If it had been afternoon and the tide had been going in, maybe those two boys could have made it. Besides, they were loaded like the rest of us. We were in the water between four and five hours before the Japanese picked us up. But in the meantime, we all unbuckled our .45's and let them go. We dropped our shark knives, shoes and everything we had. We were down to just our skivvies. That was all we had on when we were picked up. In the meantime, we were holding Larson. We were keeping him up, and a Japanese destroyer escort dropped anchor about 1,000 yards from us. We could see it in the open sea there. It was broad daylight. We could see the Japanese destroyer escort.

They dropped a whaleboat, a rowboat with two men. They were armed. They rode over to us. We all crawled in that rowboat. We got Larson in. One of the Japanese had his gun on us. We were sitting in the back of the boat. He was telling us to sit down and so forth in Japanese, but he was motioning. We could tell what he wanted. The other guy was up in front, in the bow, trying to get the buoy in the boat. He finally gave up. He couldn't get it on. We didn't tell him it was tied to a submarine.

Anyway, they rowed us back to the boat, and they had a rope ladder down the side of the ship. I was the last one out of the whaleboat to go up that rope ladder. I looked back over my shoulder, and those two guys were dumping Larson's body over the side. They didn't even try to give him any artificial respiration, they just dumped his body over the side. Picture it. It was a hot day. The sun was shining. We were on a steel deck in our skivvies. We had not been exposed to any sunlight for a long time. We were surprised, right away, to notice that the skipper and three other men had been picked up in the water. That made a total of nine of us. That was probably the roughest treatment we received the entire time we were prisoners of war. I'll tell you, we decided and theorized, but that ship probably picked up a good number of the survivors from the ships we had sunk.

Now, picture yourself on one of those ships, down in the boiler room, when that torpedo hit. With that hot steam, some of those guys were like lobsters. They were scalded, almost to death, you know. Well, Jesus, they looked at us and said, “Here are the poopers that did this to us.” They'd grab us by the hair and take a live cigarette butt and stick it up our noses. We spent five days and nights on that hot steel deck with no water and no food. Oh, the Japanese word for restroom is ‘binjo.’ They took us to the binjo whenever we had to go relieve ourselves and brought us back and sat us on that hot steel deck. Believe me, by then, we were all blistered. Our lips were blistered. Every one of us confessed to each other that, when we got in the prison camp, we all even tried drinking our own urine.

After those five days, they pulled into Taipai. They tied up there and put black hoods over our heads, tied our hands behind us, and tied us one to another in a line. They marched us, probably in the streets there, down the main street. We couldn't see, but we could hear and feel little old ladies and little kids coming up and hitting us with sticks and so forth. We had to carry a sign. It probably read, and we theorized about this, “Here's an example of your ‘superior race’” or something, because little kids and old ladies were hitting us with sticks and so forth. Well, they took us to an army post just outside of Taipai, in the main town there. I don't know if you've experienced any Japanese military personnel or not, but an officer in the Japanese army was a good example. If he was talking to a subordinate, you could be two feet away, and instead of using a tone of voice like the one I'm using right now, he screamed. He screamed an order to the man. They did take the black hoods off our heads, and we were standing in line. They were screaming these orders back and forth to each other. We thought, “Uh-oh, this is it. This is the firing squad. There's no question about it, because these guys are standing here with rifles.” There were army personnel members standing with rifles. We thought, “This has got to be the firing squad, no question about it.” They were screaming, but that was just their nature. We

found that out later. An officer gave an order to his subordinate. He could be standing right there. He screamed it to him. He didn't just give it to him a little tone of voice.

They threw us in a potato cellar that night and did give us some polished rice. Whether you're aware of it or not, when you polish rice, you do away with a lot of the nutrients. They loved their polished rice. Well, they fed us. Here in the States, we call it 'meal,' or 'chicken feed.' It grows on a stalk similar to a corn stalk. The shape of their heads was like little pellets. Actually, that had more food value to it than polished rice. Our only problem was that we'd never get enough of it.

Anyway, we did get a little ball of food that night, and the next day they put us on a train and sent us clear to the north end of the island to get us prepared to go on a boat ride to the mainland of Japan. They put us down in the hold on a ship loaded with sacks of sugar in a rough sea. We were down in the hold clear up to the bow. We all got so seasick that you wouldn't believe it. We said our prayers. We said, "Jesus, I hope our submarine Navy is not on the ball and does not sink this baby before we get to Japan," because that did happen to Japanese ships. We made it. They landed at Yokohama. It was nightfall when we got into Yokohama. They put us on one of those fast trains. There we were, still in our shorts, and it was cold weather. As a matter of fact, when we got to the station, the first camp we were in was Ofona. It was inland from Yokohama, right at the foot of Mt. Fuji.

When we got off the train that night, it was raining. We were walking in the rain for about two hours before we got to Ofona. Ofona was an interrogation camp. We were interrogated and put one man to a cell, isolated in a solitary confinement sort of thing. The Japanese navy, army and civil defense interrogated us. You name it, and they interrogated us. As a matter of fact, it was interesting. One of those interrogators we finally nicknamed 'Handsome Harry.' He

would show up every once in a while in a tie, white shirt and suit. If you closed your eyes, you wouldn't know that you were talking to an Oriental. He spoke perfect English.

As a matter of fact, the first time he interviewed me, Handsome Harry said, "Mr. Decker, where did you join the Navy?" I said, "Denver, Colorado." "Oh," he said, "Then you're familiar with the Brown Palace Hotel in Denver?" "Oh yeah," I said, "Very much so." He said, "Mr. Decker, I lived in the Brown Palace Hotel for two years while attending Denver University." I thought, "You think those poopers weren't planning Pearl Harbor a long time before it came to pass?"

Anyway, one of the things that Dick O'Kane immediately told all of us was, "Guys, don't take any undue, unnecessary punishment, okay?" The other officers were Larry Savatkin and Hank Flannigan. Larry Savatkin was a lieutenant, and Hank Flannigan was a lieutenant J.G. torpedo officer. There were three of them. The rest of us were enlisted men. If you got caught stealing or lying, it was definitely cause for a beating. He said, "Don't take any undue punishment because you guys don't know anything that they don't already know. I'm the guy they're after, so don't do it." My God, Dick took some awful beatings.

Anyway, to prove that point, and I mentioned it when I talked the other day, one of the guys who interviewed me questioned me about Fairbanks Morse diesel engines. I went by what Dick had told us, and, you know, he was our skipper. We got through with our interview and the interrogator brought in a catalog, a book out that was published with the engine at the factory where it was made. God, he could have caught me in a lie just like that, so Dick gave good advice. There was an officer and a gentleman. I mean, that man graduated from this institute here in 1934 and went out to do his job, and he did it well. Like I said, he absolutely showed his colors with his men there.

I think I mentioned to you guys that he told all of us who were not of officer status in the prison camp, "If any of you guys who want to make the Navy a career, follow me when we get out of the prison camp. When we get back to the States, if you want to stay in the Navy, I guarantee you, you'll go wherever I go, and I'll guarantee you that you're going to raise a rate a year until you become an officer. Then, you're on your own." Two of the guys took him up on it. The Boatswain Mate was my friend, Bill Liabold . Bless his heart. Bill and his wife, Grace, live on Palamar Mountain outside of Escondido, California. Even today, we have a great rapport. The other guy who took O'Kane up on the offer was Floyd Caverly. He was a First Class Radar Technician. Savatkin and Flannigan were also career Navy men.

However, of the nine of us who did survive, in the sequence of events when we got back to the States, Hank Flannigan was the first man that passed away. Truckey, one of the younger lads, was the next one that passed away. This is almost unbelievable, but Skipper O'Kane passed away on a Sunday in 1994, in Santa Rosa, California, in a nursing home with Alzheimer's disease. Pete Norwanski, who was one of the torpedomen who came aboard the *Tang* on the last patrol, in Baltimore, passed away that same Sunday evening. That boils it down now to only four of us still living, out of the nine. No, excuse me. another has passed away, and he was one of the five who came up from the bottom. He just passed away a year and a half ago in Los Angeles, California. He was a young chap.

Oh, one of the prisoners there when we got there was the ace Marine pilot, Pappy Boyington. Pappy had been shot down about a year before we were captured. He was working in the galley in that first camp. How he got thrown in with the *Tang* group, I don't know, but he did. The Japanese never allowed us to be POWs, or prisoners of war. They contended that on the freighter we sank, about ninety percent of the cargo was munitions. They also contended that 95 percent of the crew was civilian. Therefore, we were at war against their civilian population and

weren't entitled to be POWs. The consequence of that was that we only got half the food rations. The second camp we were sent to had 600 prisoners. We weren't entitled to mingle, fraternize or speak to them or anything. We were kept segregated.

INTERVIEWER: Was that near Yokohama?

MR. DECKER: No. The second camp was on an island in Tokyo Bay called Omari. It had a wooden causeway leading out to it and was just on the outskirts of Tokyo. But like I said, we weren't allowed to speak or fraternize with them. That was the other consequence. We only got half the food rations that the other prisoners got. The other thing involved me, and, of course, Skipper O'Kane. They never notified the Red Cross or our government that we were captured. In my particular case, after I got out of that prison camp, my wife was remarried. Mrs. O'Kane waited for Dick. Anyway, that happened to me, and it happened to Pete Norwanski. He was another one who was married. His wife had also remarried.

We spent our time through the winter months at Ofona. A lot of people don't realize it, but Japan can get a good foot of snow on the ground and zero degree weather. The cells that we had at Ofona were solitary confinements. We were issued three blankets that were the same as our Army blankets, but there was no heat in any of the buildings. As a matter of fact, in that interrogation camp, we never minded being interrogated that much, because when an interrogating officer would come, they had a room set up for it. The Japanese weren't sitting in chairs like we were. They sat on the floor, and what would be your coffee table at home was their main table. The interrogating officer came and put a blanket over that table, and they put a hibachi underneath. From your butt down, you know, it was nice and warm. I would say, "Let's just keep talking. Ask me all the questions you want." We were down there and had warm weather. In the cells, the way we kept from freezing to death was by learning how to take those blankets and wrap them around ourselves. Most of the time that we slept in the winter, we did so

sitting up. You started at your feet and ankles and came clear up, just as though you were a mummy and got right back in the corner. You'd get in a sitting position and could keep from freezing to death.

That was a kind of a tough one. We had allies of ours in that camp. There were some Dutch, British and Royal Navy guys. Back in the days, and maybe they still use it today, but when I was in the Navy, we called the English 'limeys.' Now, they were our allies and they were in this thing with us, but that was just what we called them. Anyway, we had some limeys in that camp. It was interesting in Ofona, in that camp. We had limeys there, too. There was Boyington, our ace Marine pilot. He shot down 28. We'd just go up, pat him on the arm, wanting to touch him, you know. "God, here was a hero," we thought.

Well, let me tell you something. If you stole, what you did steal was food. Anytime you could steal some food, you did. Believe me, guys, I think the worst thing a person can die from is starvation. Anyway, Boyington got caught and had to take a beating. What the Japanese did was line us up out in the compound, Americans and limeys and all. There was a foot of snow on the ground. We were lined up out there. By the way, by that time, we did have some kind of clothing. It didn't amount to much, but we had some clothing, and they allowed us to take one blanket, wrap it around ourselves, and stand at attention while a Japanese soldier beat him. They stripped him to the waist. They'd tie your hands and put them over a hook on a pole, and this guy started beating you until the blood and everything else was running down your back. When this guy got through beating Boyington, and he was practically in Boyington's face, he cut him down. Boyington was standing at attention, and the guy was saying, "Do you understand why I just beat you?" We were all standing at attention, watching this go on. Everybody was just as sober on their faces as they could be. Boyington was standing there, at attention, and he said, "Go screw yourself, little man." I have to tell you something. From that point forward, those limeys had a

number one respect for Pappy Boyington. He didn't have to shoot down 28 planes. When he said that, nobody broke rank or changed expression on their faces, you know.

Of course, the Japanese didn't know English. There he was, standing there in the snow with blood running off his back. He was a heck of a man, a heck of a guy. They took us down to Omari about the last week of February of 1945, and in the barracks there, my cellmate was Pappy Boyington. I could tell you a lot of stories about that. Over there, we'd always call Pappy 'Pappy,' but for the most part, you called everybody by their last name. The way the Japanese work it, the names are reversed. In other words, instead of 'Mr. Weir' you'd be 'Mr. Gary' I was called 'Deckersan,' and Pappy was 'Boyingtonsan,' and so forth. Pappy always called me Deck, which was short for Decker. Do you know something else? Whether you realized it or not, and it was probably because of the Geneva Convention or whatever, all the officers got paid every month in yen. They had no place to spend it. They'd come to our cell once a month and pay Pappy. He probably had enough yen to buy half of Tokyo.

Every morning at the second camp, they would take crews of men out and send them either to the shipyards or the steel mills to work all day, and they'd be back in the late evenings or late afternoons. The only ones who would remain behind were officers. Officers didn't have to go on work details. Boyington finally convinced them to let us do something, just to get out of the barracks. Whether you're aware of it or not, he used to tell me about that Corsair flyer that he flew. "Deck," he said, "the government never built that baby right." He would moan about it. His buttocks and the back of his calves of his legs, when he was shot down, were not loaded, but he had several pieces of shrapnel in him. We got no medical attention whatsoever. But you can take a piece of green bamboo and a piece of glass and sharpen that bamboo so that it is as sharp as a razor. Well, we'd sit out in the compound in the sunlight and he would work a piece of that shrapnel out of the calf of his leg. He'd reach down and hold it. There would be puss and

everything. He gave me this really sharp piece of bamboo, had me just cut it open, dig the shrapnel out, let it bleed there, and then he'd just hold it in the sun light. How he ever kept from getting gangrene, I'll never know.

They finally wound up taking us out while our B-29s were overhead. We were close enough to Tokyo there and whether you know it or not, practically every house in Tokyo was made out of bamboo. The B-29s would come over and drop one incendiary bomb that would wipe out six blocks. Those bamboo houses would just go up like fire paper, you know.

Anyway, we were finally taken out on work detail and the B-29s would bomb out an area. They'd march us out to that area, and back in those days, all of their vehicles were charcoal burners, you know. They burned charcoal, but they'd capture the gas and run it through the carburetor and then run the engine. We went into the bombed out areas, and we'd load the dead bodies on a flat bed. I don't know if you've ever loaded a dead, burnt body, but when you grabbed the skin, it was sticky. God, it wanted to come off on your hands and so forth. We didn't have any gloves or anything, but we had to load the dead bodies and get them out of the way. Then, we'd gather the rest of the debris that was around, put it in piles, like bonfires, and burn it, and then they let us till the soil and plant a garden. It was just something to do. That was the main thing.

But Boyington had a nicotine fit that wouldn't quit. He'd get caught smoking every now and then and he'd take a beating for it. When we'd be marching to those areas, he was constantly looking down at the ground. He'd find Japanese cigarette butts, and by about the time we'd get back to camp that night, he'd have a handful in his pocket.

The next day, if we didn't go out, we were there in our cells. We had an opening about, oh, 12 to maybe 14 inches square in the cell, just right so that during the day, the sunlight would

be coming down through the opening. Do you remember the flashlights from years ago, Gary? Did they have convex lenses?

INTERVIEWER: Oh, yes.

MR. DECKER: The flashlights today only have pieces of glass for lenses. You could take that convex lens and start a fire with it. Well, Pappy would take this tobacco, and he'd roll it in yen. He'd get about five of them and have me hold the lens. You got up there like that and he'd get one going. Well, Gary, he'd have to smoke all five because the sun would change and I couldn't light another one. He'd just chain smoke all of them. God, what a character he was.

INTERVIEWER: Was the second camp that you were in the last of the camps? You stayed in Tokyo until the war ended?

MR. DECKER: Yes.

INTERVIEWER: What was liberation like? How did you get out?

MR. DECKER: Oh boy, Gary, I'm so sorry. I brought pictures and I have them in my suitcase at the hotel. I sure would like you have one, you guys. I've got a picture that was taken of me when that Russian submarine went down. God, the media came to the house, you know. They got me in limousines and took me to radio stations and everything else. But I've got a picture of me the day I was liberated. By the way, in the Navy Yard Museum in Washington, you can see it. Oh, it's a picture four feet wide and five feet high of us being liberated out of Omari and holding the flag there, the American flag. There's a guy right in the front row with his hand up like that. That's me, and that's in the Navy Yard. I've got a book. Let's see. What do they call it? Oh, it's called 'VJ day.' I've got a fifty-year anniversary book. It's a hardback and it's got that picture right on the front cover of it. That's me.

INTERVIEWER: It's a very famous picture.

MR. DECKER: My first wife and I were talking about the tattoos. There I was, naked. I had just a pair of shorts on. It was an island, you know. It was in Tokyo Bay. Bull Halsey came into Tokyo Bay with the fifth fleet, and he had the hospital ship, the USS *Benevolence*. When that picture was taken, we had already been liberated. The Japanese pulled out about a week before. They pulled out and all they left were four guards at the main gate. We had a general, a one star general from Australia. Military-wise, it was the chain of command, but everybody voted for Boyington to be the top dog when we go to take over the camp. You know his boys of Baa Baa Black Sheep. They didn't realize that he was still alive. We got up on the roof and painted 'Pappy is here.' Oh, Jesus, the Black Sheep squadron went bananas, you know. 'Bull Halsey' came in, and he came to the island with Higgins landing boats and picked us up. That's where that picture was taken.

In the interim, or while we were in the prison camp, the B-29 was developed. We didn't know anything about it. It was interesting. The Japanese used their own numerals, as far as numbers went. One of the first things they taught us to speak in Japanese was numbers one to ten. They used 'A,' 'B' and 'C.' B-29s would fly over and they'd all run into the shelter and leave us up topside.

INTERVIEWER: They rode the Higgins boats in to pick you up?

MR. DECKER: Oh, yes. Bull Halsey then, like I said, was there with the fifth fleet. On the very day that picture was taken it was on the front page of the *Bulletin* in San Francisco. My first wife was working there, and she saw that picture. She went down to the *Bulletin*'s office and asked them, "Could you possibly pull the glossy, the actual picture?" They blew it up, and there were Clayton Decker's tattoos on both arms. I have big newspaper articles all about it, too. By then, my son was pushing four years old. In the pictures, he's sitting right there by his mom, and she's

looking at that newspaper, and sure enough, there are my tattoos, right in the front of that picture. I've got that picture, and I'll see to it that before we leave, you guys get a copy of it.

INTERVIEWER: We'll get it from the Navy photo collection. That was a nice flag in that picture. Did one of the prisoners embroider that flag?

MR. DECKER: Yes. That was 'Slim' who did that. Slim has since passed away. He had the American flag. There was the Dutch flag, also. Slim Landron was a sailor off of the USS *Grenadier*. The *Grenadier* went down. They scuttled her and the whole crew was captured. There were some of those boys in that same camp. Why they mingled and did things, and the guards isolated the *Tang* guys and didn't let us become POWs, I'll never know. I've never found out.

INTERVIEWER: Maybe the *Grenadier* didn't take out 13 ships in one shot.

MR. DECKER: Yes.

INTERVIEWER: How did they ship you out, on the hospital ship?

MR. DECKER: That's interesting, too. Don't misunderstand me. I don't know that much about aircraft, but I'm told there was about a five-day interim before the Higgins boats came and picked us up. Hey, we broke into one warehouse in that camp. There were 10,000 Red Cross packages. Those jerks never issued them to us. The B-29s had come over and that was the first time we had ever seen them. If you took a B-29 and tried to fly it low and slow, Gary, they were doing it like this. They were dropping foodstuffs to us in 55-gallon drums on parachutes, trying to hit the beach. The Japanese pulled out, but they left, at the main gate, four guards. Two of them faced one way and two had their backs there. They sat there with their guns and just a lean-to shed. A 55-gallon drum of peaches came right through the roof of that shed and killed all four of them. It surely did. Our planes dropped a peach bomb down and killed them.

I was on the very first flight and among the first 21 prisoners of war of Japan to return back to the United States. I was on a C-54 with no seats. It had benches down the side, and it contained only officers. I was the only enlisted man, so I asked Pappy, "Did you get me on this flight?" He replied, "Deck, I didn't have anything to do with it." Well, I know he did have something to do with it. I was on the first flight of 21 prisoners of Japan and the pictures I have in my scrapbook at home and everything that was taken when I landed. We landed in Guam, refueled, and went through a chow line. The next stop was Hickam Field, Pearl Harbor. They took us to the hospital, issued us a complete C-bag of Marine clothes, and after one night we took another flight into the naval station in Oakland, California. They checked us into the naval hospital there.

Dick O'Kane was in bad shape, physically. I mean, I doubted that Dick would have lasted another two or three months had we not been liberated. He was in bad shape health-wise. Most of us had what they called 'dry rot.' What happened was that you took your hand and pushed it on your skin and it would stay indented for a while because the lack of citrus food, vitamins, and that sort of thing. They immediately started treating us for that. I didn't get my discharge right then. I got a ninety-day liberty leave. I went home to Colorado and went big game hunting. I then went back and got my discharge.

In the interim, I found out that my wife had remarried. Of course, the only thing to do then was to go through the divorce procedure, which we did. The only thing for which I asked, and was granted to me, was the boy. By the way, that lad, in June of this year, will be 60 years old.

INTERVIEWER: There you go.

MR. DECKER: He lives in Page, Arizona.

INTERVIEWER: When you got out of the service, what sort of occupation did you take up?

MR. DECKER: I got out of the service and had some friends, two brothers who were born and raised in my little hometown of Peonia. They were in the gasoline business in Denver with the Sculley Oil Company. They were Sculley Oil Company jobbers, and they got me a job there. I was with Sculley for about 15 years, and I was the district retail sales manager in Denver. At one time, I had 62 service stations. I had five city salesmen, of course. I told my wife, "I'm going out and showing these guys how to make money, and I'm sitting on a lousy salary. I've got to get into business of some kind." Gary, I bought a trash business. I started with one truck. I drove it. I got a second truck, a dump truck, and I hired a driver for it. When I sold it 25 years later, I had 14 trucks, and 10 routes. That was kind of my civilian life then.

INTERVIEWER: That's not bad.

MR. DECKER: I turned 80 in December, last year, and my wife, bless her heart, January of this year, she turned 84. We have 'motor homed' all of our lives since. It's not everybody's bag, but it has been ours. As a matter of fact, the motor home we have now is a little mini-Winnebago, class C, and it's number six. We had five previous ones. As a matter of fact, when we get back to Denver from this trip here, we're going to get in the motor home and go to Loflin, Nevada, to a southwest regional World War II submarine veterans gathering. We're trying to keep pumping away.

I have this oxygen thing that I'm on, Gary. A little over a year ago, the VA went into this right lung of mine, and after they came out, they said that I had a nodule in there. Everything was benign. But the first thing they asked me was, "Clay, have you ever been in a bad automobile accident?" I said, "No, I never have." They said, "the only conclusion we can come to is that your right lung is a mass of scar tissue."

INTERVIEWER: Oh.

MR. DECKER: The only conclusion we can come to is that it happened because the Japanese would beat us. They just stripped us to our waists, tied our hands, put them up over a hook, and that right lung probably took more beatings than it could handle. Of course, during my younger years, one lung was good enough, I guess, for me to get along with, but it just showed up recently. The main reason I have to be on oxygen is that my lungs aren't producing enough oxygen to get into my blood stream. If you don't have enough oxygen in your blood to get to your brain, you're finished business.

It's interesting. You remember me using the Momsen lung. One of the things that instructors would tell you was that the biggest factor in using a lung back when we were trained was that no two individuals had physical setups that were completely alike. In other words, my physical set-up and my body are absolutely different than yours. You, Gary, as an example, may be able to actually breathe free oxygen. You may be able to breathe free oxygen longer than I can, or vice versa, you know. That was the thing that used to bother us. In the 100-foot tower, when we were down 180 feet, you said, "Well, look. I can breathe free oxygen long enough to make the 100 foot ascent, but can I breathe it for too long?" They told us that if you breathed free oxygen long enough, you'd get a bubble in your blood stream, and when it hit your heart, you'd be gone.

INTERVIEWER: That's an embolism.

MR. DECKER: That was what we were told. One of the guys was commenting about that when we got ready to put the lungs on and everything. I said, "What other choice do we have with 180 feet? Let's go for it."

INTERVIEWER: Well, thank you very much for coming in.

MR. DECKER: You bet.

INTERVIEWER: Thank you.

MR. DECKER: I thank you all. Hey, you people back here made this little man's day, believe me.

INTERVIEWER: Oh, you bet. You made our days. You made our weeks. We've been glad to do that for you. Oh yes, indeed. Thank you very much, sir. We appreciate it.

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Closed-Circuit Oxygen Diving in the U.S. Navy

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The pioneers of modern closed-circuit oxygen attack swimming were the Italians. In the early days of World War Two, the Italian Navy found itself lacking the surface warfare power of other nations. In an effort to overcome this deficiency, they developed a cadre of intrepid naval commandos who attacked ships riding on torpedoes and using closed-circuit oxygen underwater breathing apparatuses (UBAs). The Italians had been evaluating these methods of underwater sabotage as early as 1918. (1) Operating against overwhelming odds, these commandos damaged 2 British battleships in Alexandria Harbor in 1941, the HMS Queen Elizabeth and HMS Valiant. (2, 3) Later, operating from an Italian tanker, the Olterra, that had been scuttled in 1940 but was later floated and moored in Algeciras harbor, Italian frogmen attacked allied shipping in Gibraltar in 1942/43 and damaged a number of ships. (1)

British frogmen had a measure of success in this area as well, sinking six Italian ships in Sicily in 1943 and the Japanese cruiser Takao in the Johore Straights. (Clark Presswood – personal communication) The biggest British success was the operation against the Tirpitz on 22 Sept 1943. (1) The Tirpitz was one of the most powerful vessels in the German fleet. It was anchored at the innermost end of the 20-mile Alten Fjord in Norway – a harbor protected by nets, mines, and listening posts. Three British mini-subs launched an attack on the harbor– two of the submersibles successfully penetrated the defenses and launched torpedoes. The Tirpitz was not sunk, but was incapacitated for 6 months. The crews of the midgets were captured.

At the start of World War Two, the United States Navy had no combat swimmer capability. Diving was performed using the deep-sea hard-hat rig in which the divers were confined to the immediate vicinity of the support vessel. Combat swimming for the purpose of clearing obstacles for an amphibious landing was not a recognized need. At this time, a medical student at the University of Pennsylvania named Chris Lambertsen was designing and building the United States' first closed-circuit oxygen SCUBA rig. Dr. Lambertsen was a first-year medical student in 1939 when he completed the initial prototype of his Lambertsen Amphibious Respiratory Unit (LARU). (4) He first dove his LARU prototype in 1940 in Lake Nokomis, near Minneapolis, Minnesota (5) to test the functioning of his new UBA. These were the first closed-circuit oxygen SCUBA dives in U.S. history. About 12 dives were accomplished, including one on which Dr. Lambertsen suffered an oxygen toxicity episode consisting of extremity and diaphragmatic twitching. Although he was tended from the surface, the line was improperly rigged and was dropped by the tender. Dr. Lambertsen managed to return to the surface under his own power. (Chris Lambertsen – personal communication) Dr. Lambertsen had a reasonably finished product by the end of 1940. He demonstrated the LARU to the U.S. Navy Experimental Diving Unit (NEDU) in October of 1940 (Chris Lambertsen – personal communication), but there was little interest in this new type of diving apparatus.

Undaunted, in November of 1942, Dr. Lambertsen demonstrated the LARU MK II to individuals who were in the process of forming a maritime unit for the Office of Strategic Services. This classified demonstration took place in the swimming pool at the Shoreham Hotel in Washington DC. The LARU was a distinct improvement over the British and Italian UBAs used at the time in that it had a one-way, recirculating gas flow design that provided much more

efficient carbon dioxide removal than the pendulum (or “counterlung”) design used by the Italian and British UBAs. The Browne UBA was also evaluated, but the LARU was judged the best UBA for use by the Maritime Unit. (5) Lambertsen’s UBA was called simply the “Lambertsen Lung” by the OSS swimmers who used it during the war, (Tom Hawkins – personal communication) with the LARU MK III being the UBA used early in OSS operations and the MK 10 replacing it shortly thereafter. On 17 May 1943, Dr. Lambertsen conducted the first closed-circuit oxygen dive training in this country in the pool of the U.S. Naval Academy. (5) The characteristics of the LARU used by these early OSS oxygen divers are shown in Table 1. (1) The LARU is shown in Figure 1. Dr. Lambertsen graduated from medical school in 1943 and was commissioned as a second lieutenant in the Army Medical Corps.

Table 1: The LARU Closed-Circuit Oxygen UBA (1)

- Closed-circuit rebreathing system
- 28 pounds
- Full Face Mask
- Oxygen cylinder - 2000 psi operating limit
- Manual oxygen bypass
- Over-the-shoulder breathing bag
- Underwater gauge for oxygen bottle
- Oxygen flow adjustable by needle valve

Also in May of 1943, the Chief of Naval Operations ordered the establishment of Naval Combat Demolition Units (NCDUs) made up of men trained as assault demolitioners to blow up obstacles placed on enemy beaches to prevent boats from coming ashore.(6) The Marine landing on Tarawa, where the landing boats were grounded on an offshore reef, resulted in a heavy loss of life and demonstrated the need for combat demolition swimmers in amphibious warfare. (6) LCDR Draper Kauffman, who was the Commanding Officer of the Navy Bomb Disposal School, was chosen to lead this new enterprise and he set up training for the NCDUs in Fort Pierce, Florida. LCDR Kauffman had originally been denied entry into the Navy because he failed the entrance eye exam. He then volunteered to serve in the war, first with the French Army ambulance service, where he won the Croix de Guerre, and then with the British bomb disposal units. Training at Fort Pierce started in June 1943. Lambertsen demonstrated the LARU to LCDR Kauffman in October 1943, but was again informed that there was no place in combat beach reconnaissance and demolition operations for this radically new device. (5)

Closed-circuit oxygen diving and combat swimming evolution in the United States continued, then, under the auspices of the OSS with Dr. Lambertsen leading the way. One of the major factors that divers using 100% oxygen UBAs must contend with is central nervous system (CNS) oxygen toxicity. The French physiologist Paul Bert had demonstrated that breathing oxygen at increased pressure could lead to convulsions and death. (7) Significant research had been done in this area by Dr. A.R. Behnke and his colleagues at NEDU as they explored the use of oxygen to accelerate decompression from long, deep dives and to treat decompression sickness. Following a series of chamber dives, Behnke and his colleagues published the first set of hyperbaric oxygen exposure guidelines in the U.S. military. (2,8) These guidelines are found

in Table 2. As we will see later on, had they been used as operational limits for OSS divers, the results might have been disastrous. Dr. Lambertsen displayed great insight in making the limits for OSS oxygen diving much more conservative than Behnke’s chamber limits. Lambertsen’s OSS oxygen exposure limits are shown in Table 3. (9) The increased conservatism in his tables at the deeper depths was not based on any personal observation that immersion and exercise increased the likelihood of oxygen toxicity, but from Lambertsen’s realization that there would be a high probability of injury or death should a convulsion occur in a free-swimming diver. (Chris Lambertsen – personal communication)

Table 2: Behnke Dry Chamber Oxygen Exposure Limits (2,8)

Sea Level	4 hours
33 FSW	3 hours
66 FSW	3 hours
99 FSW	45 min

Table 3: Lambertsen OSS Closed-Circuit Oxygen Exposure Limits (9)

Sea level	24 hours
40 FSW	2 hours
60 FSW	45 minutes
100 FSW	10 minutes

Dr. Lambertsen also realized that more definitive limits needed to be established and requested additional guidance from the Navy Experimental Diving Unit after the war. (Chris Lambertsen – personal communication) This was a prescient action, because the OSS limits are still far less conservative than modern limits. The assertions made in the History of the OSS Maritime Unit (1) would find few subscribers today:

“Diving with the Lambertsen Unit is possible to depths as great as 100 feet. No diver should remain at that depth longer than 15 minutes at one time, however.... A more workable depth is from 50 to 60 feet at which the unit functions perfectly and permits submergence for 45 minutes without danger.” (1)

Despite these permissive deeper limits, the OSS had an excellent safety record diving oxygen during World War II, with very few toxicity episodes and no fatalities. (Chris Lambertsen – personal communication) This is probably due to Dr. Lambertsen’s emphasis in training that the swimmers swim no deeper than required by the mission. Most of the diving was conducted between 20 and 25 feet. This chapter of U.S. closed-circuit oxygen diving history ended when the OSS was dissolved by President Truman on 1 October 1945. (10)

After the war, Dr. Lambertsen corresponded with CAPT O.K. O’Daniel to ask if NEDU had any guidance to provide on the subject of oxygen exposure limits for closed-circuit oxygen divers. CAPT O’Daniel responded on 30 September 1946 with the limits shown in Table 4 (11).

Table 4: 1946 NEDU Oxygen Exposure Limits (11)

Sea level	17 hours
30 FSW	2 hours
60 FSW	30 minutes

“ The 60 FSW limit has been set by both the United States and British navies.”

The pioneering work of Professor Ken Donald in the area of CNS oxygen toxicity in divers was conducted in the United Kingdom during World War II, but this work was not done until the latter part of the war and was not published after the war. (12) Donald decided that the risk of CNS oxygen toxicity mandated a maximum depth of 25 feet for closed-circuit oxygen divers. He was also the first to describe the role of water temperature, immersion, and exercise in reducing a diver’s tolerance to hyperbaric oxygen.

In 1946 and 1947, perhaps inspired by the work of Donald and the experiences of the OSS Maritime Unit, Yarborough and Behnke at NEDU undertook the first tests of oxygen tolerance using immersed, working divers done in the U.S. (3,13) They attempted 71 exposures to 2 hours at 40 feet. 19 of the 71 exposures were stopped because of toxicity episodes. The UBAs used for this study were the LARU and the Browne units and the water temperature was 90 degrees F. At 50 feet, 3 of the 5 divers developed signs or symptoms of CNS oxygen toxicity. At 30 feet, they found that there were no toxicity episodes in 35 one-hour exposures, but two divers had symptoms at 87 and 111 minutes. (3,13) As a result of these investigations, the 1947 NEDU report stated that “For underwater work the safe inhalation of pure oxygen is limited to a depth of 30 feet.” No time limit was imposed.

In an effort to preserve the diving capability developed in the OSS Maritime Unit, Dr. Lambertsen had arranged to have custody of an inventory of LARUs transferred to him so that he could introduce OSS diving techniques to other groups. During the post-war period, Dr. Lambertsen introduced his diving apparatus to U.S. Army Engineers, the U.S. Coast Guard, and U.S. Navy Underwater Demolition Team (UDT) personnel. In 1947, the UDTs, under the leadership of LCDR Doug Fane, saw the advantages of having their members trained in the use of SCUBA gear for combat operations. This decision may have been hastened by receipt of the now-famous letter that Fane received addressed to “Underground Demolition Unit Two.” LCDR Fane proposed this training in 1947, but was informed by NEDU and the Navy Dive School that using this type of diving gear was too dangerous. (6) Undaunted, LCDR Fane invited Dr. Lambertsen to come to the Naval Amphibious Base in Little Creek, Virginia, in January 1948 to demonstrate the LARU to the UDT operators and conduct the first-ever training for Navy divers in SCUBA. (“self-contained underwater breathing apparatus” - a term coined by Dr. Lambertsen) (4,6,14)

Following this successful training, it was time to demonstrate for the Navy how closed-circuit oxygen diving might be employed in an operational setting. Since one of the most secure ways to insert combat swimmers was with a submarine, it was determined that this would be the next step. On 22 February 1948, Fane and Lambertsen accomplished the first free-

swimming, closed-circuit oxygen SCUBA lock-out and re-entry from an underway submarine (the USS Grouper) operating off the island of Saint Thomas, U.S. Virgin Islands. The sub was operating at periscope depth, so the lockout depth would have been approximately 30 feet. Although this would have been within the guidelines of the 1947 NEDU oxygen exposure limits, this was not a conscious factor in planning the dive, which lasted approximately 30 minutes. (Chris Lambertsen – personal communication)

After the success of the Grouper closed-circuit oxygen SCUBA operations, Fane returned to the UDT base in Little Creek and established a “Submersible Operations” or SUBOPS platoon with men drawn from UDT 2 and 4. (4) The activities of this group were extremely classified, even within their own organization. LTJG Bruce Dunning was the officer-in-charge of the SUBOPS platoon, which was the first unit with a SCUBA diving capability in the U.S. Navy.

Fane and Lambertsen next determined to do a study to better define the limits of safe oxygen exposures in free-swimming divers. They arranged a study at the Naval Submarine Medical Research Laboratory escape training tower later that year. This study was conducted by Schaefer and Willmon and was the first time that fin-swimming, LARU oxygen divers were observed in a study under controlled conditions. The divers swam a circular path in the tower at a speed of 0.9 knots in 90-degree water temperature. They did fifty dives with a maximum exposure time of 90 minutes at various depths and had 14 toxicity episodes. (4,6,15) This study also developed the Oxygen Tolerance Test, a 60 FSW for 30 minutes resting exposure in a dry chamber that was designed to test an individual’s tolerance for hyperbaric oxygen. No specific new Navy-approved oxygen exposure limits were established after the trials, however, leaving the 1947 NEDU limit of 30 FSW for an unlimited time as the most authoritative Navy oxygen diving limit at this time.

In October of 1948, Lambertsen and Fane conducted the second operational demonstration of closed-circuit oxygen diving capabilities. This time they were operating from the USS Quillback. The UDT divers were first all trained to operate on the deck of the underway submarine and to assist with rendezvous and recovery procedures. About 8 divers were trained. The dives were approximately 30 minutes in duration at a lockout depth of 30 FSW. Finally, the underway recovery of the British submersible canoe “Sleeping Beauty” aboard the Quillback was performed. Lambertsen positioned himself in the Sleeping Beauty ahead of the submarine on its course. He had a short bow line rigged from the bow to the cockpit of the Sleeping Beauty. After intercepting the submarine, which was towing a buoy, he threaded the Sleeping Beauty’s bow line through a metal loop on the towed buoy and then drove the craft down the line with the submersible’s power to the deck of the submarine. Losing only a stern plane to the sail of the sub, he maneuvered the Sleeping Beauty onto a cradle with the aid of the deck crew. The deck crew was out 30-40 minutes during the operation, again at a depth of approximately 30 FSW. (Chris Lambertsen – personal communication) These operations and the follow-on training demonstrated the feasibility of launching and recovering a free-flooding combatant submersible aboard an underway submarine and paved the way for modern-day SEAL Delivery Vehicle (SDV) and Dry Deck Shelter (DDS) operations. Figure 2 shows UDT members with their

LARUs.

After the successful Quillback combat swimmer operations and training, Fane briefed VADM Jerraud Wright at Amphibious Forces, Atlantic Fleet. He was stunned to receive official correspondence directing UDT to confine itself to conventional hydrographic reconnaissance and beach clearance. (4) Interpreting these orders somewhat creatively, Fane and Dunning continued to develop a submersible operations capability in the SUBOPS platoon. Perhaps appropriately, this training was headquartered in a building that had served recently as the base brig. The four UDTs on the East and West Coast used the LARU for submersible operations and training from 1948 into the early fifties. (Chris Lambertsen – personal communication)

The next event in the evolution of SCUBA diving operations in the U.S. Navy was the introduction of a new invention from France. Jacques Cousteau and Emile Gagnan had invented a new diving apparatus that they called the aqualung in 1943. The aqualung was different from the closed-circuit oxygen SCUBA used previously. The gas cylinders contained not oxygen, but compressed air. This apparatus was an open-circuit UBA, which meant that the diver's exhaled gas did not re-enter the UBA so that carbon dioxide could be removed and the unused oxygen rebreathed, but rather escaped to sea. The key bit of technology needed to make this breakthrough was Gagnan's redesign of a car regulator such that it could sense the ambient pressure the diver was exposed to and provide him with inhaled gas at a pressure that was slightly higher than ambient. Cousteau and others in the French Navy had made many dives with this new apparatus in the years that followed. Fane met with Gagnan and arranged for him to come to Little Creek in the spring of 1949 to teach the UDTs how to dive with the aqualung. (4) The aqualung had some advantages over closed-circuit oxygen UBAs: it was less complex, easier to set up, had a greater depth range, and reduced the possibility of diving accidents. These advantages led many UDT divers to have a strong preference for the new UBA in spite of the tactical advantages of the LARU. In one of the least distinguished chapters of UDT diving history, many of the remaining OSS World War II LARUs were consigned to a bonfire at a team beach party in 1953. (4,5,16)

The early fifties saw the UDT thus introduce open-circuit SCUBA into use in the U.S. Navy. Fane allegedly made the first dive by an American using the new UBA, diving to 100 feet on his first dive. (6) The aqualung was subsequently used by Fane to demolish a wreck in the Chesapeake Bay that was posing a hazard to navigation in December 1949. It was used by UDT in 1950 in Sleeping Beauty and other submersible trials. In 1952, a research program headed by Dr. Lambertsen conducted open-water trials in the waters off of Coronado, California with the aqualung and the LARU to study physiological limiting factors in underwater swimming. (4) This series of research dives was also notable in that it was the first use of the newly developed wet suits by the U.S. Navy.

Another factor that contributed to the unfortunate but temporary demise of closed-circuit oxygen diving in UDT was the July 1952 publication of the first closed-circuit oxygen diving limits in the U.S. Navy Diving Manual, which stated:

“When diving with a mask, oxygen should not be used at depths greater than 30 feet. The time of dive should not exceed 30 minutes.” (17) The 30-minute time limit was very restrictive and effectively put attack swimmers out of business, since most combat operations would entail much longer swims than this. This extremely restrictive limit was short-lived, however. Further research done at NEDU by Lanphier and his colleagues resulted in this overly conservative limit being changed. (3,18) Lanphier did 51 dives using 19 immersed, working divers at a variety of depths. The divers were breathing oxygen (averaging 99.5% purity) from an open-circuit source and the water temperature was 80 degrees F. The limits recommended by Lanphier in Table 8-2 of NEDU 11-54 report are shown in Table 5. (18)

Table 5: Third NEDU Closed-Circuit Oxygen Limits - Lanphier 1954 (18)

10 ft for 120 minutes
15 ft for 90 minutes
20 ft for 65 minutes
25 ft for 45 minutes
30 ft for 30 minutes
35 ft for 20 minutes
40 ft for 15 minutes

After several years, the UDTs began to reconsider their infatuation with open-circuit SCUBA. Closed-circuit SCUBA offered the advantages of being much smaller and lighter than open-circuit UBAs that would last for equivalent dive depths and times. Another important advantage was that there is no stream of tell-tale bubbles cascading to the surface as the diver approached a hostile ship or pier, a decided tactical plus. Since the LARUs were no longer serviceable, the UDTs acquired the World War II-vintage Italian Pirelli UBA in the years after the Korean War. (Norm Olson – personal communication) The foremost individual credited with bringing closed-circuit tactical diving back to the teams was LCDR Frank Kaine during the time that he was Commanding Officer of UDT 21 in Little Creek, Virginia but the West Coast UDTs also acquired and used the Pirellis. (Layton Bassett – personal communication)

As shown in Figure 3, the Pirelli was a pendulum-type rebreather, in which a single hose was used both to inhale from and exhale to the CO₂ scrubber and the breathing bag. The characteristics of the Pirelli are listed in Table 6. (19)

Table 6: Description of the Italian Pirelli (19)

LS-901
Pendulum system
Two 1.6 liter bottles of oxygen
Each oxygen bottle charged to 3000 psi
Constant flow regulator adjustable from 0.5 to 2 L/M flow
Lasted for up to 4 hours under normal working conditions
CO₂ absorbent canister inside the breathing bag

Pendulum type rebreathers have an inherent design flaw. The gas flows to and from the

scrubber and the breathing bag via the same hose, creating a “dead space” in the loop that contributes to CO₂ buildup. While this may not be a problem to divers who are breathing from it while riding on submersibles, it quickly becomes a problem for free-swimming divers. The Pirelli was given the nickname “The Black Death” because of the numerous CO₂ and oxygen toxicity episodes suffered by team members while diving with this rig. (Layton Bassett – personal communication) After a near-fatal accident with the Pirelli in 1956, UDT operator Harold Nething recalled:

“...after some investigation, it was discovered that in the breathing bag where the scrubber canister attached to the breathing hose, there’s a fitting that’s sweat soldered on...it had parted and failed. Later, after testing all the Pirellis, about 85% failed.” (Harold Nething – Internet site)

These problems were reported to the Bureau of Ships. (20) Further investigation by NEDU resulted in a recommendation that no more Pirellis be procured. (21) Use of the Pirelli decreased in 1956 and 1957 and this UBA was soon replaced by the initial German Draeger. A picture of the German Draeger UBA is shown in Figure 4 and its characteristics are shown in Table 7. (19)

Table 7: Description of Draeger LT Lund II (19)

Draegerwerk, Lubeck, Germany
Two oxygen cylinders – 0.8 liters each
Charged to 2800 psi
Total gas supply of 320 liters (11.2 cu ft)
Constant flow regulator set to provide 0.9 L/min O₂
Also had manual oxygen bypass
CO₂ absorbent canister was inside breathing bag
Operating limit 90 minutes

The Draeger LT Lund II UBA had an excellent reputation in the UDTs (Norm Olsen and Layton Bassett – personal communications). Weber stated that “Most of our divers prefer the Draeger to other rebreathers due to simplicity of design and reliability of operation.” (19) The Draeger was used only for several years (approximately 1957-1958) due to lack of replacement parts and subsequent maintenance problems. Subsequently, Scott Aviation reverse engineered and built a U.S. version of the Draeger. While externally, it looked the same, it did not achieve the quality of the German version and was shelved shortly thereafter. (Norm Olson – personal communication)

In the early 1950s, Dr. Lambertsen worked with the J.H. Emerson Company to develop the LARU MK 20 UBA. They introduced this updated UBA first to the Army. (Chris Lambertsen – personal communication) The LARU MK 20 was eventually modified and introduced into the Navy as the Emerson-Lambertsen UBA in about 1963. (19) One major difference between this UBA, which came to be called simply the Emerson in the teams, and the LARU series was that the Emerson was typically used with a T-bit mouthpiece and a partial

facemask that was isolated from the breathing loop. The LARU had been used with a full facemask by the OSS swimmers and the initial Army and Navy trainees. There are two primary advantages to using a full facemask with closed-circuit SCUBA: the airway is better protected in the event that the diver should become unconscious from oxygen toxicity or other diving disorder and the diver is better able to use underwater communication devices for operational or emergency communications. The Emerson-Lambertsen was also a recirculating system as opposed to the flawed pendulum design of the Pirelli, and had over-the-shoulder breathing bags, which have the advantage of being comfortable to breathe in both prone and sitting positions. One aspect of the rig that was not ideal was the 3-setting metered oxygen supply valve design. If the diver's oxygen consumption changed underwater, he might find himself with insufficient oxygen to breathe and would have to use the manual bypass valve. Conversely, if his oxygen consumption was lower than the add rate, his bags would overfill with oxygen and he would experience an undesired increase in buoyancy. (Don Crawford – personal communication) A description of the Emerson-Lambertsen UBA is provided in Table 8 (19) and a picture of this UBA is shown in Figure 5.

Table 8: The Emerson-Lambertsen Closed-Circuit Oxygen UBA (19)

Metered oxygen flow valve – 0.5, 0.9, 2.0, or 3.0 L/M

Cylinder charged to 2000 psi

Capacity 360 L (12.7 cu ft)

Normal duration of the apparatus is 120 minutes

The Emerson-Lambertsen served the teams well for almost 20 years, from 1963 until approximately 1981. By that time, replacement parts for the UBA had become very hard to obtain. Rigs were cannibalized for spare parts, maintenance was difficult, and increasing numbers of the rigs began to malfunction. By 1980, the problem had become severe and the Emerson was declared no longer usable by Naval Special Warfare. (Don Crawford – personal communication)

The demise of the Emerson meant that the UDT and now the SEA/Air/Land (SEAL) teams were in need of a new closed-circuit oxygen UBA. NEDU evaluated both the German Draeger LAR III (“LAR” is an acronym for “Lung Automatic Regenerator”) (22) and the LAR V (23) closed-circuit rebreathers as potential replacements for the Emerson-Lambertsen. The rig selected after NEDU testing was a modified version of the LAR V. This UBA was introduced into the Naval Special Warfare community in 1981, with the first 10 units going to SEAL Team Six, and others following quickly to the other teams. (Don Crawford and Rick Woolard – personal communications) The LAR V has several advantages over the previously used Emerson-Lambertsen. At 25 pounds, it is significantly lighter. It is also smaller, simpler in design, and has (as did the LARU MK 20) a well-designed oxygen add system in which a second stage demand regulator opens any time that the diver empties all the air from his breathing bag. A description of the Draeger LAR V is provided in Table 9 (24) and a picture of this UBA is shown in Figure 6. This UBA is still the primary UBA used by Naval Special Warfare in 2002. Renamed the MK 25, it has been recently modified to include a larger oxygen bottle and a larger, better insulated CO₂ absorbent canister (MK 25 MOD 2). (24)

Table 9: The Draeger LAR V/MK 25 MOD 2 UBA (24)

Length:	18 inches
Width:	13 inches
Height:	7 inches
Weight:	27 pounds
Buoyancy:	Neutral
O2 Cylinder:	1.9 L O2 at 3000 psig
Chest-mounted	
Fiberglass housing	
Bypass add rate:	60 liters/min
Oxygen addition by demand	
No constant addition of oxygen	

Although the Teams got their new UBA from the Germans, they took many of their combat swimming tactics from the French via SEAL Team TWO. Combat swimming had become an area of decreased emphasis during the Vietnam war, where the SEALs and UDT became jungle warriors. Many SEALs, including then-CDR Bob Gormly at SEAL Team Two, recognized the need to re-establish the SEAL's expertise in the water. LT Ryan McCombie, recently returned from Vietnam, was sent to France for an exchange tour with the French Commando Hubert in St Mandrier. There he was exposed to a totally different diving culture. During this period, the Commando Hubert were arguably the best combat swimmers in the world. Their training typically entailed 5-7 dives per week. The dives were complex, multi-dogleg and long duration.

During the 6 month French basic training, Lt McCombie with Lt Jean Francois Tardiveau as a swim buddy, completed a 7000 meter, 4hour 10 minute closed-circuit oxygen dive. This particular dive was remarkable, even for the Commando Hubert, and demonstrated what could be accomplished with the proper training and equipment. Now-LCDR McCombie returned from France with a clear vision of how Naval Special Warfare could enhance its combat swimming skills.

He was to have an opportunity to act on this vision. Several years later, CDR Rick Woolard assumed command of SEAL TeamTwo2 and LCDR McCombie was his Executive Officer. CDR Woolard had been embarrassed by a poor showing of SEAL attack swimming abilities during a "Flintlock" combat exercise with German and Dutch counterparts in 1981. He also had great respect for French oxygen diving capabilities. While Executive Officer of SEAL Team TWO, McCombie had arranged for a Hubert officer to be assigned there. LT Francois d'Avout reported to SEAL Team TWO shortly after Woolard assumed command in 1982, and Woolard immediately directed McCombie and d'Avout to develop and conduct a course in attack swimming to correct the SEAL operational deficiency. The resulting eight-week Combat Swimmer Course stressed accurate underwater navigation, precise buoyancy control, long-distance underwater and surface swimming ("turtlebacking"), and full-mission profiles that realistically integrated the attack swim into stealthy air/land/water target approach and withdrawal scenarios. The instructors and students were carefully selected, and all graduates had

to show they could approach, attack, and withdraw from targets miles from their dive point without surfacing despite multiple underwater course changes. In 1983, Woolard's efforts were rewarded when his SEALs successfully completed a long and very arduous attack swim during a major exercise in Germany...and their German counterparts did not. From then on, Combat Swimmer Course graduates routinely outperformed their European counterparts, and by the late 1980s they were teaching attack swimming to the Germans and others. The course was eventually accepted by the Naval Special Warfare community as a major improvement in SEAL capabilities, and its primary lessons are still part of both the Basic Underwater Demolition/SEAL and SEAL Qualification Training courses that every SEAL must complete." (Ryan McCombie and Rick Woolard – personal communications) Figure 7 shows SEAL team members on a combat swim using the Draeger LAR V.

The Navy oxygen exposure limits had also evolved over time. New limits appeared in the 1959 Diving Manual that were modified somewhat from those proposed by Lanphier. The 1959 limits are shown in Table 10. (25) No experimental basis was identified for these changes to Lanphier's 1954 recommendations.

Table 10. 1959 U.S. Navy Diving Manual Oxygen Exposure Limits (25)

10 ft for 240 minutes
15 ft for 150 minutes
20 ft for 110 minutes
25 ft for 75 minutes
30 ft for 45 minutes
35 ft for 25 minutes
40 ft for 10 minutes

By 1981, the USN oxygen exposure limits had been modified further as shown in Table 11. Note that the 240-minute limit for dives 10 feet and shallower as well as the 150 minute limit for dives 15 feet and shallower had both been dropped. Again, the reasons for these changes from previous limits were not documented in the Diving Manual. (26)

Table 11. 1981 U.S. Navy Diving Manual Oxygen Exposure Limits (26)

20 ft for 110 minutes
25 ft for 75 minutes
30 ft for 45 minutes
35 ft for 25 minutes
40 ft for 10 minutes

For the SEALs to utilize their new Draeger Vs and newfound combat swimming skills, the advance in oxygen diving required next was the establishment of less restrictive closed-circuit oxygen exposure limits. Increasing contact with combat swimmers in allied countries found that their oxygen exposure limits were less restrictive in those in the U.S. Navy. In 1981, Naval Special Warfare requested that NEDU re-evaluate the oxygen exposure limits to see if longer exposures might be safely

accomplished. NSW also requested that NEDU evaluate the feasibility of making a brief downward excursion after a lengthy exposure at a shallow “transit” depth. This request resulted in 3 major dive series conducted by Butler and Thalmann at NEDU between 1982 and 1984. (27,28,29) Divers were immersed, exercising, and subjected to moderate cold stress in an attempt to create reasonable “worst-case” conditions for operational combat swimmers. Experimental divers used the same Draeger LAR V UBAs then in use by the SEAL teams. The UBA was purged to achieve a minimum oxygen fraction of 95% before the exposure was started and CO2 levels were constantly monitored to ensure that there was no CO2 build-up, which would make the divers more susceptible to oxygen toxicity.

The trials began by re-evaluating the 40-foot exposure limit. A 20-minute exposure at this depth produced 2 convulsions in 17 dives while a 15-minute exposure produced no convulsions or definite symptoms of CNS oxygen toxicity in 41 exposures. (27) A 15-minute excursion was then attempted following a two-hour “transit” period at 25 feet. This profile produced 2 definite hits on the previously safe 40-foot excursion and one convulsion at 25 feet. After consultation with operational SEAL units, the transit depth was reduced to 20 feet and the testing resumed. (28)

The second set of dive trials finished re-evaluating the single-depth oxygen exposure limits. The new single-depth oxygen exposure limits proposed after this series (28) and displayed in Table 12 were approved for use in Naval Special Warfare in 1983 and are still in effect in 2002. (30)

Table 12: Current USN Single-Depth Oxygen Exposure Limits (30)

25 FSW or shallower	240 minutes
30 FSW	80 minutes
35 FSW	25 minutes
40 FSW	15 minutes
50 FSW	10 minutes

The second set of dive trials also found that a 20-foot oxygen exposure for periods of up to 4 hours did not adversely affect the diver’s ability to make a brief downward excursion. (28) The current U.S. Navy Transit with Excursion limits are shown in Table 13; they were also approved for use in 1983 and are still in use in 2002. (30)

Table 13: Current USN Transit with Excursion Limits (30)

- Transit portion of dive 20 FSW or shallower
- Single excursion allowed
 - 21-40 FSW 15 minutes
 - 41-50 FSW 5 minutes
- Total dive time 240 minutes or less

A third NEDU oxygen dive series was conducted in November and December 1985 and was designed to evaluate the feasibility of making multiple downward excursions from 20 feet on a 4-hour dive. (29) This series encountered an increased incidence of toxicity episodes in attempting multiple excursions on a single dive and no modification to the single-excursion rule was proposed. (29) A total of 686 dives were accomplished during the three series with 67 episodes of in-water CNS oxygen toxicity, including 8 convulsions.

On the protocols above, a single toxicity episode was seen on the 25 and 30-foot depths within an exposure time that was completed by many other divers without incident. Both divers suffered multiple toxicity episodes during the dive series and were considered to be more sensitive to the effects of hyperbaric oxygen than their fellow experimental divers. Since both divers had passed the oxygen tolerance test (OTT) as part of their screening for diver training, the sensitivity of this test in identifying individuals who are unusually susceptible to oxygen and its usefulness as a screening tool was questioned. This issue was addressed by Butler and Knafelc following the NEDU oxygen dive trials. (31) They identified three divers that had had multiple episodes of oxygen toxicity on profiles other divers had performed without difficulty. They then performed multiple OTTs on these individuals to see if the test was sensitive enough to identify any of the divers as sensitive on multiple exposures. None of the divers had symptoms on any of the OTTs, leading the investigators to conclude that the failure of the OTT to elicit symptoms of CNS oxygen toxicity in these divers was reproducible. The next question addressed was how many individuals fail the OTT (have signs or symptoms of CNS toxicity within the 30 minutes at 60 feet). A review of the records from the Naval Safety Center revealed a 1.9% failure rate among diving candidates undergoing the OTT. Since the individuals identified as sensitive to oxygen during the NEDU dive trials had repeatedly passed the OTT, the 1.9% of individuals who failed the OTT on the first trial were considered to be perhaps even more sensitive to oxygen. The authors therefore recommended that the OTT be retained for any divers who would be using closed-circuit oxygen because of the high probability of a fatality resulting from a convulsion that occurred while engaged in untethered diving. (31)

The issue of approving oxygen exposure limits that had been shown to produce CNS oxygen toxicity was a contentious one, especially in light of the single convulsion that occurred at 25 feet after only 72 minutes, when many other divers were able to tolerate 4 hours at this depth without incident. Professor Donald commented some years later:

“The present author would strongly oppose the acceptance of the possibility of acute oxygen poisoning in the oxygen exposure time limits recommended for routine diving operations. Such an acceptance could impair the traditional and essential trust between divers and those responsible for their safety.” (3)

The safety of the new limits was greatly enhanced by a SEAL corpsman who inquired in 1983 about the rationale for the purge procedure used at the time. (Master Chief Johnny Johnson – personal communication) The Draeger LAR V purge procedure in use in 1983 was to manually fill the breathing bag with oxygen and then empty it by inhaling through the mouth and exhaling

through the nose three times on the surface before the dive. The UBA was also purged every 30 minutes during the dive to protect against dilutional hypoxia occurring as the tissues of the body off-gassed nitrogen. A review of NEDU reports and the Navy Diving Manual revealed no explanation of why that particular volume of purging had been chosen nor any measurement of the oxygen fraction produced in the UBA by the procedure. (32) The procedure used by Lambertsen in the OSS and in the initial training of Navy UDT and Army cadres prior to diving the LARU was as follows: "...sucking the bag completely flat and closing the mask shut-off valve. O₂ could be added to the bag or not. Then, when ready to dive (could be an hour or more later), a full exhalation of air from lungs, and switch to O₂ rebreathing. No O₂ flushing of the unit was done. Any later gas venting supplemented this by accident and not intent." (Chris Lambertsen – personal communication) This procedure was used throughout World War II and apparently served well. The origins of the three-cycle fill and empty and the every-30 minute during the dive procedure that came into Navy use later remain obscure.

In rethinking the purge procedure at NEDU following Master Chief Johnson's question, Butler and Thalmann determined that the purge should seek to achieve a level of oxygen in the UBA only high enough to prevent hypoxia. This level was determined to be 45% for a purge being done on the surface (32) and 55% for a purge being done at depth. (33) A single fill/empty cycle of purging prior to the dive was found to be sufficient to ensure this level of oxygen in the UBA and to produce a mean value of 71% FIO₂ (fraction of inspired oxygen) on the surface. Purging nitrogen out of the rig beyond this level serves only to increase the risk of CNS oxygen toxicity and consume gas from the UBA cylinder, thereby shortening the gas supply available for the mission. The mean oxygen percentage in the UBA was found to increase to a mean of 82% as the diver descends to a depth of 20 FSW to begin his swim. Additional purging conducted during the dive was found to be unnecessary for hypoxia prevention, to consume additional gas, and to potentially compromise the diver's position if his bubbles are observed by hostile forces on the surface.(32)

This seemingly modest decrease in FIO₂ may be of great importance to the safety of the diver. Using a probabilistic model, Harabin and her colleagues at NMRI showed that the risk of developing CNS oxygen toxicity from breathing "nearly pure" oxygen at 30 feet for 80 minutes is about 4 %. If the recommended new purge procedure is followed, however, resulting in a lower FIO₂ of 0.74, the probability of toxicity after 80 minutes is less than 0.1% (34) How safe have the 1983 oxygen exposure limits proven in practice? Walters et al addressed this issue in their 2000 paper. (35) A review of the records from the Naval Safety Center found 157,930 LAR V dives with only one reported episode of oxygen toxicity.

Many SEAL operations, including ones that entail closed-circuit oxygen diving, are carried out in secret and never become public knowledge. One exception to this rule is the ship attack that was carried out during Operation Just Cause in Panama in 1989. (16)

CDR Norm Carley, Commanding Officer of SEAL Team Two, was directed to attack three Panama Defense Force (PDF) gunboats prior to the larger assault. The planners for Just Cause wanted to avoid major damage to the vessels so that they could be used by the new

Panamanian government, but CDR Carley convinced them that this would entail unacceptable risks to the SEAL operators involved. The operation was complicated by several additional factors. The patrol boats were made of aluminum, so limpet mines would not stick to the hulls. The attack was instead carried out with haversacks of C-4 plastic explosives.

Cutting across the Panama Canal, the two SEAL combat rubber raiding crafts (CRRCs) ran into unanticipated boat traffic north of Balboa Harbor, including some boats with spotlights. The CRRCs, running at low speeds so not to leave a wake, avoided detection. Arriving at the far shore early, the CRRCs hid in a mangrove tree line north of Balboa Harbor while waiting to insert the SEALs. Two boats left Balboa Harbor, but the Presidente Porres remained at the pier. After 15 minutes, CRRC #1 started its motor and began creeping out of the mangrove. CRRC #2's outboard motor had quit, and it was thus unable to follow. Carley, aboard CRRC #1, decided to proceed to the insertion point alone. The CRRC advanced out of the mangrove, headed a few hundred yards in a southeasterly direction, and quietly approached a position 150 yards north of Balboa Harbor's Pier 18. With a backdrop of the darkened mangrove, the CRRC approached without being detected. A pair of SEALs, LT Edward Coughlin and EN3 Timothy Eppley, slipped over the CRRC's side at 2330, went underwater, and started toward their target. CRRC #1 withdrew, returned to the hideout, slipped a tow line to its disabled sister, and headed out of the mangrove. Together they proceeded to the insertion point off pier 18, where the second swimmer pair, ET1 Randy Beausoleil and PH2 Christopher Dye, quietly left CRRC #2. Swimming underwater, the second pair was five minutes behind the other two swimmers. To destroy the target, each swimmer pair was equipped with a 20-pound Mark 138 Haversack explosive package with a MCS-1 clock, a Mark 39 Safety and Arming Device, and a Mark 96 detonator.

After the SEALs were inserted, Carley ordered that CRRC #2 be towed back to NS-Rodman so that its outboard motor could be changed. Although the CRRC had a spare outboard motor on board, Carley felt that it was too risky to attempt an engine change out on the water, given the CRRCs' proximity to the target and the level of activity around Balboa Harbor. Besides, the starting process of the outboard motor was loud and sure to alert the PDF. Avoiding a compromise of the SEALs swimming to the target was uppermost in Carley's mind. On the return to NS-Rodman, the CRRCs evaded two more craft going across Balboa Harbor. The remainder of the assault force arrived at NS-Rodman and began changing CRRC #2's outboard motor. Carley observed the target area for indications that the PDF might be alerted. Balboa Harbor appeared quiet. The pairs of SEALs, swimming underwater on a compass bearing, approached pier 18. It became apparent to the swimmers the marine effect of bioluminescence was playing havoc with their ability to read watches, depth gauges, and compasses. Underwater navigation was difficult. Surfacing under the pier, the swimmer pairs used it as overhead cover as they alternated between surface and underwater swimming to reach the inner part of Balboa Harbor. As the SEALs reached toward the shore end of the pier, they saw the PDF patrol boat was moored by its stern to a nearby floating dock adjacent to a quay wall and its bow pointed out into Balboa Harbor. The SEALs dove and approached the target underwater. Swim pair #2, ET1 Beausoleil and PH2 Dye, swam underneath the target at 0011, 20 December. It took them two minutes to attach the haversack of explosives to the port propeller shaft just forward of where the

"V" strut held the shaft. They then began swimming south to pier 17. The other pair of SEALs, LT Coughlin and EN3 Eppley, arrived on target a minute later and attached a haversack to the starboard propeller shaft near the "V" strut. These SEALs finished the arming sequence of the demolition charges--the detonator cord leads between the two charges were tied to ensure dual priming--and set the charges to explode at 0100. The SEALs had 45 minutes to exfiltrate a safe distance from the target.

Just as Coughlin and Eppley swam away, the patrol boat's engines started. The propellers were not engaged and the boat remained stationary. Tonight, unlike previous nights, some PDF crew were aboard the patrol boat. The second pair of SEALs also swam underwater to pier 17. Following the contour of the pier for concealment, the SEALs swam away from the target. With the advancing of H-Hour, battles had started in Panama City with the attack on the Comandancia. Shortly afterwards, the SEALs were subjected to two intense underwater explosions. The SEALs, afraid they were compromised and under an anti-swimmer grenade attack from PDF soldiers patrolling pier 17, surfaced and hid behind pilings to escape injury. Continuing to move under the pier, the SEALs alternated between surface and underwater swimming to conserve oxygen in their Draeger systems. A couple of hundred yards further, four more underwater explosions forced the SEALs to surface again and take refuge behind the pilings. Although firing was heard overhead and tracers were seen arcing toward the Panama Canal, it did not appear to be directed at the SEALs.

Both pairs of SEALs were behind pilings under pier 17 when at precisely 0100 the charges underneath the Presidente Porres detonated. "The boat reared up forward . . . it went straight up--the bow went up," recalled LT Michael Argo, who observed the explosion through high powered binoculars from Naval Station Rodman. The explosion blew a hole ten feet wide through the hull and deck, destroying the stern of the boat. The engine room was a complete loss. The boat flooded and sank within two minutes. The floating dock next to the patrol boat, its steel floats punctured, swamped with water the next day.

Shortly after the explosion, most boats in Balboa Harbor started their engines and turned their propellers as an anti-swimmer attack measure. The SEALs were behind schedule to make the extraction point and rendezvous with the CRRCs to be taken back to NS-Rodman. The extraction point was located at the south end of pier six, a structure 500 yards south of Balboa Harbor, and a distance that the swimmer pairs could not arrive at by the previously planned time of a few minutes after H-Hour. Prior to H-Hour, the swimmers had tried to establish communications with TU-WHISKEY to say they were behind schedule. But the radios were malfunctioning. After the explosion, the SEALs pairs started moving again, heading to the end of pier 17, on a course toward the extraction point. Swimming a course to reach pier 6 took the SEALs near the main shipping channel of the Panama Channel. As the SEALs swam into the Panama Canal, a strong current of six knots running in the direction of the Pacific Ocean nearly swept them off course. Just then a deep-draft ship was making its way through the Panama Canal shipping channel. As Coughlin recalled, "You can't tell under the water exactly where a vessel is; you just hear it getting louder, and louder--it sounds like a freight train coming." With the ship approaching, the SEALs descended to 45 feet to avoid being drawn into the propellers.

The increased toxicity of the pure oxygen in the Draeger system in deeper water was risky. Alternatives, however, were lacking. The SEALs remained at this depth for 10 to 15 minutes until the ship passed overhead. They then ascended to 20 feet, the normal depth for the Draeger system, executed a turn, and swam on a bearing for pier 6. Reaching the pier separately, the swimmer pairs surfaced, used the pier as overhead cover to swim on the surface, and reached the extraction point at its southern end.

Meanwhile, as the swimmer pairs were making their way under pier 17, the CRRC crews replaced CRRC #2's outboard motor. The engine change took just a few minutes. At 0045, both CRRCs departed NS-Rodman and arrived at the extraction point ten minutes later. They hid under the pier, eight to nine feet above their heads, as firefights erupted in the vicinity between PDF and American forces. A few minutes later the harbor shook from the explosion under the patrol boat. The CRRCs waited but the swimmers did not appear at the designated extraction time. CDR Carley sent CRRC #2 to the next pier over to search for the SEALs in case they had missed the extraction point. CRRC #2 returned reporting no sign of the SEALs. The CRRCs continued their vigil at the extraction point. An hour passed before the first SEAL pair, Coughlin and Eppley, arrived at 0200. The other pair, Beausoleil and Dye, made it to the extraction point five minutes later. The SEALs were recovered and the CRRCs headed back to NS-Rodman. As the assault force cleared the far shore and went across the Panama Canal to NS-Rodman, infrared strobes onboard the CRRCs were turned on to help U.S. forces recognize the CRRCs as a friendly unit. A message was transmitted to TF White stating that the SEALs had been recovered and Task Unit-WHISKEY had executed its mission without casualties. (Norm Carley – personal communication)

Butler and Knafelc suggested in their 1986 paper (31) that the incidence of OTT failures was suspicious based on a smaller than expected number of OTTs reported. Walters et al reviewed records from the primary chambers administering the OTT to Navy SEAL candidates and found that the incidence of failure of the OTT was only 0.096%, much lower than previously reported. (35) The conclusions and recommendations from this paper were:

- 1) The failure rate for the OTT as it is currently administered in Naval Special Warfare is 0.096%. This number is approximately 5% of the previously reported incidence of 1.9%, which was based on data from the Naval Safety Center.
- 2) The logistic burden of administering the OTT had caused testing to be currently conducted after the SEAL students have completed the most rigorous 9 weeks of SEAL training. Disqualification of a SEAL candidate at that point in training should be based on clear and compelling evidence that he is unfit to continue training. The OTT does not meet that standard.
- 3) Even if a more severe OTT were to be developed, intra-individual variability prevents any single screening test from being a reliable indicator of increased oxygen sensitivity.
- 4) Factors other than individual oxygen tolerance such as a high exercise rate, diver hypoventilation, canister failure, inadvertent depth excursions, inadequate thermal protection, or excessive purging of the UBA may contribute more to the risk of operational oxygen toxicity than individual sensitivity. (36)
- 5) Naval Safety Center dive reporting procedures should be modified to document all suspected episodes of oxygen toxicity which occur on closed-circuit oxygen dives. This should

include a reporting format that provides for the maximum capture of pertinent data to facilitate accurate and reliable determinations of the CNS oxygen toxicity incidence in operational diving.

6) In light of items 1 through 4 above, the authors recommend discontinuation of the OTT as a screening test for Navy Seal candidates. The OTT was discontinued as a screening test for NSW candidates in April of 1999. (37)

Another significant advance in oxygen diving in the Navy was accomplished as a result of establishing UBA and oxygen exposure limits for resting as opposed to swimming divers. This physiological situation applies primarily to SEALs who are piloting or riding in SDVs. These free-flooding submersibles, whose operating characteristics are classified, are capable of transporting SEALs over long distances underwater. Since these divers have a much lower rate of oxygen consumption and CO₂ production, their gas supply and canisters should both last longer and the risk of CNS oxygen toxicity should be lower. This realization in 1996 resulted in the Naval Special Warfare Command initiating tasking for NEDU to re-evaluate limits for both the Draeger LAR V and the SEAL operator at 20 feet in a mostly-resting scenario. Marino and Maurer tested 8-hour dives in 76-81 degree F. degree water and found that all canisters were still adequately removing CO₂ after 8 hours. (38) Approximately 25% of the UBAs had to have oxygen bottles replaced before the end of this period. There were no episodes of CNS oxygen toxicity although a number of divers displayed early symptoms of pulmonary oxygen toxicity. New limits were subsequently established by NAVSEA for this UBA which remain classified, but are significantly longer than allowed by the previous limit. (39) At shallow depths, pulmonary oxygen toxicity or UBA limits may be the limiting factor for exposures rather than CNS oxygen toxicity. (.38,39,40)

Current research in oxygen diving in the U.S. Navy has focused on the development of deep water Draeger LAR V lockout procedures for the Advanced SEAL Delivery System (ASDS). The ASDS is a new submersible that transports SEALs close to their intended target in a dry, one-atmosphere environment. At their lockout point, the SEALs exit the ASDS and begin a combat swim for their final approach. The maximum lockout depth is classified, but is in excess of 100 feet. Operational units using this craft requested that a procedure be developed whereby missions requiring deep-water lockout could be accomplished using a Draeger LAR V rather than a bulkier and more complex closed-circuit mixed-gas UBA. A proposed procedure has been developed in which the divers breathe chamber air and vent the UBA rig to equalize pressure during compression. They then exit the lockout hatch breathing from the submersible's built-in hookah rigs until they reach the ascent line. Once ready to ascend, the divers swim toward the surface inhaling through the mouth and exhaling through the nose. This serves to vent the expanding gas from the UBA and to provide the diver with compressed air to breathe during the ascent. The oxygen valve is closed until the diver reaches 15 feet and carries out an underwater purge. He then begins his swim with a purged UBA. This procedure was proposed by the Naval Special Warfare Command in 2001 (41) and has been successfully tested by NEDU in controlled conditions. (42) Open water testing is anticipated in 2003.

It is a noteworthy observation that Dr. Lambertsen was a member of the ASDS Medical

Advisory Panel that developed the procedure described above, thus resulting in his contributions to closed-circuit oxygen diving spanning the entire history of the U.S. Navy experience in this area. Another important observation is that the Naval Special Warfare community was responsible not only for the introduction of closed-circuit SCUBA diving to the Navy, but for the first employment of open-circuit air SCUBA as well.

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UNDERSEA & HYPERBARIC MEDICAL SOCIETY

INTERVIEW OF DAVID ANDREWS, EN1, (DV) USN

Kensington, Maryland

Thursday, September 4, 2003

PROCEEDINGS

INTERVIEWER: I'm at the Navy Special Clearance Team One with Engineman First Class David Andrews, an Explosive Ordnance Disposal (EOD) technician who was with the unmanned underwater vehicles during Operation Iraqi Freedom. How long have you been in the Navy?

EN1 ANDREWS: I'm going on 13 years now. It's 12 years and change, at this point in time. It'll be 13 years come October.

INTERVIEWER: After EOD School, where did you go?

EN1 ANDREWS: I was in the 31 Program, so that was the first part of my training. I went out, came into the Navy, went to boot camp and then to my A School, which was Engineman A School at the Great Lakes Naval Training Center in Illinois. After that, I was assigned Temporary Additional Duty (TAD) to EOD Mobile Unit 2 to get in shape for dive school, for a period of two to three months.

I went to dive school and then to the first part of EOD training. From there, I was stationed at EOD Mobile Unit 9 in Vallejo, California. I stayed there for about two years, in San Francisco for the majority of my time. From there, I went back to EOD school to finish up my training and become an EOD technician. After that, I was stationed at EOD Mobile Unit 8 in Sigonella, Sicily. I did a little over three years in Sigonella.

INTERVIEWER: You did some training with the Special Warfare Development Group?

EN1 ANDREWS: Yes, exactly. From there, I was TAD'd to Training Unit 2 for the better part of the year and then transferred to a shore detachment based out of Mobile Unit 2. It's Detachment Earl in New Jersey. Within the last year, in March, actually, I was transferred to Naval Special Clearance Team One here in San Diego.

INTERVIEWER: You've been here less than a year, then?

EN1 ANDREWS: Yes.

INTERVIEWER: How long were you on board before you went to Iraq?

EN1 ANDREWS: I was stationed, or I got on board, and within a week was transferred to Iraq.

INTERVIEWER: That's amazing. Did you expect that when you came here?

EN1 ANDREWS: It was actually up and down. I had spoken to people and the guys on my last team were trying to get me out here, be it the chance I could go and be a part of Operation Iraqi Freedom. The last word that I got when I left my private documents at Earl was that I wouldn't be going, so I came here with the notion that I would be staying behind. Then, once I got here it was put out that they needed operators out there, so they tried to get me out there as soon as possible. Within a week I was transferred out there.

INTERVIEWER: The rest of the unit was already out there?

EN1 ANDREWS: Yes. Actually, when I first got here they were basically loading up and leaving.

INTERVIEWER: You weren't very much behind them when you got over there.

EN1 ANDREWS: No. They were literally about a week ahead of me.

INTERVIEWER: You were doing the Unmanned Underwater Vehicles?

EN1 ANDREWS: That's correct.

INTERVIEWER: How did you get assigned to that?

EN1 ANDREWS: I don't know if it was a request or anything. I didn't know much about them but I had called forward to find out where I would be stationed within the command. They said that was the platoon that I was going to. I tried to find out as much as I could before I got here, as far as what they did, who was in the platoon and things of that nature.

INTERVIEWER: You are like a diver in the platoon?

EN1 ANDREWS: Yes. That's right.

INTERVIEWER: I was wondering, because you are an engineman. You'd think that they would have an electronics technician to run the Unmanned Underwater Vehicle (UUV).

EN1 ANDREWS: Actually, they do. They do have two or three individuals who do a lot of the programming. But it's one of those things with which we, as operators, try to learn and work as much as possible with, as well as the programming side of the house. We go out and launch the vehicles, depending on where they need us and what type of situation and so on and so forth.

INTERVIEWER: After the vehicle goes out and maps an area and scans contacts, you go out and verify them?

EN1 ANDREWS: Actually, we go out and set up a grid. We lay transponders that the UUV can actually use as beacons to find out where it is in relation to this grid that we want to program in. We lay out that grid and then we launch the UUV, but prior to that, before we even lay this grid, we program all information based on maps and the area that we want to cover and so on and so forth. We program in how much coverage we want, how much of a side scan we need and how much yardage we want on a scan. We send that out and program it all in the night before and set up everything the night before, like you would for a regular dive operation. The following day, we go out, lay the grid, launch the UUV, let it do its thing, come back, retrieve the UUV, download the information afterward and find out what it did scan and whether there were contacts or anything like that.

INTERVIEWER: How many guys are on a UUV platoon?

EN1 ANDREWS: When I got on board, there were eight or ten. They are trying to get it up to 17, I believe.

INTERVIEWER: Are they a mix of reconnaissance Marines and SEALs and EOD people?

EN1 ANDREWS: Yes. They have all three areas and I think we had a couple of sonar technicians, as well.

INTERVIEWER: Doctrinally, what do the divers do?

EN1 ANDREWS: We're the ones who are actually going out and doing the physical work, whereas the fleet technicians are going to stay back, and I don't know if you would say we go 'into harm's way.' We check out any kinds of problems, do the download afterward and the post-mission analysis. We set up a disk with all the information that we gathered from the UUV.

INTERVIEWER: Then, you dive on the context that the UUV generates?

EN1 ANDREWS: We do not. We pass that along up the chain to the doghouse and to the top. Then, they can either choose to decipher that information further with the mammals, if they want them to require any of these contacts or give them to what was, at one time, just a single dive

platoon. The dive platoon could go and dive on the contacts afterward if they felt it was a strong enough contact that the UUV picked up.

INTERVIEWER: What's the doghouse?

EN1 ANDREWS: It's similar to the top, I guess. It would just be the head shed through which they would disseminate all the information.

INTERVIEWER: How much diving did you do?

EN1 ANDREWS: I did not do any diving while I was in Iraq. It was strictly just surface operations, working with the UUV.

INTERVIEWER: The UUV really earned its pay over there, huh?

EN1 ANDREWS: Yes, it did. It got a lot of attention, from what I understand, from a lot of higher-up admirals and so on and so forth. They took a particular interest in it, from what I understand.

INTERVIEWER: How important do you think the UUV was to the success of the clearance team's mission?

EN1 ANDREWS: I think that it played a major role in that it allowed for much quicker area coverage. It allowed us to see exactly what was going on with the currents and what type of bottom type we had. It also gave temperature readings, bathymetry, and everything along those lines so that we knew exactly what was going on.

Then, if there were any questions, we could run the UUV again and make sure, without having to put any of the mammals in if we so chose, or if they didn't feel that the mammals were needed for that. It cut down the search time from possibly weeks to a matter of days, as far as the area of recovery we had to do.

INTERVIEWER: That was important, right, because you had 72 hours to clear the port so that humanitarian aid could arrive?

EN1 ANDREWS: That's exactly correct.

INTERVIEWER: Were you able to get that done?

EN1 ANDREWS: Yes.

INTERVIEWER: The UUV cleared most of Umqasr?

EN1 ANDREWS: Yes, it definitely did.

INTERVIEWER: What sort of contacts did they find?

EN1 ANDREWS: The great majority of them was made up of grain bags, tires, or some other junk down there. I believe they did have a couple of sub-surface wrecks. They managed to get good Latin long on for future references.

INTERVIEWER: In the end, they were able to establish to a very high degree of confidence that the port had not been mined?

EN1 ANDREWS: Yes. That's Correct

INTERVIEWER: After you finished at Umm Qasr, what did you do?

EN1 ANDREWS: When the old port was done, half the team split off to clear up the new port and the other half of the team had a mission to go find a downed F-18 up in the lake area, closer to Baghdad.

INTERVIEWER: Where were you?

EN1 ANDREWS: I was one of the individuals who split and went to the new port to clear it.

INTERVIEWER: What did you find up there?

EN1 ANDREWS: We found more of the same, like a lot of tires grain bags. It was a much smaller port. We managed to do that in two separate missions, two days' worth of work, in about three hours for each mission during the day.

INTERVIEWER: That's pretty impressive. That port was also used for humanitarian material?

EN1 ANDREWS: It might have been. I don't know that it was, but they were waiting on it as much as the old port. I'm sure that they probably moved ships in there afterward, after we were done with it. They never really told us exactly for what it was going to be used, but they said that it needed to be cleared, just in case.

INTERVIEWER: With the old port, you guys were under a lot of pressure to get finished quickly?

EN1 ANDREWS: Yes.

INTERVIEWER: What about the lake job? How did that turn out?

EN1 ANDREWS: It turned out they had a large area to cover. They broke it off into different sections. They had a downed pilot. They had the exact location of the F-18. The pilot had been ejected from the plane and it was the job of the other half of the UUV team to go find that pilot.

They just started breaking it up symmetrically. I think it was the third day they found the body, but it had decomposed. There were gases in the body and it buoyed up and they managed to find it just from a visual sighting. Nonetheless, we were up there using that and I guess it got a lot of attention. A lot of people did not know that we were able to do that for lakes and things of that nature.

INTERVIEWER: That's kind of a grim job, though.

EN1 ANDREWS: Unfortunately, yes it is.

INTERVIEWER: How long were you over there?

EN1 ANDREWS: From the get-go until the time we came back, it was three months, I believe.

INTERVIEWER: That's pretty exciting, to show up on your first week and get sent off to war, huh?

EN1 ANDREWS: It was definitely a trial by fire, you know. But I wouldn't change it. I definitely enjoyed it. I was welcomed with open arms, and we had a good bunch of guys that I worked with on the UUVs. The rest of the crew just seemed to be an outstanding bunch of guys.

INTERVIEWER: Now you're with the dive platoon?

EN1 ANDREWS: Yes.

INTERVIEWER: How do you like that?

EN1 ANDREWS: It's different. It isn't better or worse. It's just a different job. I like it as well as the other stuff. I definitely enjoy it.

INTERVIEWER: Do you like diving in the Viper?

EN1 ANDREWS: I do. I just went through a Viper class when I came back here, just to get certified for that. I have been fortunate enough to dive in a number of different rigs throughout

my travels in EOD to my various commands. I like it. It's a good rig. There's both a plus and a minus side to it. But all in all, it's a decent rig to dive. I have no major complaints about it.

INTERVIEWER: Having gone and seen the UUV in action and all the attention you got, do you think UUVs will eventually replace divers?

EN1 ANDREWS: I think that they will. I think there will come a time, and that's the Navy's objective, from what I understand, to get the human factor out of that loop so that they don't have to do that.

INTERVIEWER: Do you mean for mine searches?

EN1 ANDREWS: That's exactly right. From what I've seen in the short time that I've been here, just being privy to the first of many upcoming things, it definitely seems to be a very exciting field. A lot of advancements are coming out and technology is just growing by leaps and bounds. It's going to be interesting to see what happens here within the next few years, definitely, as far as UUVs are concerned.

INTERVIEWER: Hey, is there anything else we didn't discuss that we ought to?

EN1 ANDREWS: Off the top of my head there's nothing I can think of.

INTERVIEWER: Well, thank you very much.

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UNDERSEA & HYPERBARIC MEDICAL SOCIETY

**ORAL HISTORY OF THE MAJOR PARTICIPANTS
IN U.S. NAVY UNDERSEA TECHNICAL DEVELOPMENTS**

**Interview of
PROF. DAVID ELLIOTT, O.B.E.
Shell Professorial Research Fellow
Robens Institute of Health and Safety
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PROCEEDINGS

INTERVIEWER: Dr. Elliott, tell us something about your background. Start back when you were a youngster and tell us where you were raised, where you went to school and so forth and then bring it forward until you got into the diving business.

DR. ELLIOTT: Wow. That's a big jump, isn't it? My early childhood was before the Second World War, about which I remember quite a bit. In particular, I remember that just before D-Day, my father walked me along the cliffs by the English Channel, because he was in the military, and that permitted me into the no-go zone. He asked, "What do you want to do when you grow up, son?" As he was in the Army, I said, "I want to join the Navy. I think I'd like to be the doctor of an aircraft carrier."

Well, I managed to do most of that except I never actually became the doctor of an aircraft carrier. I had that thought in the back of my mind, and that must have been at the age of nine or ten. I came out the other end a few years later, qualified as a young physician.

We then had national service to do in the British military. My father said to me, "Son, I can get you a job as a regimental medical officer for my old regiment." I said, "Dad, rather than do a year and a half with that regiment, I've signed on for three years in the Navy because it's a better deal." You can see that I was an absolutely normal child rebelling against his parents. In fact, what happened thereafter was that I had to do a three-year short service commission in the Navy, which was, after doing intensive house jobs and all the rest of it in the civil sector, an interesting period. The level of medicine required, of course, like most military peacetime jobs, was ever smaller. You were really

on board a ship. I was on board a ship in the Far East. You were there like an umbrella, just in case something went wrong.

My entire three years in the Navy, plus the large tax-free lump sum I got at the end, were justified by just one incident. I looked at a particular patient and told the commanding officer that we did not have to take the ship, which had been ten days steaming altogether, back to Singapore. That saved the ship enough money, as it was a hydrography ship, to totally cover my salary for the three years. The umbrella was used, but the umbrella was only used for about five minutes of my three-year commission.

That's me in a nutshell. I then left the Navy along with everybody else and went into research at University of Oxford. There I was in a wonderful department that had, incidentally, a very strong history of work with the Navy during the war. That was where they did all the ergonomics and thermal work with a man working inside gun turrets and things like that. It was a fantastic department. The great joy of Oxford in those days was that you had a pass into the scientific part of the Bodleian Library and could go down to the stacks yourself and thumb through. One learned a whole lot. One learned that you could find a report on a particular experiment written by the same names, but the names were in a different order, and they had the same facts but came to conflicting conclusions. That is the purpose of learning research. It doesn't matter what subject.

At that particular stage, I realized that the base of the pyramid for promotion in the academic world, and medicine in the U.K., was spreading wider and wider, and the chances of actually moving on financially were pretty poor, even in those days. The opportunity to combine research with a career in the Navy was again one of those serendipitous opportunities. You just have to grab it before it goes. I grabbed it, and there

I was. I was sent straight down to the RNPL. That's not quite true, actually. They did pay for my last year at Oxford just to get my thesis written before I came back, to be honest.

INTERVIEWER: That was at St. Bart's?

DR. ELLIOTT: No. It was at Wilfred Le Gros Clark at Oxford University. I did research into the growth of collagen, which was a totally useless and esoteric subject. I thought nothing more of it. I published some papers and proceedings at the Royal Society. The papers all sounded very clever until many years later. Brian Hills, who everybody knows is a very good decompression modeler and theorist, once said to that he was working on the kangaroo rat's tail tendon as a model tissue for decompression studies. He said the great joy of doing that was that it was a tissue in which the modelers of elasticity were known. There was a paper by my namesake that was relevant. He pulled out the paper I had written for *Biological Review* on the growth of collagen strength. Unwittingly, I'd made my first contribution to diving literature, so that was a start. How about that?

INTERVIEWER: Let's go back even further. You were born in 1931, 1930?

DR. ELLIOTT: I was born in 1932.

INTERVIEWER: Where?

DR. ELLIOTT: I was born in London. I went to school in Canterbury and had a very privileged time there. The school is actually going through its fourteen-hundredth anniversary next year. When you have a background like that, you realize how transient the activities of individuals are. Basically, I went from Canterbury and trained at St. Bart's Hospital in London, and that was a fantastic period of time. At the end of it, people like me had to go and do national service.

I was thinking of going in for obstetrics and using the anatomy and physiology to work toward surgery. But then, I got a phone call from a chum of mine who'd stayed in the Navy. I was just about finished with my doctorate of philosophy at that stage. He told me he'd been talking to the appointing officer within the Navy. They were looking for somebody who would come in and look after the naval medical branch's research program, and asked whether I was interested. The long and short of it was yes. It meant going back to the quality of life that I felt my family deserved and going into a research area, which had much more practical applications. It was actually general naval physiology.

My first acquaintance with underwater medicine would have been some lectures during which we probably fell asleep. They were on oxygen toxicity, nitrogen narcosis, decompression and so forth and given by the gurus of the time, people like Val Hempelman and so on. They were really good people. That would have been 1958. Nothing very exciting was happening. As the years went by, of course, things began to gather momentum. I must say that at that stage, diving medicine was part of the syllabus, like aviation medicine and submarine medicine, and it was just one of the things one learned.

Again, this is another irrelevant little piece for your mosaic, but I think it may be of interest. The lifestyle of a naval medical officer was such that in those days, which were the late 1950s, and this was actually at the naval hospital in Plymouth, one would roll in at about nine o'clock, in uniform, into the office of the senior medical officer, surgery, the surgeon captain. You'd stand there, talk to him for five minutes, and ask whether there were any admissions last night and so forth. It was usually absolutely

nothing, and then one would retire to one's wards. You'd have coffee with all the sisters in your own wards and your colleague's ward down the corridor and so on. Then, at about half-past eleven, you slowly wandered back to the mess because the bar opened at noon.

INTERVIEWER: If you can, pick out two or three people who influenced you to get into the diving field and what impact they had on your decisions.

DR. ELLIOTT: One person who was very influential with me was Johnny Rawlins. The thing about John is that a lot of people think of him in a certain way. There was a paper written on escaping from an upside-down, underwater aircraft. What you don't realize is that he was actually the subject in that airplane.

The first thing I did once I finished my Ph.D. was to go down to the Naval Physiological Laboratory in Alverstoke. Eric McKay, who did a lot of work with the HMS *Reclaim*, was one of the doctors there. When I joined in 1965, approximately, he went on to another job and his number two, Peter Barnard, who was a couple years in the navy and senior to me, became my boss. I took the junior job. As a diving medical officer in those days, I went off and did the clearance diving course and all those sorts of things. We were at the forefront, which would sound grand if you judged that by today's standards. We were at the front line of what was a very small organization. We had a diving team to work with. We had the RNPL, which was doing all the physiological research, to work with. We were two uniformed doctors in a civilian research unit that was using naval divers to do the work. There was nothing else.

There was really no recreational diving in the U.K., other than a few mad enthusiasts. There were no other operational chambers in the U.K. There were one or two

in dockyards that could be called on if needed, but nobody ever wanted to use them. There were perhaps one or two cases of civilian decompression sickness each year in the whole country, and there'd be people diving in dockyards and things like that. They weren't recreational divers.

I joined RNPL in 1964, when I got my Ph.D. I became the junior doctor there alongside Peter Barnard. We worked together for three or four years. 1965 was when the submarine escape trials were being done. I can't remember if it was before or after that, but during the same summer, Peter Barnard and I and the whole of the HMS *Reclaim* went to Le Lavandou on the south coast of France. We were based at Toulon Navy Base and started to do bounce dives on sea trials, having already cleared them.

The laboratory work had been going on for years before I joined. I get no credit for the research. I was just part of the medical cover. But we then found that having the medical cover was quite a responsibility. Those dives were being done with the ship in deep water off the Iles d'Hyeres, which are not far from Toulon. They were important because we learned a lot of lessons. The cases themselves have been written up elsewhere, but just for marking the milestones, I think two are worth mentioning because they do affect the policy of deep bounce diving, recompression and those sorts of things.

I think the first one to mention was that somebody had made one of those deep dives. Bear in mind that in the British navy, for academic purity, the dive was made with no single atmosphere of air in the chamber to start with. The chamber was cleared out and filled with oxy-helium, so there was no nitrogen loading of any significance in the chamber. On board the ship, they would use an oro-nasal mask as they did their compression.

They then went down to depth in the bell to do their swims, which were quite brief. The maximum duration was an hour, and a lot of the dives were only thirty minutes. They came back into the bell, locked into the bell, brought it back to the surface, locked into the deck chamber, and underwent a decompression, which would last, as far as I can remember, for maybe a couple of days or so.

There was no great sort of structural engineering problem except that our deck chamber had a maximum depth of 300 feet. Any decompression deeper than 300 feet had to be done in the bell in the water. Our particular protocol was that the people breathed oxy-helium all the way to the surface. Upon reaching the surface, the door would be opened and at atmospheric pressure, they'd switch to air.

We'd already worked out that when a person got a bend deeper than 165 feet, the conventional treatment tables were absolutely useless because they didn't go that deep. Mickey Goodman's table was just coming in at that stage. We had very conveniently gotten these divers to the surface and had established a new routine for treating people who surfaced with bends after helium exposure. The reason I emphasize that is because there was some confusion between the British and the American navies, who have a very close working relationship. It is similar in the United States. They are not dives quite as deep, but there is a switch from helium to air quite deep. Therefore, because the divers had already made the switch and decompressed an hour or two or longer on air, they had no problems at all when they recompressed any bent diver on air and did not see why we insisted on using helium. That sort of concluded that phase. It was a setback, but we carried on diving.

The focus of our lives was propelling the deep-diving research. Dr. Taylor was then the superintendent of RNPL. We were producing tables, or trying to produce safe tables, to do dives at 450 feet, 600 feet for durations of thirty to sixty minutes and an 800-foot dive for twenty minutes. That was pretty much our work in that field.

At the same time, quite independently but in the same lab, the SCOSER Committee was responsible for improving submarine escape. A program was already well underway. The primary movers were Dr. Cam Wright and some people at the submarine escape tank, like Jimmy Hamlin, who was the command escape officer, his deputy, Matthew Todd, and an engineer whose name I can't remember. Cam Wright and others worked on his work to show that by making a buoyant ascent, the exhalation of gas was sufficient to keep the carbon dioxide below the threshold for having to take a deep breath in, providing one ascended at a reasonable rate. The trials were done by human volunteers at RNPL in tanks of water in the chamber from about 300 feet. The whole business of submarine escape that the British navy had worked out from tragic precedent assumed that surface people could come and rescue a submarine. First of all, they had great difficulty in finding it. Second, when they got there, there wasn't very much they could do except pick up the survivors. The British navy worked it out that as long as people got out of the submarine themselves, provided they had adequate thermal protection at the surface, it would be the primary method of escape.

This is basically well known physiology, so I won't waste much time on it. Compartment escape was limited by the fact that the compression was very slow. Therefore, one could only make shallow escapes without lost people getting decompression sickness. One tried to make the compartment smaller, and this idea had

been around for a long time, since some of the early escape hatches in the 1930s were pretty small units that the submariners would get into. But the idea was to try to make it so that the person who was essentially waiting at one atmosphere to come to the surface without decompression sickness. The slight overpressure that occurs in sunken submarines was not really a matter that we concerned ourselves with too much at that particular state of the research. Subsequently, it's become important for both escape and for rescue. They tried to reduce the exposure so that by rapidly compressing somebody to a great depth, they would be able to come to the surface without decompression sickness.

Now that entire research is well written, and the program was essentially a thirty-second compression. With the upshot trials in which I was involved in 1965, it was a thirty-second compression with about five or so seconds at maximum depth and an ascent at between eight and ten feet per second. It took about fifty seconds to get to the surface. That was how men got out of a submarine at 500 feet. Matthew Todd was the first.

Because we didn't have any thermal heating in those days for helium diving, they put hot water bottles inside their dry suits in secret because they didn't want anybody else to know. They'd be thought of as sissies. They had a couple of hot water bottles quietly locked in without me noticing, which, of course, I think was very good, indeed. We unlocked the diving bell, dropped it over the side into 300 feet of water, opened the bottom door and then started slowly to lower it.

We didn't even have a helium unscrambler. In the bell, you could hear topside, but if they spoke, it was in a helium voice. When an individual had a problem with staggers, as did happen, you'd be asking, "Are you better? Are you worse? Are you the same?" To those questions, the responses would be thumbs up, thumbs down, or the horizontal okay.

That was the only way we could communicate with the people in the bell. There were lots and lots of very primitive things.

What really got us was the fact that we could not recompress deeper than 300 feet. Even at 300 feet, we had difficulty locking the bell onto the deck chamber. We had many other reservations about it. Peter Barnard and I advised the captain, “We cannot guarantee that we are going to be able to solve it if you have a problem at these depths.”

Although the navy wanted to put a new chamber into the *Reclaim* during the coming years, you can well understand the bureaucracy that went on. We were offered a free chamber by industry to fit into the HMS *Reclaim*. It was the right size. The only difference was that it had something like a 600 or 800-foot capability, as opposed to the 300-foot capability of our present one. The Navy rejected it on the grounds that it didn't have any STANAG number. A STANAG is the standardization within the North Atlantic Treaty Organization and the numbers are assigned to each part so that there is an adequate supply of spares in time of war. You could think of nothing less relevant. There we had the opportunity of a deep diving system on the HMS *Reclaim*, and we could have continued our program. It was killed in the first instance because Peter and I said, “This is not safe,” and second, because the bureaucrats wouldn't replace the unsafe equipment. That was the end of the navy's deep diving program. We had a few convulsive efforts trying to get it started again.

INTERVIEWER: What year was that?

DR. ELLIOTT: That would have been 1965 to 1966. We continued expecting the HMS *Reclaim* to be ready. We continued the development program in the RNPL. At that time, DiveCon came in and dived with us, using our dry chamber. Al Behnke was actually the

advisor to DiveCon, and I know that his tables switched from helium to air at about a hundred feet.

We decided that ethically, in order to dive as deep as, shall we say, 600 feet, the deck chamber had to go to 600 feet. You couldn't rely on a 300-foot chamber. That essentially meant that was the end of the diving trial. That, in fact, proved to be the end of the Royal Navy's deep bounce diving. In fact, as far as the development of diving was concerned, that research was really quite important to you guys, by which I mean George Bond and the U.S. Navy. With your own participation with Ed Link and so forth, you were much more focused on saturation diving, probably habitat diving at that particular stage. Ours was based on a submersible bell going down, doing something and coming back.

In the RNPL, we had two things happening. We had the development of submarine escape, and all the hard work for that had pretty well been done. Jimmy Hamlin and Matthew Todd were the command escape officers. My involvement was non-research. It was purely the medical officer duties of standing by and catching any problems. But there are a lot of very important experiences, like blowing Matthew Todd down to 300 feet in a couple of seconds accidentally and that sort of thing. Many things were developed again by serendipity in submarine escape.

At that time, the U.S. Navy was actually not doing saturation work. They were looking at some fairly deep bounce for some particular reason. I don't know why. At that particular stage, the British navy approach to decompression was based on the bounce dive and we had a lot of experience with that. I think in the United States Navy, there were two other developments to which we were not a party. One was saturation diving up

to SeaLab. The other one was, of course, the minimal recompression tables of which we'd heard whisper developed by Mickey Goodman and Bob Workman. Bear in mind that the experiences of people like Peter and me were of decompression sickness with an abrupt onset that we had the ability to recompress within a minute or two and completely get rid of.

At that particular time, industry, for what it was worth, mostly in North African oil, was doing hardhat bounce diving at 400 to 500 feet. During that period, we had various cases, like paradoxical recompression. We had to learn in water to 455 feet in order to clear his vestibular bends. We had a lot of good clinical academic experience, all of which has been written up elsewhere. I think it also marked the end of the navy's deep diving program because of the problems we had imposed by the limitations of the equipment available to us. That was in the days when divers expected to not get cold.

We still did quite a lot of bounce diving, and there was some operational bounce diving, too. For instance, we concluded that if we got a helium bend, it was preferable to recompress in helium. We decided if you were going to do a deep dive, the chamber must go to the maximum depth of that dive so that you don't have to put people back for recompression in the water. The third point was just a very interesting one. Those, to me, were all the highlights. We had lots of ordinary bends and things like that, but these were things that really sort of struck one firmly between the eyes.

The other dive was on board the same ship, but it was an operational dive. We recovered some prototype torpedoes from Loch Fine from about 450 feet. Anyway, the important thing was that the divers would come back into the bell for lock-on because the decompression stops were fairly short on that particular dive. There wasn't time to lock

them on until they had reached 120 feet. At 120 feet, which was where they switched from 10/90 to 20/80, they were then being locked on. I happened to be watching the closed-circuit television. There was suddenly a noise from the television set that looked down inside the bell. I could see two divers collapsing to the floor, unconscious. They didn't have any BIBS in their mouths, but they should have. They were breathing chamber atmosphere. At that particular moment, we realized there could be a crisis. I went up the stairs and asked the diving officer if we could actually do something about this. You just made those decisions very quickly. They may not have necessarily been the best decisions, and there may have been other ways to do things. But what we did worked, which was to immediately blow the chamber back from 120 feet, where this happened, to 300 feet using a new bank of gas.

The trouble with the bell was that it had an inwardly opening door, and we locked it on. Luckily, one of our divers, who later became a policeman, was a huge individual and was locked into the deck chamber. We blew him down to 300 feet. By sheer strength, he opened it.

We then discovered that those individuals had accidentally been put onto pure oxygen at 120 feet. It took us a few hours to work that out. What they had done was go into oxygen anesthesia with no fit or anything. We sort of scratched our heads about that.

But the consultant to the Navy was Bill Payton, professor of pharmacology at Oxford. He said, "Ah, yes. Well, you haven't read my paper, have you?" He'd actually published a paper on the narcotic effects of oxygen, and we had demonstrated it. Thereafter, the subsequent decompression was reasonable, but it did actually sound the death knell of the HMS *Reclaim* and the deep diving research, because we realized we

didn't have a decent system. I think that probably occurred in 1966 or 1967, a year or so after the other incidents. Al Behnke used the same routine that the U.S. Navy had been using. He actually switched the divers from oxy-helium to air at quite a deep depth. Every time that happened with us, the divers got symptoms just after the switch. We had a discussion with Al and made the switch to air at a more shallow depth and stretched the stops a bit, and I think that worked out okay. But it was a very interesting phase, and that, again, lasted several months. You can well imagine that with all the horrendous bends and so forth we were getting at that time, we were getting a lot of experience.

INTERVIEWER: The dives with DiveCon were being done at the AEDU or the RNPL?

DR. ELLIOTT: They were being done at the RNPL and were dry chamber dives, testing Behnke's schedules for work in the oil industry.

INTERVIEWER: How deep were they?

DR. ELLIOTT: They could have been 600 feet for an hour of bottom time. The EDU was opening up for SeaLab III, and it was interested in doing some deep excursions. I think I was invited because people knew by then that I'd been in some crazy situations. Anyway, they very kindly paid for me to go out. On that occasion, I stayed with Will, whose surname I forget, but he was one of the EDU doctors. Then, as soon as the SeaLab crew came in, I shared a flat with Walt Mazzone, Paul Linaweaver, Mark Bradley and Jim Vorosmarti. The SeaLab team took the chamber deeper than 1,000 feet for the first time in the history of the U.S. Navy, and that was really quite a remarkable experience. At about that time, Johnny Rawlins was the British navy exchange officer with the Bethesda team. I was then appointed to replace him, which I did around about early 1970, and had three years out at the Navy Medical Research Institute.

INTERVIEWER: One of the missing links is the interaction between the U.S. Navy and the British navy. You've mentioned that a couple of times, but one of the things I want to make sure we discuss, because the Royal Navy influenced it greatly, is what happened in the U.S. Navy and undersea technology in three specific areas: the closed circuit breathing apparatus, submarine escape, and basic deep diving.

DR. ELLIOTT: Well, I hope that is all true. My perspective is not quite as strong as that. Certainly, there's no doubt that there was a lot of collaboration between the two navies. We had the IEP B-12, the information exchange program, which was very useful because it meant we met every six months and compared notes. There's no doubt about it. The U.S. Navy was very helpful to us, as well. It was very much a healthy, two-way exchange.

When it comes to those specific items, let's take the closed-circuit breathing apparatus first. That makes me think of the breathing apparatus that was being developed for use with the Mark I diving system, rather than the Mark II diving system. I think that was almost post-SeaLab, actually. Divex in New Orleans was developing it under a U.S. Navy contract, but we were very much involved in that. I can remember driving to the Divex place a few times during our various visits.

That went on for a long time, and it was developing the bell-mounted scrubbing system of recirculation, so the closed circuit refers to a bell-mounted unit with a supply and return line hose to the diver. Unlike the commercial stuff that Krasberg and others developed later, the gas was not returned all the way to the surface, as far as I recollect. But that was very much an engineering project, so I didn't get too involved with that except that I'd go along for the drinks.

The U.S. Navy was very keen to make sure that we were able to continue to do such work when possible. That led to programs that lasted through into the 1970s in which we would do joint dives with the U.S. Navy. By that time, the U.S. Navy had moved, in fact, to Panama City. That was all part of this same continuing IEP, or information exchange program, and the MOU, or the memorandum of our understanding, which existed between the two countries. Through those did we freely exchange information on all sorts of things.

I was not concerned with breathing apparatus equipment development, which could well have been part of the entirety, but very much more concerned with the human aspects of the development of safe diving protocol. Because of the tragic fire at the EDU, the Experimental Diving Unit actually came, and I can't remember for how long, but certainly for months, and worked at the RNPL deep trials unit and did some deep dives. We got some very good experiences out of that.

I think our experience with deep diving was of great help to the U.S. Navy. At that stage, Bob Workman and Mickey Goodman had developed the protocol for shallow oxygen recompression of compressed air decompression sickness, and the mind-set of the EDU doctors was very much in favor of that. We were not that convinced because our experience was with deeper diving that required deeper recompression.

We were meeting in alternate countries every six months or so and exchanging a lot of information. I was confined to the medical and physiological staff really, so I think on equipment development, I'm not really the person to speak. It was very much teamwork. It was a great time to be in the field. I thoroughly enjoyed it. Do you want to backtrack to submarine escape?

INTERVIEWER: Oh, yes.

DR. ELLIOTT: I was on the 500-foot escape and could tell you a lot of tales about that, as well.

INTERVIEWER: You actually made that escape, didn't you?

DR. ELLIOTT: No. I've done it from 100 feet. I haven't done it from 500 feet. The general feeling is that as far as human ethics are concerned, we've gotten to the end of what we can do safely in submarine escape from a sub that is still at one atmosphere, because to do more experiments might expose the subjects to decompression sickness. What it meant was that if a submarine was stranded perhaps as deep as 800 or 900 feet, the persons on board would be able to make an independent escape without any surface support, and a significantly large proportion of them, if not all, would make it successfully. It's just that it's unethical to do the research. I didn't get involved with submarine rescue. I certainly went to have a look at the deep sea rescue vehicle (DSRV). Submarine escape, to us, was solved. I think that was only a year or two ago. I know the U.S. submarines didn't adopt it as a secondary method of escape, but the actual configuration of the escape tower was quite awkward in some of our nuclear submarines, as well, you know.

I don't know who the scientist responsible for this idea came from or who he was, but they had a submarine escape suit which was, of course, a bit like the Michelin Man. It was this quilted, air-inflated, double-skinned suit that certainly provided a lot of thermal protection. The current system, of course, is to get into a life raft, because that is even better, thermally.

I think that it's worth mentioning that the double skin has been taken even further and has been made into a triple skin, but I don't think that the British navy has adopted it. It's become part of the offshore industry's survival at sea, particularly if people are escaping from a sinking helicopter, and ocean racers have also adopted it. If you have a triple skin, you don't get any cold patches because where there's a weld between two of the skins, the third skin is separate and full of gas. Whoever it was actually demonstrated that these suits are good for 24 hours of immersion in really cold water and probably all right for much longer.

Later, in the Falklands, we had a bit of a problem with a number of Marines going down with some of the helicopters. The idea of providing passengers with means of escaping from a helicopter was important to us in the oil industry because we have cooks and bottle-washers who go off there and their lives are as valuable as anybody else's.

The concept of an air pocket is that you re-breathe from your rubber bag. Underwater duration would prolong it from the normal no-stop time of less than 25 seconds, which is not enough time to get everybody out of a helicopter, to about 45 to 55 seconds, which is long enough. All the trials were conducted in dunker training units in cold water, and we know that it works. This was a development that I think was worthwhile, and it basically came from the submarine escape ideas. In fact, one is limited by carbon dioxide buildup. There is a bit of oxygen deprivation, as well, but it is not significant because, of course, with the new air pockets, there are little cylinders so you can actually top the things up and last a bit longer still. Although that may or may not have some potential military application, and it's for the SEAL team crowd to answer that question, nevertheless, it's another good example of what was started by the original

collaboration between the two navies in the 1960s. I think that sort of puts all the submarine escape stuff together and into context.

INTERVIEWER: Let's go to your time with the Naval Medical Research Institute as an exchange officer. Tell us some about what you did there.

DR. ELLIOTT: Oh, that was fabulous. That was the best appointment I ever had in the Navy. Bearing in mind that while I was supposed to be doing physiological and animal research at RNPL, it was very difficult to get it properly funded. The nice thing was that I went to NMRI and the commanding officer, Tor Richter, whom I'd already met at various meetings. He and his wife were very supportive of us. I took over from Johnny Rawlings.

INTERVIEWER: That was at the beginning of the SeaLab III program, which preempted the EDU, which was why the EDU divers went to England.

DR. ELLIOTT: That could well be.

INTERVIEWER: I was at the EDU.

DR. ELLIOTT: At that stage, you were working with George Bond, I think.

It was great to see the ways that Walt Mazzone maintained the morale of his group and did it in subtle ways, like being the chef for everybody and cooking the meal. It may have been instinctive, but it was wonderful leadership.

INTERVIEWER: How about the Undersea Medical Society? It was founded in the United States.

DR. ELLIOTT: Yes. I did not get to the first meeting because we were very short of travel funds. What happened was that whoever had the most clout and wanted to go

would get there. Peter got there one year, and the year that I wanted to go, Stanley Miles went and so forth and so on.

INTERVIEWER: Were those the underwater physiology symposia that you are talking about?

DR. ELLIOTT: They were the underwater physiology symposia, yes.

INTERVIEWER: They were in 1967 and 1970.

DR. ELLIOTT: That's right.

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“ONE MORE STORY” BY EARL F. LAWRENCE

I was born and raised on a farm in Missouri. My dad was as tough as nails, and that was the way he treated me. He would send me, at the age of nine, out on jobs that were tough for a grown man. I never said to him that I couldn't do it. I never could say that in front of him because he would have kicked me right in the butt! From a young age, he treated me as if I was a man. I learned the hard way and I learned the good way. I was raised on the farm and learned to take responsibility at a young age.

I joined the Navy in 1935, at age eighteen, and went to the Naval Training Station in Great Lakes, Illinois. I finished my training there and was transferred to a submarine tender, the USS *Holland*, which was stationed in San Diego. I wasn't aboard more than two weeks when a salvage ship belonging to the squadron was alongside for a ten-day repair. I would spend the evenings on the salvage ship talking to the divers about what they did for a living. I said, “Boy, that's for me!” In about two weeks, I got them to transfer me over to that salvage ship, where I started my diving career.

In 1937, I qualified as a second class diver and worked a lot of jobs on the ships around San Diego. Because I was the low man on the totem pole, I was given the dirty jobs, but I never turned them down. Those jobs taught me a lot about diving and taking on responsibility. I also learned that if you did not take responsibility for a job, you did not get blamed for a failure. For example, during this time, I had an experience with the skipper of a large harbor tugboat that had run aground near San Clemente. The harbor tug was hung up on the rocks for three days. All the skipper and I did was remove equipment from the tugboat and load it onto a small boat. I realized later that the skipper didn't want to even attempt to salvage the tugboat for fear of failure. If you did not take responsibility, then no one could fault you for not succeeding. At the end of three days, the tugboat broke up and slid off the rocks into deep water.

While on the salvage ship, I continued to dive and work on my other trade, a second class carpenter's mate. I was then sent to the Deep Sea Diving School, a first class diving school in Washington, D.C. It was a six-month school, where I learned underwater burning, welding, and ship fitting. While I was at the school, the submarine USS *Squalus* sank. The divers from the Navy Experimental Diving Unit, which was next door to the diving school, were all sent to salvage the submarine. It had sunk in 242 feet of water. At that time, the Navy didn't have a lot of divers. While the divers were gone on the *Squalus* job, our class was able to get a lot of diving experience in the Experimental Diving Unit. This was when helium and oxygen were being

developed for diving. Helium was taking the place of nitrogen. Our class members were used as guinea pigs to experiment with the use of the new gasses. We dove down 250 to 300 feet to see how we handled these experimental gasses. I completed the school in December of 1939 and became a first class diver, qualified for dives of three hundred feet. I then transferred back to the same salvage boat. We were the only salvage boat that had first class divers. Because of that, we had all the diving jobs along the west coast. I gained a lot of diving experience.

In April of 1940, I transferred back to the submarine tender, the *Holland*. I shipped out to Honolulu for about a year. Because of the concern about a possible attack by the Japanese, our ship was sent back to San Diego on rest and recovery. When we got back to San Diego, we received word that anyone getting paid off before the tenth of October could get out of the Navy. I had my six years of service and was due to get out of the Navy on the eighth. I made it by two days. I got paid off. I was out! Those who were in the Navy for longer terms had to stay for the duration of the war.

Before I left the Navy, I put in my resume at the Mare Island and Bremerton Naval Shipyards. The warrant carpenter and the divisional officer signed my resume for Mare Island, and it was sent in. The divisional officer, executive officer and captain signed the resume for Bremerton Naval Shipyard. Bremerton responded right away because I had 'diver' on my resume. They were looking for divers. I got out of the Navy, went home to Missouri to square everything away, bought a new car and drove to Bremerton, Washington.

As a side story to my trip from Missouri to Bremerton, I was traveling through western Nebraska when I picked up a kid who was hitchhiking to Seattle because he had just gotten a job with Boeing. We drove all day and night. We would pull over to the side of the road and sleep for a while, then continue. At a restaurant, we stopped for breakfast. The kid ordered a piece of pie and a glass of milk. The next time we stopped to eat, he ordered piece of pie and a glass of milk. Even for dinner, he ordered a piece of pie and a glass of milk! I said, "My God! Is that all you eat?" He responded, "You know, this is all I can get for 15 cents!" He was so broke that pie and milk was all he could afford. I took him all the way to Seattle. I then went to Bremerton and checked into the Navy Yard.

After I had worked in the Navy Yard for about a month, the labor board sent me down to the diving barge. The word was that the diving crew was going to see what I knew and then kick me out! Soon after I arrived, the crew got a job on an old steam tug that had knocked two of its rivets out below the water line after running into a pier and. It was close to quitting time, so the crew sent me home and headed out on the job. That didn't bother me, and I went back to my apartment on Washington Avenue. At about nine o'clock that night, I got a knock on the door. It was a sailor with the message that the crew wanted me down on the diving barge. When I got there, I saw the extent of the job and was told that George Bauer, the 'hotshot' diver, was trying to weld the holes created by the absent rivets. George was working on one hole. The boss told me to get

dressed, get down there and weld the second, or bottom, hole. When I got down there, I found that George hadn't welded the hole. He had actually made the hole larger. It was a mess. He had no idea how to weld underwater. I welded the bottom hole and came up topside. George was supposed to go back down and finish the first hole, but he never did. I ended up going down and welding the first hole the right way. My work on that old steam tugboat showed everybody that I knew what I was doing. It won me a place on the diving crew.

The crew had two members who had qualified as second class Navy divers at Keyport. They had completed three dives, two at fifty feet and one at ninety. Along with some diving they had done in the Navy Yard since qualifying, that was the extent of their training. George Bauer supposedly had diving experience outside of the Navy and was a topside welder, though had no idea how to weld underwater. Through the tugboat job, I proved that I could handle the underwater welding, so I ended up on the diving team permanently.

Shortly following the tugboat job, a plane went down in the Columbia River near Astoria, Oregon. It was a seaplane that had struck a log during take off. The impact of the log broke the plane right in half. There were four people in the plane, but only one survived. A little, redheaded lieutenant fell through the hole in the plane and was able to make it to the surface. They didn't have any divers in that area, so they called in the Navy Yard to recover the plane. Three of us from the diving crew went to the job. A Navy captain briefed us on what had happened. It turned out that the plane went down in fifty feet of water with four depth charges set to go off at fifty feet. The depth charges were still on the plane, hanging on the wing. If any of the depth charges were hit or dropped below fifty feet, they were likely to explode. Due to the danger of the job, the captain asked if we still wanted to dive. I said, "Heck, I'll dive down there. If the thing blows up, it's going to blow you up topside, too." The captain said, "Yeah, but we aren't going to be here. We're going to put you out on the tender, in a small boat, and you're going to do the diving while we circle around and watch what happens!" I said, "Heck, I'll go!" The captain told me not to go into the plane. He said, "Don't go inside. The men are in there and we don't want them disturbed." I made my dive and found the plane completely broken in two, split right about where the men would have been sitting. The plane was resting as described, but the tail had broken off from the main portion. I swam inside of the plane and discovered that there were no bodies inside. Meanwhile, the topside crew came out with a small tugboat and wire, which I used to hook to the tow pendant on the seaplane. When I got topside and climbed into the small tugboat, they started towing the plane to the beach. An ambulance came roaring down toward us as we got close to the beach. I asked, "What is the ambulance for?" The topside crew responded, "It's for the bodies in the plane." I said, "There aren't any bodies in there. I went into the plane and took a look while I was down there." They just blew their tops when they heard that! The plane was pulled up onto the shore. Of course, there were no bodies inside. They were never recovered. That was the first time that I had been called for a job because of a lack of qualified divers. It was my first job independent of the Navy Yard. I had been through a six-

month diving school and was qualified as a first class diver. I already had the qualifications and more experience than those so-called 'hotshot' divers did.

Burning and Welding

I started taking a topside welding class at night school at the old Washington School in the yard. After attending the class for some time, I decided to set up an underwater practice stage for burning and welding. I rigged a stage underneath a pier in the Navy Yard, about ten feet off the bottom in nice, clear water. I built a table on the stage, just like at the topside welding school, with a place to sit and practice underwater welding and burning. I got tons of scrap metal from the ship fitter's shop and experimented with burning and welding for hours at a time. Through this experimenting, I built an underwater torch. The development of the torch brought me recognition in the newspaper and an award of \$150 from the Navy for such a beneficial suggestion.

The yard set up a schedule for the divers to practice welding one day a week. The other divers were too lazy to take to practice, so I wound up taking their allotted time and practiced burning all day. I became very efficient, using the welding tool that I had developed. The shipyard had a topside welding school at which participants were required to take welding tests. I was able to get all the test materials for the school and practiced those tests, underwater. I took my underwater welding pieces to the topside school and had them inspect my work. I passed all the required welding school exams with my underwater welding.

Word of my underwater welding abilities got around the shipyard and to Washington D. C., as well. The shipyard sent information to Washington about the underwater welding I had accomplished. I guess that the Navy Department didn't like my welding developments and to show us how welding should be done, it sent Lieutenant Norwood. Before he got to the shipyard, a box was delivered marked, 'Do not open until the arrival of Lieutenant Norwood.' When Lieutenant Norwood showed up, he opened his box, which held his burning equipment. He was there to show us how to use his equipment. We went down to the underwater stage and watched him burn for a while. We went back up topside and he asked me what I thought. I said, "I think you don't even know how to bum with your own equipment!" He got quite hostile. I invited him to go back down, where I proceeded to use his own equipment and just bum like crazy! The lieutenant stood there dumbfounded. He couldn't believe what was happening.

Our burning and welding program was quite successful. The shipyard kept sending material back to the Experimental Diving Unit in Washington D. C. I took a two-foot long, 18-inch wide plate and burned it across for a couple of inches. Then, I burned one piece all the way off. I used a straight edge and burned notch to show how the burn went neatly through both sides. Apparently, they finally believed that I could burn when they received the plate in Washington

D. C. They took pictures of it and used it in the underwater welding section of the Navy's new diving manual. It was a real compliment to me to have my work recognized in that way.

I began training sailors from ships coming into the shipyard. The ships would send six to eight sailors to the diving barge for six weeks' of burning and welding training. The program went through the apprentice school of the shipyard, which handled the qualifying paperwork for the sailors that completed the program successfully. I trained over 250 Navy divers and 24 Army engineers during the beginning of the program.

The Army sent a Lieutenant with his crew to Bremerton to go through the program. That unit of twenty-four divers later went overseas and worked on salvaging ships that had sunk in the English Channel. I was very pleased to hear from that group of Army divers through notes and Christmas cards. They wound up doing more diving across the English Channel than the sailors did! In 1946, I received permission to go through the diving school in New York City at Pier 88. The school was based around the USS *Normandy*, which had sunk right next to the pier after catching fire while tied up. The Fire Department responded by shooting volumes of water into the ship, attempting to put out the fire. As a result, the ship sank. During the six-week diving school, the divers, including me, were to learn how to burn and weld. It turned out that I knew more about welding and burning and ended up teaching them how to bum! I vividly recall the muddy, muddy Hudson River and dropping down into that mud, which came up to my knees!

Diamond Knot Cargo

A ship called the *Diamond Knot* was returning from Alaska with three-quarters of the season's salmon catch on board. It was about fifteen miles offshore from Port Angeles in the fog when another ship ran into the middle it and knocked a big hole in the side. The two ships were wedged together for hours. While wedged, the second ship tried to push the *Diamond Knot* closer to the shore until its captain thought he was about to run aground. As he backed out, the *Diamond Knot* took on water and sank. It sank in 136 feet of water with all the canned salmon on board.

A guy named Martinoni from a San Francisco insurance company got the job of salvaging the ship and its cargo. The cargo was insured for about four million dollars. Martinoni was able to secure topside equipment from Foss Launch and Tug Company but had trouble getting local divers. He ended up hiring divers from Portland and San Francisco. They had been working on the project for six weeks when Martinoni came into the shipyard for equipment and information. It turned out that he was an admiral in the Naval Reserves, so he was given permission to borrow my burning equipment for his job. Commander Price, in the shipyard production office, had a meeting with Martinoni and asked me to attend. Martinoni explained how he wanted to bum holes in the sides of the cargo holds and run a twelve inch siphon air lift to bring up the cans and dump them on a barge. The plan was to take the salmon to Seattle and Everett to re-can them. It

was 1947 and there was a shortage of food after the war. Martinoni complained that he was getting nowhere with the group of divers he hired for the job. Commander Price responded, "You know, the only thing I can think to do is to send Lawrence up there." Martinoni jumped at that and said, "Send him up."

In surveying the site, I realized that I would have to dive on the tide because the current was so strong that I wouldn't be able to stay on the side of the ship. I didn't have my own equipment but would be using equipment from Walter McCray, of Seattle. I walked out to the site at about ten o'clock at night, which was during slack water, to check out the project. I asked Walter McCray, "What's the story here?" McCray walked me toward the ladder, pointed to the equipment and said, "There's the gear. There's the ship. Now, go to work." I went straight to Martinoni and told him that I would not work under those conditions and with those attitudes. Martinoni said, "Listen. During the past three weeks, the divers have cut a hole of about a fifteen square foot area in the number four hold. I want you to bum back from that hole toward the stem." Those were my orders. I went down and burned fifteen feet toward the stem, which was more than the other divers had done in weeks. As I was burning, I realized that I was burning into the engine room because lube oil was leaking from the cut. I told my tender to let Martinoni know that I had reached the engine room. Martinoni didn't believe that I had gone that far and questioned the location of several different fittings. He then realized that I was at the engine room and directed me to burn across to the other side. I burned about nine feet across and fifteen feet up and opened the plate to expose the cargo. This was my first on the ship dive and I had accomplished more than the other diver had in three weeks.

Martinoni was thrilled! He said, "Do you have any more divers that can burn like you can?" I replied that I had one other diver who was a good burner. He said, "Get him up here. This job is yours. The heck with this." The union divers raised cane and tried to kick me off the job. Martinoni responded, "As long as you can't furnish better divers than those you have furnished, you can go fly a kite. Don't worry about Lawrence. He's going to be here until the job is over!" From then on, I took over the burning, but the original divers were kept on to break up the pasteboard boxes and feed the siphon with the cans of salmon. The number four hold had two decks, one at the top level, one at the bottom level and a one deck in between. I burned forty feet on the number four hold and thirty feet on the number three hold. Then, I burned about thirty feet up to the number one hold. I lifted all those plates out, exposing the whole side of the ship. That allowed easy access to the cases of salmon. I was on the job for five weeks. Old Martinoni was so pleased with the job that he sent me a case of Blue Springs scotch and a \$500 bill as a bonus. In those days, that was a lot of money.

The Missouri River's Hell's Canyon Dam, Helena, Montana

When the Hell's Canyon Dam was built, there were only two penstocks, which is through what the dam's water goes through in the generators. A topside gate slides down to plug the hole

where the water comes through the generator. One of the holes had something blocking the gate from sliding all the way down, thus not allowing the complete cutoff of water flow. After reviewing the blueprints, I had the grate (the screen that keeps the logs and debris from passing through) lifted. I dove down 130 feet to check out the penstock. The structure was a nice square, smooth concrete form. Since I couldn't see anything, I felt around with my hands until I found a sloping wall. There, I discovered a large glob of concrete that had been dropped into the hole after the penstock was built. It was raw concrete that had dropped into the hole and it was blocking the gate. I secured a jackhammer and spade from topside and went back down. I popped a yard of concrete out and had it hauled up to the surface. I was called upon to do quite a few such small jobs.

Aircraft Carriers - Armor Plate Removal

The shipyard had the job of modernizing three carriers, the USS *Roosevelt*, the USS *Coral Sea* and the USS *Midway*. The carriers had armor, seven and half inches thick, built into their sides in large, twenty by twenty-foot sections. Each section was bolted onto the side of the ship and the bottom edge was welded. The job was to remove those plates and replace them with torpedo bulkheads. Each of the sections weighed about thirty-seven tons. To put these carriers in dry dock and lift these heavy plates by crane would have been extremely difficult. It was decided that the plates would be removed while the carriers were in the water. A barge with railroad tracks on it and a railroad car, loaded with sixty tons of weight, was brought up alongside the carriers. This barge had lift pads welded onto it that were to match up with the lift pads on the armor plate. The procedure required the divers to go down and bum off the bottom edge on one of the armor plates. The weighted rail car was to be slowly run to the edge of the barge so that it would tip down into the water until it matched up with the pads on the armor plate. The pads were to then be shackled together. Then, the weighed rail car was to be slowly run in the opposite direction from the ship so that the armor plates would be lifted away far enough for a crane to pick them up and place them on a nearby pier. It was reported that the shipyard saved \$100,000 on each ship by removing the armor in this way. A report was sent to Congress and the shipyard received much recognition for the way that the project was handled.

A New Tugboat for the Diving Crew

Our diving boat was a nice, wooden, fifty-foot long boat and had no equipment on it due to its size and capacity. When the Navy started to decommission tugboats and ships, I saw a 65-foot tugboat that had been decommissioned in Seattle. I convinced my boss, Walter Bruns, that we needed a bigger and better diving boat. He put in for it and we got a decommissioned tug. The tug was converted to a diving boat once it arrived in the shipyard. We secured the welding machines and air compressors behind the deckhouse and built quarters for the divers to change

into their gear. We made a big deck on the backend of the boat, which we used as a platform from which to dive. It was the best diving platform in the shipyard.

Johnson Island, Barrier Reef Blasting

My experience and reputation as a diver was well known by several contractors in Seattle. When there was a job for which they needed a diver, they would call me. If I could get leave from the shipyard, I did those jobs on the side. They called it 'moonlighting.'

One such contractor, Phil Stewart, bid on a job on Johnson Island, which is 750 miles southwest of Honolulu. It is a little island that, from a distance, looks like an aircraft carrier sitting out in the middle of the ocean. In fact, it is used as an emergency landing field. It is home to over two hundred Air Force personnel who take care of any planes and crews that have to land on the island under emergencies situations. The job was to dredge the harbor to create a larger turning basin. A channel went through the barrier reef and into the turning basin. It had a pier for ships to dock. There wasn't enough room for the ships to turn around and get to the pier. The Navy surveyed the harbor and determined that there were eighty-seven coral heads ranging from five to fifty feet in diameter in the turning basin. They wanted the coral heads blasted out to a depth a twenty-nine feet and six inches at mean low water. The contractor indicated the job would take three months. I said, "I'll see if I can get a month's leave. I can blast those things out of there in no time!" The contractor responded, "You get the job running during your month of leave and I'll get a crew out of Honolulu to finish it off." I got the month off and headed to the job with five sets of SCUBA gear and an air compressor. I had picked up a book on underwater blasting from Dupont, but it didn't help me at all. By trial and error, I quickly learned the size of the charge needed to blast the top off of the coral. If you used a big enough charge, you ended up with a huge hole in the bottom of the harbor, which wasn't our goal.

We rigged up a 12-inch by 100-foot long H-beam and filled the grooves with concrete so that it would weigh 110 pounds per foot. This H-beam was rigged to hang under a landing craft at exactly twenty-nine feet and six inches. The craft would cruise along and when the beam hit a coral reef, I would go into action and blast it out. I found that I could move more quickly by skin diving than by using the SCUBA gear. My legs were very strong and my ability to hold my breath allowed me to zoom down to set the explosives and zoom back up. I became so efficient with this system of blasting, using just the snorkel and fins, that I was able to go like a house-a-fire! I was able to finish the job in three weeks!

I had an extra week of leave, so I trained some of the Air Force guys in SCUBA diving and wound up selling all my SCUBA gear to them for their recreation department. I worked extremely hard on that job, but it was a great experience and I had a terrific time. I was able to

take a few days to enjoy Honolulu with my wife, Maxine. We were given the keys to a red and white Ford convertible and had a wonderful time on the island!

Listening Devices Installation in St. Croix, the Virgin Islands

My next job was in St. Croix, the Virgin Islands. A contractor from Seattle bid on a job to install listening devices at a depth of 3,000 feet on a firing range near St. Croix. Once the equipment was installed, submarines from the east coast could go to the range to fire torpedoes. The instruments were to test the speed of the torpedoes, a practice similar to the testing performed at the Keyport Torpedo Range. I worked on the equipment with the contractor in Lake Washington, in Eastern Washington, before the job started in St. Croix. When the equipment was shipped down to the Virgin Islands, I took leave from the shipyard and Maxine and I flew down. My job was to transfer the equipment from one ship and rig it to another ship, which was to lower the equipment into the depths. Most of the time, I was working in fifty feet of water in an area infested with sharks. They would swim around on the surface in the area where I had to dive. While I was underwater working on the devices, I could look out and see eight to ten sharks at any time. From a distance, one of the sharks started slowly swimming toward me, watching me the entire time, slowly passing by and then joining the group of sharks again. I was able to study the sharks during the job. I learned the sharks' patterns in their hunt for food. Like a seagull that located a fish, the sharks dove down and grabbed their prey.

I also came to realize that those who have been attacked by sharks, particularly in the surf, don't know that a shark is nearby. They attract the shark by slapping their feet while swimming, and it attacks. National Geographic did a story on sharks off the coast of Florida and Mexico and showed that divers can swim right up to them without being attacked. If the shark is not hunting for food and remains unprovoked, it will not attack.

In speaking to the photographer who filmed the movie *Jaws*, I learned that in order to get the shark to attack him in the underwater cage shown in the movie, they took ground liver, placed it in a porous sack alongside the boat and dragged it in the water. Once the scent of liver had its attention, they lowered the cage, which had a hindquarter of beef in it, and the shark attacked it violently. People believe that all white sharks will attack in this manner. They do not. The shark in the movie was provoked into a feeding frenzy. Unfortunately, the public is frightened by that representation and believes it as real.

Diving School in Key West, Florida, 1956

In 1956, the shipyard gave me special permission to attend the Underwater Swimmers School in Key West, Florida. There were forty-nine people in my class. I was the oldest, at age forty. Every morning, we would run four miles before breakfast. Then, we would get our diving gear and

board a landing craft, which took us out a mile into the ocean. We'd have to swim back to shore. Each night and every morning, I would strengthen my legs and abdominals by doing five hundred flutter kicks off the foot of my bed. I was in much better shape than the others in the class. I knew how to swim and had the strength and endurance to do it.

Teams were set up for a navigating exercise and I was partnered with an eighteen-year old named Brad. Our mission was to swim underwater at a distance of a mile out from shore. Using a compass, we were to find our way to three contact points that were anchored on the bottom with a buoy marking them topside. Halfway up the buoyed line was a sign-in board, which we were to sign with our team number. Our number was nineteen. The teams had to swim underwater to each station, sign in and move on to the next.

I told Brad, "We are going to be the first guys to those stations because if all of the teams get there at the same time, it's going to be a crazy mess!" I told him to stay right on my back. "I'll navigate and get you there, but you need to follow me because I'm not looking back for you," I said. He stayed right with me. The little devil did a really good job! Of course, since we were always the first to shore, we were the last team off the boat for the exercise. I took off quickly to the bottom while most of the guys descended gradually. We made it to all the stations and to shore, beating the rest of the teams. The skipper in charge of the school had built a fifteen-foot tower on the beach so that he could watch swimmers who might be in trouble or might try to cheat by coming up to the top. During the navigating exercise, a group of Germans was visiting the facility. Later, one of the Germans told me that the skipper said, "Watch, the old man is going to be the first guy in on the beach," and I was!

After I completed the school, the skipper of the Underwater Swimmers School wrote a letter to the Admiral of the Shipyard, telling him of my performance and how well I had done at the school. Soon after, our hometown newspaper wrote a story about my accomplishments. The fact that I had done so well, at age forty, was featured in the article.

YMCA SUBA Classes and Rescue Squad

Shortly after the Underwater Swimmers School, I started to teach SCUBA lessons at the Bremerton YMCA. SCUBA diving was new and a lot of people were interested in learning the sport. I also taught students from Olympic College for credit, as part of its physical education program.

I also trained a rescue team of divers that went all over the State of Washington to recover bodies from lakes and rivers. We were called at all hours to assist in finding drowning victims. We would then turn the body over to the proper authorities. Over an eight-year period, I volunteered my time and equipment for such searches.

Once, two or three planes went down off Whidbey Island in deep water. They were never able to recover them and determine the cause of the crashes. When a fourth plane went down near Lopez Island in about 150 feet of water, they wanted to recover the engines, for study, and the bodies, of course. The Keyport Navy divers went up to work on the search but came up with nothing. The shipyard sent us there with our sixty-foot diving boat, which could endure the bad weather we were having. With a combination of SCUBA and hard-hat diving gear, I was able to tie onto the engines and pull them up. We also recovered the bodies. With the engines recovered, they could do the testing that would help them discover why planes were going down.

Transfer to Superintendent of Salvage Office as Ocean Engineering Specialist, 1966

In January 1966, I was transferred from the Bremerton Shipyard to the Supervisor of Salvage Office in Washington, D.C. as an ocean engineering specialist. When I first arrived, I was on the crew that inspected our Navy yards. I discovered that many of the shipyards were in poor condition. My specific area of inspection was the tugboats and barges. The first major job I was given was a submarine, the USS *Tarrow*, which sank at a pier at the Mare Island Shipyard. The sub sank on the swing shift and the Supervisor of Salvage Office called me in to take over the project. The conning tower was all that could be seen of the sub. We closed off the main deck hatches after the cable and electrical wires and hoses were taken out. My suggestion was to use the submersible pumps, which could be dropped through the hatch, and pump the submarine out. The submarine personnel wanted to blow it out, as you would do if the sub were in deep water. I was against that. You just never know what might happen if you blow like that. I tried to tell them that by pumping out the water, you could things and have control of the situation. We dropped the three-inch submersible pumps down into the sub through the conning tower and began pumping out the water. To assist in lifting it, we hooked a big wire onto the back of the sub and also attached a floating crane. We slowly pumped the crane with air as we pumped out the water from the sub. The submarine popped up to the surface with no problems. I went inside the boat and couldn't believe the sight. The muddy old Napa River water had settled all over the instruments in the control room and throughout the sub. It was a mess. Our job was to raise the sub and put it in dry dock. We had the sub in dry lock in three days. The project was a success and due to my work, I received a new title, the Senior Salvage Master for NAVSHIPS. I was really happy about that.

Saving the *Alvin*, Woods Hole, Massachusetts

The *Alvin* was a small, two-man submarine that belonged to the Navy Research Lab operated by Woods Hole in New England. The researchers were putting the *Alvin* in the water 135 miles offshore, in deep ocean, off-the-shelf territory. The waters were very rough and a huge wave came up and hit the sub as it was being lowered. The two researchers got out in time, but the hatch was open when the sling broke. The sub sank in 5051 feet of water. The Navy tried, unsuccessfully, for ten months to salvage the sub and had given up. I talked to my boss about

letting me work up a plan of salvage and was given the approval. The first thing I did was have the surface ship, the *Mizar*, converted to handle the lifting of the *Alvin*. The work was done in the Boston Shipyard. My plan of salvage was to use another small submarine, which would drop a toggle down through the open hatch. My one concern was determining the size of line to use. I wanted to use the smallest line possible so that it was easier to maneuver, yet strong enough to handle the weight. A study group of engineers from NAVSHIPS and a civilian engineer from Ocean Systems worked on determining the issue of line size. I also enlisted the assistance of a young kid, who was a computer expert, from the Naval Research Lab. He was attending to the University of Michigan. In the conference room of my office, I gathered all the people working on the problem of line size. The engineers from NAVSHIPS and Ocean Systems all reported that they had not yet figured out what to recommend and needed more time. The young kid from Naval Research spoke up and basically laid out all the options of line size and how to determine the results of load on the line. I had never worked with computers prior to that but decided to go with his recommendation.

I then worked up a line and toggle that hooked onto the small, seven-man submarine, the *Aluminaut*. The *Aluminaut* spent thirteen hours on the bottom and accomplished nothing. It was a great disappointment. Then, bad weather delayed us for a week. While back at the base in Woods Hole, I discovered through conversation with some of the seven-man crew that utter chaos reigned among them during the thirteen hours underwater. The operator was totally confused as to what to do. There were continuous, contradictory commands from the sub crewmembers. Knowing what had occurred, I decided to work only with the submarine operator. I would control the topside operation and he would control the sub and operations below. It was agreed that he would take commands only from me. We went back out after the weather cleared. The *Aluminaut* went down and dropped the toggle bar down the hatch. We picked up the *Alvin* and brought it within a hundred feet of the surface. Because the sub weighed so much, we needed to get a hard wire on it before the toggle nylon wire stretched. At that point, I dove down, secured the hard wire and attached it to the *Mizar*. We then brought the *Alvin* closer to the bottom of the *Mizar* and hooked big rubber pontoons to hold up the sub. Each pontoon had to carry 8.4 tons of weight. One was secured to the sub and another at a lower depth, below it. If a pontoon blew, the next would catch and hold the boat. The system worked well and we started towing the sub to shore at about two knots. We had 135 miles to travel to the harbor area. Every morning and night, I dove down to inspect the pontoons and lines. We brought the sub into the harbor and had a floating crane pick it up and place it on a barge that would take it into Woods Hole. As a result of our success on the project, I was given an award.

The Azores Project

Seven countries were involved in a United Nations project near the Strait of Gibraltar. They were Canada, Britain, Germany, France, Spain, Portugal and the United States, which furnished most of the finances. My part was to fix the mess that was left after attempts were made to place

instruments across the Strait to monitor submarines going in and out of the Mediterranean Sea. The piece of equipment weighed 74 tons dry. It was composed of a huge radar transfer chamber, such as you might see on top of a mountain, a 24-inch diameter screen, two 12-inch diameter screens and a cable that reached fifty miles to shore. The device was set on the bottom of the sea in 3,000 feet of water. It projected 125 feet up and rotated around, monitoring sounds. The instrument was originally placed on the bottom and the cable was hooked up. The contractor piled the leftover equipment on the pier and called it quits.

The problem was that the equipment never worked. Six months later, Admiral Zumwalt announced that the Navy would do whatever possible to put the device into operation. The admiral commanded that the salvage master be sent over, so I went to Paris for a conference on the project. I sat there listening to all the problems they had and what they thought they could do. One of the representatives asked who might be able to do the job. I said, "I'll do it!" The guy went crazy with excitement, jumping up and down! The job was mine.

On the way back from to Washington on the plane, I lay half-asleep and dreamed of all the things I had to do to get the job done. I decided to use the little cable-controlled Navy vehicle from San Diego. It was called the CURV III and had been built to pick up torpedoes that had gone down off the the San Diego area firing range. I asked the original builders of the CURV III to convert the vehicle to handle more detailed actions and to put a manipulator and long-range sonar on it. Then, I had it shipped to the Azores. My intent was to use the vehicle to retrieve the sonar instrument from the bottom. I designed a shackle that was hooked to the top of the device pad. I welded a piece of pipe over the shackle head and stuck a pin inside. Behind that, I placed an explosive charge. I pushed a button from the surface that fired the pin through and locked it into place. I was very pleased with that accomplishment, as we were then able to pull the instrument from the bottom of the ocean and next to the surface ship, the USS *Array*. We used pontoons to float it back fifty miles into shore. Once back at shore, the device was set on the pier and the electronics personnel refurbished it and made it operational. The fifty miles of new cable arrived at the dock. It was a two and a half-inch double-armored cable, piled on the pier. I had to coil it into the cable tank of the *Naubuc*. Twenty Portuguese men and one engineer worked on coiling the cable, as it would not lay down in a coil pattern. It would coil for a while, then kink up and become crooked. I ended up taking a large turn up the cable tank wall, tying the cable up with straps and changing the direction of the coiling. I changed its direction 26 times with the coils tied up on the wall each time. The British, who had built the cable, were on the pier. When they saw the cable tank coiling system, they said, "Man, you've got a bloody mess down there. You'll never get that cable out of there!" We headed out to sea and put that instrument on the bottom. Then, we started back to shore at a steady two knots, the cable peeling out of the tank as if it were coming off a reel. It was slick! The British couldn't believe their eyes.

I received a lot of credit from the Navy Department for the work I did in the Azores. About three months after the project was completed, I was asked to attend a conference at the Pentagon to explain how I accomplished the work. There were four people presenting on the project. I was the third presenter. I knew the job so well that I detailed every point and explained how each step was accomplished. When I finished, one of the 150 people attending the conference stood up and asked me where I had learned the trade. I replied, "Heck, I learned it on a farm in Missouri!" Well, that was kind of half the truth, but I did learn that when you go out to accomplish something, you stay with it and use common sense.

NASA Rocket Recovery

The National Aeronautics and Space Administration, or NASA, built a rocket package to carry camera and electronic equipment, which was worth one and a half million dollars at the time, to take pictures of an eclipse of the sun. In March of 1972, they fired the rocket package. It was rigged to shoot off an internal rocket to blow off the engine and the nose cone and leave the rest of the package to float down by parachute to the ocean, where a ship would pick it up. The internal rocket did not fire and the whole package dropped into the ocean about eighty miles off Wallops Island, Virginia, in 6,000 feet of water.

NASA called the Supervisor of Salvage Office. I happened to answer the phone. The NASA official told me what had happened and asked if there was any chance that the package could be recovered. I said, "It can be recovered if you have the funds to do it." He said, "I'll be right over." Naturally, the project had to be discussed with my boss, Captain Mitchell, who told the NASA official that we had a little submarine with search and rescue capabilities. Mitchell, however, would not commit to the project, as he didn't want to take on the responsibility. The official left our office and immediately called me and said, "You seem to be awfully confident that you could go out there and recover this rocket with the little cable-controlled vehicle." I said, "If you can give us a good location as to where this rocket is, I can assure you that we can go out and find it."

I put together a recovery plan and headed to Norfolk, Virginia, where all the NASA officials were establishing what had happened to the rocket. Taking into account the speed of entry, the depth of the water, and the current, which they said was four knots from south to north. After determining how long it would take the rocket to get to the bottom, the NASA Officials marked a place on the chart.

The Rescue of the *Pisces III*, a Little British Submarine

An Underwater Beacon off the Bermuda Diving Habitat

At Mare Island: A Decommissioned Submarine Moved through the Bridge to Fleet Reserves

The Salvage of a 512-foot Ship to Save Channel Shipping on the St. Claire River

Saving the USS *Tecumseh* from the Battle of Mobile, Alabama

Consultant for Crawley Maritime

Salvaging the *Patrick L*, a Ninety-foot Fishing Boat

Conclusion

To sum up, I did a lot of salvage jobs. I completed every salvage job that I started. I did not have one failure, which is unreal in this world. When you look at history, you see how many salvage failures have occurred. No one stayed in the salvage world like I did. I learned different jobs by using common sense and was able to accomplish every one that I set out to do. I have a great plan to salvage the *Tecumseh*, but because of politics and the lack of financial support, the ship will not be salvaged. I know that ship very well and that I could salvage it.

UNDERSEA & HYPERBARIC MEDICAL SOCIETY

INTERVIEW OF EDWARD AUSTIN KOTH

Kensington, Maryland

Thursday, September 4, 2003

PROCEEDINGS

INTERVIEWER: I'm at Navy Special Clearance (NSC) Team One with EM3 Edward Koth, a SCUBA diver with the Mark 8 Marine Mammal System. How long have you been in the Navy?

EM3 KOTH: I've been in the Navy four years.

INTERVIEWER: This is your first command?

EM3 KOTH: Yes.

INTERVIEWER: You said you were a SCUBA diver, right?

EM3 KOTH: That's correct. I came here as repair, just turning wrenches. Then, I went to dive school and transferred to mammal.

INTERVIEWER: Where did you go to dive school?

EM3 KOTH: They came out here. The people from Hawaii brought some instructors out here and they taught a class of us. There was about seven of us from this command who went.

INTERVIEWER: That's great. Did you go through any additional training to work with the mammals?

EM3 KOTH: No.

INTERVIEWER: What system were you assigned to?

EM3 KOTH: I'm not assigned to a certain system. At the time, we had a dive crew. We were called 'whiskey divers.' When an animal takes a mark away, it has to put it a certain distance away from the mine. Then, as a dive crew, we dive down and come back up and tell the handler who has the primary handle on the system and how far away the animal was from the mark.

INTERVIEWER: Explain how that works. How does the animal mark the mine or the mine shape?

EM3 KOTH: We get what's called a 'pinger.' When you are going through the minefields and the animal sees what it thinks is a mine or an obstacle underwater, it will pop up and the handler will know, through certain communications with the animal. It will give what we call a pinger or a marker. It sends off a signal. Our dive platoon can pick it up on some of their instruments. He will have the bite plate on it and the animal will bite it, take it down and place it next to what it

thinks is a mine or a shape that we deem as dangerous. Then, it will come back to the boat and you continue on to the minefield.

INTERVIEWER: How soon after the animal marks the mine do you go down and check?

EM3 KOTH: It's almost instantly. Right when the animal takes the mark to the mine, a buoy will pop up that's attached to the pinger itself. I would say that within a couple of minutes after the dolphin marks it, we check. Once the dolphin starts coming back from dropping the mark, we go down on the mark.

INTERVIEWER: You don't wait for him to mark every mine. For each mine you go down and verify?

EM3 KOTH: Yes. This is all for training purposes. If we were to do this in a real time scenario, we wouldn't be there because they would be going tactically into a minefield. So, obviously, we wouldn't be there. For training, we shadow the work boat that has the animal and every time they drop a mark, we come back up and tell the handler the distance and stuff like that.

INTERVIEWER: You tell them so that they know the animal has done it correctly?

EM3 KOTH: That's right, and they can give him the reward that is necessary.

INTERVIEWER: The animals wait for that reward?

EM3 KOTH: That's exactly right. The faster you are, the better it is, because as smart as dolphins are, they are still animals and they will forget why they are waiting there. They are trained to wait next to the boat, but they'll get bored or preoccupied and want to take off and they'll forget why.

My job has a lot of bounce diving. It's a lot of up and down. Some days, we can do 25 to 30 dives. We work all four animals, and each animal will take eight or ten marks, which isn't unlikely in a minefield. We try to train them every day. There is a lot of up and down. We don't really go that deep. It's very shallow water. We rarely go down to the depths of forty feet in shallow water.

INTERVIEWER: It's tough on your ears, though.

EM3 KOTH: Yes, there are a lot of ear problems. But luckily enough, we have enough guys who dive, so we can split it up.

INTERVIEWER: How long have you been doing that?

EM3 KOTH: I have been in Mark 8 mammals for about a year and a half now. It's been roughly a year and four months.

INTERVIEWER: Since you don't do that reinforcement in a real operation, what kinds of things were you doing when you went over to Iraq for Operation Iraqi Freedom (OIF)?

EM3 KOTH: When I was over there, we were pretty much attached to the USS *Gunston Hall*. We would help out in well deck operations and also do watches and stuff to help the animals and anything else that the handlers and the rest of the team needed. You need guys to help. We would pull the animals for medical reasons, for sonograms, for instance, and make sure they are doing well, and take blood. You need someone to hold the animal down. We just helped with basic needs for our platoon.

INTERVIEWER: On the *Gunston Hall*, you had a well deck and the animals were in there in pools, right?

EM3 KOTH: That's correct.

INTERVIEWER: How do you get them out of the pools? Do you put them into a boat or do they go right into the ocean?

EM3 KOTH: They go into a boat. We have what is called a 'beaching cart' and it has a net on it that the animal beaches in and out of. I guess it's about 4 feet tall. It's on wheels, like a big cart. The animal will beach up onto that cart and we close the mat up, which is called a 'beaching mat.' We close the mat up and we roll the cart next to the boat that's on the well deck. Then, the animal will beach into the boat from the cart. The boat then gets marched off the well deck and gets transported into the minefield.

INTERVIEWER: The process is reversed when they come back.

EM3 KOTH: That's exactly what happens for the first one to come back in.

INTERVIEWER: So, you didn't join the Navy to work with mammals?

EM3 KOTH: No. I didn't know that this billet actually existed until I came over here to the VSW. That's what it was called at the time, or NSC Team One. I had heard about it. I just wanted to dive, to tell you the truth. I heard something about whiskey diving and the mammals needing a crew for diving. They were short divers. I put in my package, or I put in a request chit to get transferred from repair, from first lieutenant over to the mammals and it got approved. I've been here ever since.

INTERVIEWER: Was that a good decision for you?

EM3 KOTH: Oh, it was an excellent decision, because it allowed me to get changed to an EOD detailer. My EM detailer dropped me and I was taken as a mammal handler by an EOD detailer. Since I'm getting ready to go to UE school, it made it a lot easier for the transfer. I didn't have to go to my EM detailer. I got to dive every day and I love to dive. It was great. On top of that, I got to see how these systems work, how these animals work and how the Navy uses them. In our minds, they're pretty much the best thing the military has right now.

INTERVIEWER: It's pretty impressive how quickly they can clear an area.

EM3 KOTH: Yes. I think that in the past, we have been about 95 percent effective, which is pretty good.

INTERVIEWER: Is there anything else about that OIF deployment, or about your time here working with whiskey diving, that I should have asked about that I didn't?

EM3 KOTH: No. In OIF, my deployment was split in two. I was on the *Gunston Hall* for about a month. Then, we went forward to Kuwait. The problem with being on a ship with those twenty-foot pools is that you can't keep an animal in there for too long because of its attitude. They start to get depressed and their attitudes start to go down and they start to slip. Medically, it starts to become a problem.

INTERVIEWER: How's that? Is it stress-related?

EM3 KOTH: Yes. Well, there are two dolphins in a twenty-foot pool. Since they have been moved halfway across the world, they are really tense. Some of them don't sleep very well in the pools. Since they are so confined, they hate going in and being in there. They're still trying to

figure out a way to make it positive for the animals. But right now it would be like putting you in a closet for a month and then letting you go out on the town but telling you that you have to come back, you know.

INTERVIEWER: That's exactly how BM1 Robinson described it.

EM3 KOTH: It's the same thing. That's how it is. We saw it when we were on the *Gunston Hall*. The animals' attitudes just started to slip away. They didn't want to work. They were really lackadaisical. They were really lazy. They didn't have the energy they would normally have. We moved them off of the ship and got them into Kuwait in Miller pens, which was a lot better because those pens are much bigger. It seemed to definitely help the animals a lot.

INTERVIEWER: A couple of the animals ran, right?

EM3 KOTH: Yes, we had two animals run. One of our animals ran and another one ran when they were in Umm Qasr. Now, it's just a perfect example of the animal not wanting to come back, you know. It stayed in the general area. It's not like it went anywhere far. It stayed within our box and every couple of days we'd see him. He'd come back to us and let us know he was around.

INTERVIEWER: He just didn't want to go back to the boat?

EM3 KOTH: He just didn't want to go back to the boat.

INTERVIEWER: He wouldn't be the first sailor.

EM3 KOTH: That's right, exactly. He wasn't the first one that went UA. But it was interesting to go into Kuwait. The only thing I would say is that right from the get-go, you've got to get these animals out of those pools and into somewhere, like Kuwait. That should have been done right away. They sat on a boat for over a month, some for like a month and a half, you know. It's just not healthy for the animals.

INTERVIEWER: It's hard to explain to the animals about operational necessity, huh?

EM3 KOTH: That's right, exactly. I didn't know what was going on. I was just there to do my job. But there are a lot of lessons learned. It also has to do with effectiveness, you know. The animals aren't going to be as effective if as they could be if they are cramped in the pools.

INTERVIEWER: Are you glad you went?

EM3 KOTH: Oh, yes. It was a really good experience, an incredible experience. I didn't make it up north. We stayed in Kuwait and didn't make it up north. But just seeing a different culture and a different people was pretty incredible. Just being part of the whole operation was great.

INTERVIEWER: Did you get many VIPs or distinguished visitors come in and see the mammals while you were in Kuwait?

EM3 KOTH: Yes. We had a lot of them. It seemed like every day we would have some Kuwaiti family, some ambassador or somebody come down and check them out. It's pretty cool to have civilians come down and actually see, first hand, what we do with the marine mammals. There are a lot of rumors out there about how we abuse them or something. These dolphins live a lot longer than dolphins in the wild because they are kept so well and stuff like that. It's good to see civilians come down and get rid of some of those myths. That was my experience of a month on the boat and a month in Kuwait.

INTERVIEWER: Is there anything else we ought to talk about?

EM3 KOTH: No.

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UNDERSEA & HYPERBARIC MEDICAL SOCIETY

INTERVIEW OF DR. EDWARD THALMANN

P R O C E E D I N G S

INTERVIEWER: Go ahead. Identify yourself for the record.

DR. THALMANN: It's Ed Thalmann being interviewed by Dick Vann on the 2nd of May, the deuce of May, 2003.

INTERVIEWER: What are the date and place of your birth?

DR. THALMANN: My date of birth is April 3rd, 1945; my place of birth is Jersey City, New Jersey. Well, we're going to start the interview, and as they said in Alice in Wonderland, we'll start at the beginning, and when we get to the end, we'll stop. My first shot at joining the Navy was actually as an undergraduate, and I was rejected summarily because of my heart murmur, which I've had since birth. It has provided no physiological limitation, but back then, nobody knew what to do with it, so they decided that I should become an invalid. Why I picked the Navy, I don't know. In grade school, I fantasized about the Air Force, but it very rapidly became obvious because of my heart murmur that was a non-starter. Growing up around the shore, I had a natural affection for ships, so that was probably why I picked the Navy. At any rate, that didn't work, so when I got to medical school, I heard about the senior medical program. The Vietnam draft was still on when I was in medical school, and when I graduated, the deal was if you had two arms and two legs, you were in no matter what. If you could walk and talk, you were good enough to be drafted.

INTERVIEWER: Give me some years.

DR. THALMANN: I graduated in 1970, so it was in 1968. I decided that it would be better to enlist than to get drafted. I applied for the Navy senior medical program,

which basically commissioned me as an active duty ensign for the last two years of medical school and paid me an ensign's active duty pay, allowed me one year off to do my internship, but then required that I come back for a minimum three-year tour after the internship.

As part of the program, which I think it was called the Ensign 1915 program, I got a dream sheet in the mail one day. It read, "Welcome to the Navy. We have many interesting things you can do," and it listed them. "Why don't you fill out this piece of paper and tell us what you'd like to do in order of priority?" At the time, being interested in ----, my number one priority was to join a forward, what you would call a casualty hospital, with the Marines. I listed that as number one, which was probably a suicide wish, and for number two, I listed undersea medicine.

As a high schooler, I did get interested in SCUBA and had a SCUBA tank. I had done zero dives, because in New Jersey, there are not a lot of places to dive and --- Bay was kind of muddy. You'd go down there and couldn't see anything. But I was interested in diving, so I signed. I was interested in sea hunt, so I put that as my second [third] choice.

Little did I know that the Navy was more interested in getting submarine medical officers than sending guys over to Vietnam, because Vietnam was winding down, so they gave me my second choice and told me I was going to go to sub school, which sounded kind of interesting. After I completed my internship in Montreal, I found my way to Albany, where I filled out a whole bunch of paperwork and was formally inducted into the Navy and told to report to New London, Connecticut, no later than 30 June 1970, I think. I went to New London and went through the course.

As part of the courses, the first big decision was where you wanted to do your dive training, and you could either do it in New London or at the dive school in Washington. However, they did point out that there were certain billets that were only available to individuals who trained in Washington.

INTERVIEWER: Just double-check this.

DR. THALMANN: You're hindering my spontaneity.

INTERVIEWER: Sorry. You were on a roll. I'm sorry about that. Go ahead.

DR. THALMANN: The deal was if you went to D.C., you could get any billet. Having gone to medical school at Georgetown University, going to Washington didn't seem like a bad idea considering they were going to pay us a whole \$25 a day. Plus, we were going to drive down and get mileage. Off to dive school in Washington I went with a class of about ten other guys.

INTERVIEWER: Did you have the choice of New London or Washington?

DR. THALMANN: Yes. You had the choice of New London or dive school, and I decided I wanted to go to my dive training in Washington. Then, I would be eligible for any billet.

At that time, the experimental diving unit was right in back of the dive school, and there was one door between them, and it went through the sick bay. The only other way to get from one ---- was to go outside the building and actually walk around it. But if you went to the sick bay and opened a door, you could go through. There might have been another door down in the machinery room. I don't know. But as part of dive school, we made a tour of experimental diving unit, which at the time, was busy upgrading its chambers to 1,000 feet. I looked around, and it looked pretty interesting.

I got the number billet two choice because I had the second highest grade in the class, and your choices of billets went in order of where you were in the class, so the top guy got to pick first and the second guy got to pick second. At that time, we just got to pick our subs, so I initially picked one out of Holylock, Scotland, because I had a cousin who was living in Scotland. Then, one of the other DMOs there gave me a big sob story and song and dance. He plucked my heart strings and convinced me to swap with him, so he got the boat in Scotland, and I took one out of Spain. It turns out he spent his whole tour in the yard, which from what I heard was much more miserable than actually being on patrol.

I got assigned to the USS *Thomas Jefferson*, and I got pulled out of sub school in November, a month early, because the medical officer who was supposed to make that patrol had an injury or was not physically qualified, so I missed the last month of sub school. To this day, I'm not sure what I missed, but it must have been something.

I did my first patrol, which was semi-interesting. I learned to sleep 18 hours a day, which is what all good medical officers do on sub patrol. I eventually qualified as a diving officer, which was pretty interesting, having to learn all the ins and outs of how a nuclear submarine worked. It was fun to get to drive one for a little while and hit that horn and dive. I became totally bored with the whole thing and had a couple run-ins with the XO which evidently angered the commanding officer, a guy named Jack Garney to the point to which he eventually made admiral and I evidently got a couple of crappy fitness reports from him. Those came back to haunt me later on. But the ultimate was that this guy was in great shape, such great shape that he died of a heart attack while running around the base one day.

INTERVIEWER: That's the way to go.

DR. THALMANN: Between my first and second patrol, I was angling to decide what I was going to do after my second patrol, and my first choice was to work at the emergency room in New London. I was really interested in casualty emergency medicine at the time, but I found out all those billets were spoken for. I poked around some more and found out that the experimental diving unit billets weren't taken, and I looked at them again and decided they were of interest. I made a trip to Washington and talked to Bill Spaur, who was the senior medical officer at the time. I told him I was interested in coming there, and having had some pretty solid credentials from my undergraduate internship in science and engineering. My undergraduate education was at RPI, which is a science and engineering school, so even though I graduated with a degree in biology, I had a math, science and chemistry background. It was a basic science background, which appeared would be of use to medical officers.

It turned out that before I went on my second patrol, the word went out that there weren't enough medical officers to go around, so you might have to make a third patrol. Of course, that had everybody up in arms, but we were gently reminded that the deal for two patrols was only if the needs of the Navy could be met, and they managed to remind all medical officers what happened if they didn't follow written orders. I went out on my second patrol not knowing if I was going to make a third patrol. But halfway through my second patrol, I got the word that I was not going out again because they evidently made the decision that they were just not going to put medical officers on board boomers anymore. It really didn't do them that much good, and an independent duty corpsman would fit the bill. I kept reminding my detailer, who at the

time was Ben Hastings, and his able assistant, who was a dive school companion named Ken Bayway, that I wanted to go to NEDU, which was the way it worked. If you didn't do that, they kind of forgot and sent you wherever they wanted, but they did send me to NEDU.

INTERVIEWER: The length of your tour on the *Jefferson* was two years?

DR. THALMANN: No. It was two patrols.

INTERVIEWER: How long did that take?

DR. THALMANN: Well, the first patrol ended in February, and then we were new on it for three months. The second patrol was three months, and at the end of the second patrol, I got relieved. I was actually on board the submarine for nine months. Right after I finished my second patrol in September of 1971, I went off and got married in Newfoundland. I remember when I arrived at NEDU, they were busy putting arterial catheters in divers as part of these physiologically based measurements to determine adequacy of underwater breathing apparatus. What you really wanted to know was the arterial CO₂ partial pressure. They asked me if I knew how to put catheters in, and I said yeah. I spent three months in the cardiovascular service, so I had some experience in sliding arterial catheters in.

Shortly after my arrival, I found myself on the bottom of the ED web pot ----, where there was a big fiberglass water tank called 'the ark,' in which the diver sat on a bicycle, ascended his arms through the wall of the arc, with rubber sleeves so that his wrist was outside. The arterial catheter was placed before he got in the water, and once he fit his arm through, we hooked it up to a little sampling thingy.

INTERVIEWER: Who were the other medical officers there at the time?

DR. THALMANN: Well, Bill Spaur was the senior medical officer. There was a guy named Caruthers, John Caruthers, who made the 1600 foot dive, and Taylor [name?] a year and a half later, and a guy named Brandon Wright, who was a Lambertsen protégé who eventually, tragically, took his own life because of personal problems unrelated to the military. That was it. There were four of us, generally. Brandon Wright eventually left, and a guy named Bill Braithwaite came. I take it back. Braithwaite was there initially. It was John Caruthers who replaced him because Braithwaite was brought in so that NEDU could put in and get approval to get a computer. Back in that time, a computer was a big deal and required years to get approval. They were going to get a PDP-12, a deck PDP-12. Braithwaite was brought to ED specifically because he had a very heavy computer background. He eventually went off to the medical informatics department in Denver, at University of Colorado, I think.

INTERVIEWER: That was out of the Navy?

DR. THALMANN: That was out of the Navy. But in absolutely predictable Navy timing, the whole thing was arranged. As the computer was going in the door, he was going out at the end of his tour. But he was there long enough to help get the computer set up at least, and he taught me about computers. At the time, the only computer-literate guy there was Tom Berghage, who tapped into the National Institutes of Health computer and seemed to be totally uninterested in the deck machine. Well, the deck machine came with a bunch of training credits, and since I was the only one interested, I got to spend over the course of the next year, six weeks in Maynard, Massachusetts, learning everything there was to know about the PDP-12.

INTERVIEWER: That's what I use here.

DR. THALMANN: Right. Before I left for Maynard, I just went to the library and grabbed a bunch of self-teaching manuals for Fortran. While I was in Maynard learning assembly language and stuff, I taught myself Fortran.

INTERVIEWER: They taught you assembly language?

DR. THALMANN: Oh, yeah, it was assembly language. It turned out that when I got back, we eventually got a Fortran compiler site and used very little assembly language.

But I had learned enough Fortran to be dangerous. As a self-imposed project, I grabbed the report that Bill Braithwaite had written. I think it was "A Cookbook Method For Computing Dive Tables," which was basically based on the Workman 665 report. He just systematized it.

INTERVIEWER: That was the HEO-2 tables, was it not?

DR. THALMANN: No. It was air. It was the Workman M-Value report. But Bill just systematized it. He had never written a program to compute the tables, so I took it upon myself to program the computer to compute Navy tables. I got the pertinent ED reports out and programmed in the pertinent equations and computed the first of the dive tables, which didn't look much like what was in the dive manual. I read the reports more carefully and found that while the tables, indeed, had been computed by a computer, a Univac at the David Taylor Model Basin, there was a lot of hand diddling. To make a long story short, I eventually figured out most of what the diddling was and came up with a set of M values that I called M valve 0, which did a pretty good job of computing the Navy tables as they appeared in the manual at the time.

INTERVIEWER: The Navy tables were computed, but they were also tested?

DR. THALMANN: Yes.

INTERVIEWER: Now, when an individual table failed, or in other words, had too many bands and six trials, were the whole set of tables recomputed to a new standard to get around the particular hit that occurred, or was just that one particular schedule that got hit diddled?

DR. THALMANN: At the time, I wasn't paying attention to that. But eventually, I wrote a paper on the history of the Navy air tables, in which I went into that in some detail. It was not a hundred percent sure, but in the first go around they recomputed all the tables, and in the second go around they just computed the tables that gave them problems. They only tested tables that gave them problems, so I think they got it down to six schedules. They would dive these things with only three or four guys. But at the end, I think, and this is where it is unsure, they recomputed the whole thing again, and it was not sure. I have written this all down in a presentation I made at a Navy workshop on air tables.

INTERVIEWER: Was that ever published?

DR. THALMANN: Well, Mike Curley, who's retired, is busy writing it up. But it turned out that I was supposed to basically edit what I said, and rather than edit what I said, which is just ----, I turned around and smoothed it into an actual paper.

INTERVIEWER: Where is that now?

DR. THALMANN: Well, he says it will eventually be published an addendum. I need to turn around. I think I can get it published at UVR. In it, I detail as much as I can gather from the reports and exactly what happened with the air tables. The bottom line was that they could not all be computed exactly, even taking into account affairs from the M values.

INTERVIEWER: Was that because some of them were manually adjusted?

DR. THALMANN: I think so. I think some were just manually adjusted. They just went in and empirically added five minutes here and five minutes there, yeah. But the point is that it was a method by which I learned to use the computer to program Fortran, making up these dive tables. Eventually, I programmed so that I could either put in the depth and time and get a schedule, or I could have it print out a whole set of tables. And reasonably using the PDP-12, actually depth enough to be able to read the blueprints and do minor repairs.

The first project I was given had to do with a 1600-foot dive. Initially, Bill Spaur thought I should be a subject on the dive, but when the question of my heart murmur came up, we decided the best thing to do was to keep a low profile on that and not have me be a subject. To be a subject, they would have had to get a waiver. He might have been right on that. He probably was right. At any rate, the first project I was given had to do with the fact that divers got ear infections on dives, and he wanted me to go to the literature and figure out if there was anything out there that could be done to prevent this. He also pointed out that ONR had spent a lot of money on guinea pig models of these ear infections in an effort to come up with some kind of a cure.

To myself to the library, medical school ---- Georgetown, being an alumnus, I was familiar with it, and ---- intimidating in the National Institutes of Health library of medicine, and I could also get right into the stacks without a bunch of bologna. I researched it and found an article in some relatively obscure journal about a doctor at a YMCA camp who figured out that an acid alcohol seemed to work well, and he eliminated swimmer's ear from the YMCA camp, where it had been pretty rampant

before. I went back and presented this to Bill Spaur. I wrote it up as a report. He and Brandon Wright reviewed it and had me in their office to assure me that I didn't know what I was talking about and that, in fact, the Navy had spent millions of dollars on researching this. Why was there some obscure guy who had figured it out twenty years ago when all these great brains who were now doing guinea pig models couldn't figure it out? I guess I got somebody mad and said, "Look, you sent me to find the answer. You didn't tell me what answer to come back with, so I came back with the best one I could find. This is it." They assured me that there was part of the Y report that the individual discovered, if the kids didn't leave it in their ear for a full five minutes, it didn't work well. I was also assured that there was no way Navy divers were going to take five minutes off to put the stuff in their ears. Well, my incredulity seemed to be worth something, because in the next deep dive we did, we tried this prophylaxis. It was the first ear infection-free dive NEDU had in the previous four years, so they reckoned they might have been on to something, or at least this doctor at the YMCA might have been on to something.

He wrote it up using the deep dive, and the rest is history. It's now a formal part of the diving that is used by the Navy for ear infections. Normally, you would be treating three or four infected ears during any given dive. It is now a thing of memory, and when they do occur, it's generally because the ear canal gets plugged up. But ear infections are no longer a major problem in diving in the U.S. Navy. It turned out that in those instances in which commercial diving companies tried to use it and failed, it was always because they couldn't get the commercial divers to leave it in for five minutes.

INTERVIEWER: You've got nothing but time when you get in the chamber. I would think that would be fairly easy.

DR. THALMANN: I guess those guys are all ----.

INTERVIEWER: They are unlike Navy divers.

DR. THALMANN: You can be a primadona, but you've got to be a primadona to follow those orders. Be that as it may, it's my legacy that I wiped out a disease single-handedly. I eliminated otitis externa from U.S. Navy dives. I don't know if that's up there with AIDS and SARS, but it's all I got.

INTERVIEWER: It's pretty close.

DR. THALMANN: It's close. Well, the Navy at that time was pushing for deep diving, and as part of it, we did a couple 1,000 foot dives in the Navy yard facility, and then we packed all our instruments up on the truck, went to New Orleans, to Taylor Diving and Salvage for a 1600 foot dive, which was really a big deal at the time. We had guys who were kind of unknowns at the time. For example, John Hallenbeck came by to do EEGs on our divers. A guy named Larry Raymond was chosen to be one of the medical officers on the dive. The other guy on the dive was John Caruthers, who had come in to relieve Bill Braithwaite.

I was just the junior medical officer on the outside. Well, it took us about two weeks to get everything set up, get all the wiring in. The day the dive went down, I kind of eased out of the ceremonies and went to one of the on-call rooms and went to sleep.

INTERVIEWER: You went where and went to sleep?

DR. THALMANN: They had on-call rooms with beds in them. I just went to sleep.

They were out there and had the divers. They were doing pictures, and there were speeches and stuff that didn't involve or interest me. Well, at some point during my nap, somebody rushed in, woke me up and said there were problems, so I went out to the control console. The divers had locked into the chamber, but it was all full of something in the air that didn't smell right, so they immediately vacated.

INTERVIEWER: Now, this was post-dive?

DR. THALMANN: Well, I'll get into the details. The Taylor chamber was basically a vertical wet pot and a horizontal living chamber. What they had was an automatic depth control system. We wanted to put the vertical wet pot where all the instruments were, at depth, the night before and let it sit overnight so all the instruments would stabilize. And the next day, the divers were supposed to come into the living chamber and simply compress to the first depth, I think, which was 300 or 400 feet. I forget. It wasn't very deep. We were going to go down in stages. A problem arose.

Well, it turned out that for some reason, and it may have been miscommunication, a Taylor guy was taking the vertical wet pot and sent it down, so then we got the tape changed. At any rate, the vertical chamber had gotten deeper. When we came in, in the morning, it was deeper than it was supposed to be, so they brought it back up to where it was supposed to be, and then the divers locked down. When they went into it, there was this mist in the air. They looked inside the chamber and said it was all foggy and smelled funny. The word they used was 'funny.' We immediately went into the emergency mode and separated the chambers and got the divers back into the horizontal chamber, and they began an emergency decompression. They said they couldn't smell anything in the chamber, of course, but who knew?

While Spaur and Bill Braithwaite wrestled with the problem of how to get the divers back to the surface, I was dispatched to try to figure out what the contaminate was and if we could do anything about it.

Taylor had a mask gas there and an operator, who was pretty good, took a sample. Well, we surfaced the wet pot and went in and looked. There was a little squeeze bottle of Freon in there that that the technicians used to clean the pipes, the oxygen piping, and one of the bottles had been left in the chamber. The dip tube was below the surface of the liquid, so as the chamber compressed, of course, air went into the dip tube and filled the bubble above the liquid. While they were at depth, it was fine, but when they brought the chamber back to a more shallow depth, the bubble inside the bottle expanded and forced the liquid out the dip tube in a very, very fine stream, which atomized and filled the chamber with a large amount of fog. Well, we took some samples and verified that the only contaminant that was in there was the freon. There was a bunch of phone calls to Dupont, who cited some literature that they had had, but they basically convinced us that the Freon in and of itself was not harmful, so we didn't have to worry about any harmful effects to the divers.

We then dispatched a crew inside the vertical chamber with buckets of soap and water, and they scrubbed it from top to bottom. We compressed it and decompressed it a couple of times, and pretty soon we had the Freon well below the dangerous range.

At that time, we had a big conference that included the divers. We decided it was safe to go forward with the dive. The divers had only decompressed a couple hundred feet or so, so they went back to depth and latched up with the vertical chamber, and we began the dive.

During the dive, we had a UBA called a GE Mark 10, which was a constant PO-2 rig, and we did experiments looking at each PNS and balance, and Tom Berghage had his diver performance monitor, Sinbad. Actually, my main experiment, I recall, was audiometry. I was looking to see if there were any changes that I could detect. It was a reasonable experience. The Navy was pushing to go deeper and deeper at that time and pushed its saturation capability as deep as it could.

After several weeks in New Orleans, which has a lot of other stories associated with it that we don't need to go into, we reckoned the dive was a big success. A lot of the stuff got written up, and that was where we observed the peculiar feeling that the divers got while exercising at great depth, and we just instituted a whole bunch of other studies investigating that feeling, to see what its cause was. There were like half a dozen papers that came out of that dive, I guess. Plus, we showed that the Navy saturation procedures work well at 1600 feet.

INTERVIEWER: That means compression and decompression?

DR. THALMANN: There was some, but it wasn't random; it seemed to work okay.

INTERVIEWER: Did you have any hits when you decompressed?

DR. THALMANN: I don't remember. If there were, they were probably only a knee pain here or there. I actually don't remember. I've got it written down someplace, but I don't have it here off the top of my head. We went back to Washington, and things were fuzzy, but there was a lot of discussion over what NEDU should do. The chambers at the NEDU facility were only good to 1,000 feet, and we had just done the 1600-foot dive. The intent was to go deeper.

While doing a dive, Taylor reckoned that it was something we could do as

standard procedure. I then heard rumors that they were considering moving NEDU to San Diego, where the sat school was. Somewhere in there, Panama City came to our attention.

INTERVIEWER: Now, was this before the OSF?

DR. THALMANN: No. This was after. The OSF had been under construction for some years, and I forget when it started, but it was instigated by George Bond, and from the Man in the Sea program, and it was ----.

INTERVIEWER: That was totally separate, then?

DR. THALMANN: That was totally separate from NEDU. The OSF was to have nothing to do with NEDU. It was to be a totally separate facility run by the guys in Panama City. Yeah. The Man in the Sea program, I wasn't an expert in it, but with Barry Cannon's death, there was a lot of political stuff, and George Bond got put in Panama City.

INTERVIEWER: He was put to pasture?

DR. THALMANN: I think it was kind of a purgatory to get him. He had been appointed to a lot of highfalutin communities, but they wanted to kind of get him away from Washington, so he had been dispatched to Panama City. The OSF was supposed to be some kind of a simulation facility in which aquanauts would train and eventually go out into the real ocean and do wonderful things.

INTERVIEWER: Was that a follow on to SeaLab III?

DR. THALMANN: I don't know. I absolutely don't know. You'd have to ask somebody involved with SeaLab. I don't know how it meshed with SeaLab. As we all know, after Berry Cannon died, the whole program folded.

INTERVIEWER: Do you have any insights into the relationship of Panama City and sea lab?

DR. THALMANN: No. I came in well after SeaLab was underway, and you'd have to talk to someone else. I know little or nothing about SeaLab except what was written down. I had no personal interaction. At any rate, somewhere along the line, I guess it was decided that they were going to dedicate the OSF in Panama City and then mothball it because they had to let the contract finish, but they didn't set aside any operating budget. NavSea told NEDU to go have a look at that and see if that facility would meet their needs. I guess Colin Jones was the commanding officer of NEDU at the time. Then, he dispatched a guy named Don Chandler to go down to Panama City and see if the facility was suitable.

INTERVIEWER: Now, Don Chandler was a diving officer at NEDU at the time?

DR. THALMANN: He was an MSC Lieutenant at the time, and he was sent down to see if the Panama City facility would suit our needs. I was not privy to all these conversations. All I knew was from what I could gather by being there and listening to different people talk. But the bottom line was, yes, the facility seemed to have many of the things NEDU wanted, but no, it wouldn't exactly suit their needs. NEDU was instructed to go down there and look at it and try to get it buffed up so they could use it.

INTERVIEWER: That was in, what, around 1972?

DR. THALMANN: That was in 1972, right after the 1600-foot dive. I made several trips to Panama City with Bill Spaur and Bill Braithwaite to look at the facility, and it was about that time that Ed Flynn came back from Buffalo and ended up at NEDU.

INTERVIEWER: He had done an anesthesia residence in Buffalo?

DR. THALMANN: No. He did a two-year physiology post-doc. Some years later, he did his anesthesia residency at Bethesda. There was a political issue that commenced because the lab in Panama City, at that time known as the Naval Coastal Systems Laboratory, envisioned that NEDU would come in and provide the people to operate the OSF, but they, in fact, would be in charge of it and direct NEDU as to what should be done with it. Of course, NEDU had different ideas. They said, "Oh, we're our own command. We will be in charge of it. We will be in charge of diving it, and we will be in charge of scheduling it, and we will be in charge of it, period." A lot of political fighting went on to decide who was going to be in charge of the OSF, and at the end of the day, it was decided NEDU was. The lab had to get all their people out of there, and that was the end of it, although NEDU was instructed to work closely with the lab because NCSL was in the business of developing certain kinds of diving gear.

INTERVIEWER: Was George Bond still around at the time?

DR. THALMANN: Yes. We'd go down to NEDU. He was there, I'm not sure, six months or a year, and then he retired and went back to Bat Cave, North Carolina. At that time, we had begun to do these things called 'saturation excursions,' in which we were trying to develop tables. If a diver was saturated at some depth, how shallow could he go without getting bent, or if he was saturated at some depth, how deep could he go for a given time and still return to his storage depth? We had done a bunch of dives at NEDU North for that, and the first dives in Panama City were a series of sat dives to look at the saturation excursion dives. That was a project that was already in the mill and was suitable because it already had prescribed a bunch of dives at different

depths down to whatever. Bill Spaur had mapped out a plan at NEDU in which we would begin going deeper and deeper to the maximum pressure of the facility, which I think was 2,200 feet.

INTERVIEWER: Oh, so it was a plan to go down that deep?

DR. THALMANN: It was planned to go to that, yeah. They did a 1,000 footer, a 1200 footer, a 1400 footer, a 1500 footer and had culminated in the 1800 foot dive, which was the deepest set dive that they ever did in the OSF, because as we were pushing deeper and deeper, the politicians in Washington were fighting amongst themselves and eventually decided that the Navy's maximum depth capability only needed to be 1,000 feet, or something like that. I'm not sure what went on.

INTERVIEWER: What drove that decision? Do you have any idea?

DR. THALMANN: I have no idea. Nobody asked me. My first tour to Panama City was short, and the reason is that as NEDU was in the throws of deciding on Panama City, I had been accepted into a post-doc at Buffalo. The original plan was that I would finish up at NEDU in July of 1975, go to Buffalo for two years, and then come back to NEDU. Well, somewhere before 1975, and I'm guessing it was July of 1974, moving to Panama City became a fire drill, and all of a sudden it was very important to move down there at once.

INTERVIEWER: Now, this was Buffalo early then?

DR. THALMANN: No. This was before Buffalo. I had the program set up. I thought I was just going to mark my time in Washington until we go to Buffalo. But around July, Ed Flynn, Ken Miwah and I went to Panama City on a per diem, and after becoming somewhat suppressed at the housing prospect, stumbled onto Sugar Beach

Condominiums, which made our stay really great. At that time, Sugar Beach was one of the few condominiums on the beach. The beach was actually fairly vacant back then. Sears was downtown. There was one movie house that always seemed to be playing a Walt Disney flick. We began going through the throws of getting the medical department moved to NEDU. Miwah was due to get transferred.

INTERVIEWER: Spaur was still the SMO?

DR. THALMANN: Spaur was still the senior medical officer. Flynn had decided he didn't want to go to Panama City; he wanted to stay in Washington and made kind of a big fuss about it. In the end, he ended up going to the dive school.

INTERVIEWER: The dive school stayed in Washington?

DR. THALMANN: The dive school was in Washington. There were no plans at that time to move the dive school, as far as I know. When the smoke cleared in January of 1975, I guess I was the only guy from NEDU besides Spaur who was going to be there. Interestingly, just before NEDU decided to move, my wife and I had moved from an apartment in Arlington to a house in Burke owned by a co-worker of hers whose husband was going off for a year or two of post-graduate work with the Army Map Service. They had just bought this brand new house and were worried that there would be nobody there to look after warranty repairs. They initially got stars in their eyes when some realtor had told them how much money they were going to be able to rent this place for. When that didn't happen, the guy came to me and gave me the deal of a lifetime. Basically, it was cheaper than living in Arlington because he had to pay utilities and stuff. We had moved to Burke, and just after moving there I ended up going to Panama City. I left my wife up there by herself for six months. But I gave her

a puppy dog. That made all the difference, or so she says. I thought I was going to have to be in Panama City another six months, so I decided to bring her down. We packed all our belongings in a U-haul. We had no furniture of our own at that time. She spent six months in Panama City at Sugar Beach, which was very nice. We were finishing up the saturation excursion dive, and then I, in June or July of that year, left NEDU and went off to Buffalo.

Now, just before we had moved to Panama City, a couple of guys from the Naval Ocean System Center in Hawaii came by. I think one guy was Ron Siple and the other guy was Kirk Jennings. They had been doing a lot of work with these very small high position pressure.

INTERVIEWER: Ron Siple, was he an ex-fellow?

DR. THALMANN: I don't know. All I know is his name. At any rate, they had this idea of putting this device in a wristwatch and using it for a decompression computer, and they came by to see if they could sell it. We said, "Yeah, it looks great." As you recall, at that time, I had been learning to program the PDP-12 by trying to program the Navy dive tables. We were pretty much up on algorithms, or at least I was, that we could have used the Navy air decompression tables.

INTERVIEWER: What year was this now?

DR. THALMANN: This would have been 1974.

INTERVIEWER: That was the inception of the Navy dive computer?

DR. THALMANN: Yes. It was a long time coming. The bottom line was if you sent them off to NAVSEA and told them, "Look! Hardware!" and that NEDU could provide you with the software to actually compute the dive tables, they did that, and the

SpecWar community looked at it and bought off on it. At the same time, the Mark 15 was coming down the pike, which was closer to UVA, which really had no tables. I guess that originally, they were going to use equivalent air depths.

The details are fuzzy, but at the end of the day, NEDU was asked to develop a set of tables for the Mark 15 with the idea that this would provide the software for these guys to put into their decompression computer. But it was reckoned the tables would be useful in and of themselves, even if the decompression computer never came to be.

So I wrote a protocol to test the tables, knowing that I was going to be going off to Buffalo before testing actually started and that somebody else would have to actually do the testing. My job was to set up the software so they could compute tables wherever they wanted. The guy who ended up in charge of this was a Canadian exchange officer by the name of Buckingham, who managed to finagle a tour at NEDU because the Canadians were building the saturation chamber DCIEM in Toronto. He had saturation experience, so he told them that the way to do it was to send him to Panama City for two years to learn everything about sat diving. They also had a line officer down there, and the names come and go. I'm not sure who is the right guy, so I won't say. But they basically had an exchange line officer and an exchange medical officer. Besides that diving, Buckingham was given charge of the development of the Mark 15 tables. Initially, he recognized that these were tables that were going to be used to lock in the submarines. Having no experience, he wanted to lock out as deep as possible. Somewhere, 175 feet came up, and it was decided that this was a depth that would be used to lock in and lock out, and that the table should be tested to 175 feet.

Well, at that time, the only way to do it was to actually compute the tables, have the computer print them out and then give them to the operators and have the operators follow them as closely as possible. Of course, when there were delays during descent, that made for some messy compromises. But the other problem was that the divers were so narced at 175 feet, they didn't know which way was up, because they were diving at a .7 partial pressure and 175 feet is, what, six atmospheres, so they had six atmospheres of nitrogen on board. Nitrogen narcosis was pretty prevalent. Plus, they were having problems, as I mentioned, in compressing and accounting for delays and a whole bunch of other stuff. I made at least one visit from Buffalo to try to help out.

INTERVIEWER: You were at Buffalo by the time the dive series got underway?

DR. THALMANN: Right. I was only called when they absolutely needed help and there was nobody else to whom to turn. What became apparent to me was the problem in having the handwritten tables, because we were actually using computed tables at Buffalo. We were doing 190-foot dives to do physiology experiments, and some of these dives had the potential to go on for forty or fifty minutes. I think the schedules went from thirty minutes to an hour and then to an hour and a half. There were big jumps. I computed a whole bunch of intermediate tables using my HP 65 calculator. We had them in hot stand-by if we had to go over the thirty minutes allocated by the diving manual. It turned out that we only did that a couple times. We were using the calculation to some advantage to compute tables at Buffalo. It was obvious to me that one way to get around it would be to have the tables computed to real time. Therefore, besides doing the stuff I was up in Buffalo to do, on the side I was also figuring out

how to compute these tables in real time by using the PDP-12 computer. They had that and the Hewlett Packard computer down there. When I got back from Buffalo to NEDU, I got into the thick of things with these tables, the Mark 15 tables, which I had absolutely nothing to do with the research I did at Buffalo.

They basically moved my wife to Panama City in January of 1975, and we spent six months on Panama City Beach at Sugar Beach and continued with work at NEDU. That July, I went off to do a post-doc at Buffalo, leaving behind the decompression computer work, which was in the form of a bunch of software computer tables and printed tables and that was about it, with Eon Buckingham. He was working with some computer contracts at NCFC to not only run the program in the PDP-12, but in the control room they actually had an HP 1000, I think it was.

INTERVIEWER: Now, was that connected to the chamber?

DR. THALMANN: Yes. Well, it was originally connected to the chamber to monitor strain gauges for engineering purposes. At the time, I guess it could record depth, but it really wasn't used to do that. Once the requirement for the strain gauges went away, they pretty much relegated it, and it just became a stand-alone computer, which was kind of clumsy because it had a paper tape operating system.

I went to Buffalo, where we bought our first house, and actually had a good time. When I got there, Claes Lundgren was there, and as I understand it, he was on sabbatical from Sweden because Ed Lanphier had left, and they were looking for somebody to run the hyperbaric lab. But as I rolled in, he was scheduled to go back to Sweden and in negotiations with the university. He had a plan for doing some studies in the chamber involving looking at static loading and exercise, and there was a plan.

There was kind of an apparatus that was partially built, et cetera. When I got there, I was essentially put in charge of the whole hyperbaric lab, even though I was only a fellow. They had nobody else with any experience. The chamber eventually fell directly under Herman Rahn, so Dr. Rahn was kind of my boss, although he didn't mess around except for really big picture stuff, especially when he had to write a renewal grant.

INTERVIEWER: He was gone there for a good part of...

DR. THALMANN: He left within three weeks of my arrival. Then, he came back four or five weeks before I left. For that year and a half, he was negotiating with Buffalo. I don't think there was any doubt he was going to come back, it was just how much they were going to pay him and other things that I wasn't privy to. I found myself in charge of this lab, which had, I think, four full-time guys and a couple of part-time guys. Plus, there were peripheral investigators, like Mary Ann Rokitka, from the nursing school. She was our part-time chamber operator and log keeper. I'm not sure if we had one other person who wasn't in the lab full-time, but one who used to help out when we did chamber operations.

We set up the apparatus and booked a bicycle odometer box, the electric box, and we figured out how to get true entitle sampling at the great depth without mixing, and what precision we needed to analyze the gas mixes. It turned out that we needed to go out and buy volt meters with two more decimal places on them that came with the specification in order to get the precision we needed. All our gases were measured at one atmosphere, so we were at 190 feet, which is almost seven atmospheres.

The gas concentration was divided by seven, so we basically needed seven

times the precision in order to get oxygen consumption measurements at 190 feet, which would be in the same ballpark as what we were using at one atmosphere.

By and large, my time at Buffalo was taken up in building the apparatus and testing it and eventually gearing up to do the study, which consisted of a few subjects, one of which was myself. Another subject was a guy by the name of Ron Smith, who works over at the lab, and another was a graduate student named Dennis Sponholtz, who came into the hyperbaric lab when his interests changed. It turned out that the three subjects in the paper really all worked in the lab, so it worked out really well in terms of scheduling and other things. We didn't have to work around a lot of stuff.

Since I was a Navy undersea medical officer, I could also be medically responsible for the whole operation, which was convenient because other individuals at Buffalo would have to go out and beat the bushes at the VA hospital, which was across the street, or they would have to go to some other hospital to get a physician to be medically responsible for their studies. As I recall, while I was there, I also began to assume medical responsibility for just about any study that went on in the lab, because they reckoned having an in-house doctor was a boom, at least a licensed doctor, in New York. Al Zock, I think, was an MD, but I don't know whether he was actually licensed or ever actually treated patients. I didn't treat patients, but I was there for emergencies.

INTERVIEWER: Did you do treatment for decompression sickness at the time?

DR. THALMANN: We treated the odd case. There wasn't a lot of diving up in the Niagara fRahntier. But I recall we had one or two cases of decompression sickness that we treated. From our experimental dives, we only treated one, and that was in ----.

Hopefully, we'll get to that story, but he was the only guy to ever get bent in the profiles we did for the study.

I spent most of my time in a bathing suit in the water. They had this big, circular donut shaped pool. It was eight feet by eight feet by eight feet by, I guess, eight feet wide, but the diameter, the inside of the circle must have been 60 feet. It was a pretty good size. As I said, the chamber, at that time, was funded by ONR. In order to keep the ONR grant going and before Lundgren got there, they did this big study with putting mice in the chamber, doing behavioral studies at great depth and writing it up in some behavioral magazine.

When I got there, we were actually progressing to manned studies. The ONR grant came up for renewal, and I remember Herman Rahn called me into his office. We sat down and wrote some stuff. It's all kind of blurry. But the bottom line, since I was there and actually making progress, was that we got this apparatus built. We were almost ready to test subjects. ONR continued funding it. I was probably responsible for at least keeping that job slot open while Lundgren was negotiating, because if that grant hadn't gotten renewed, and the hyperbaric team had gotten broken up, which was composed of incredibly talented guys, I don't know if he would have had the same degree of expertise that he had when he got back.

At any rate, we started doing runs on a regular basis. We did esophageal balloons. From all my leadership training, I knew that if you were going to get the troops to do something, you had to do it first, so I turned my back, went into a corner, and vomited and made all kinds of unhealthy noises. I retched and convulsed, but in the end, I turned around, and there was an esophageal balloon catheter coming out of

my nose. I had kind of persuaded everybody else to at least give it a try. We commenced on our exercise runs. We did runs at the surface, which were really 15 feet, because we needed 15 feet of pressure just to get the samples out of the chamber. Anytime we did a wet or dry run, we did them at 15 feet. Our other depths were 60, 120 and 190 feet. During the run, we would drain the wet pot and put in a seating arrangement, so you could pedal a bicycle dry. The 190-foot runs were fun because everybody was narced out of their mind with Nitrogen Narcosis.

There was more than one time when the whole experiment just collapsed because somebody would not stop laughing, and once you started laughing at 190 feet, you couldn't stop it. The whole dive had to be aborted because everybody was so busy laughing and doing goofy things that there was no way that any useful work was going to get done.

I was in Buffalo for the great blizzard of 1977. That was interesting in and of itself. But during the whole great blizzard, I used to come into work every day and go swimming. It turned out that the pool at Buffalo was not heated by natural gas, which was in a shortage, but rather by a coal-fired steam plant on campus, and the coal-fired steam plant, by the fall, had all the coal it needed for the whole winter, so we plugged away.

Then, I ended up sharing an office with a guy named Hans Ornhagen, and I got to know him pretty well. I then got involved with Hugh Van Liew over the papers he wrote with Mike Costolla, trying to come up with predictions on bubble growth. I spent a lot of time delving into his equations and also audited the pertinent courses, cellular physiology and cardiovascular physiology.

I actually wasn't allowed to take courses for credit. That was part of the agreement. I was a Navy post-doc who was just up there to learn, but not to get credit. Those courses were incredibly interesting, though. Buffalo, at that time, had probably the best-integrated physiology program in the country. Herman Rahn was professor, and he still did a lot of teaching.

INTERVIEWER: Boy, those are some good people.

DR. THALMANN: Yeah. Don Redding was there, and I'm trying to remember who else. He was the head of the department at the time, and I guess he ventured over to the medical school. I got really interested in what Van Liew was doing and got into the math and began to learn about solutions and numerical analysis and the stuff that was maybe one or two courses up from what I had had in undergraduate school. By the time I left Buffalo, I was dabbling in bubble models. We finished all of the exercise experiments in the prone position, which basically involved exercising divers on a bicycle in the prone position up to 150 watts in the water. We also did maximum oxygen consumptions at different mouth over under pressures to see what effect that would had. We did find that if the static load was too positive, the divers got terribly short of breath, uncontrollably short of breath at the end of a heavy exercise.

INTERVIEWER: Now, Lundgren was still away at this time?

DR. THALMANN: He was away, yeah. He came back and visited once or twice, and then for the last month or so, he was there full-time because he had accepted the job and come back. I basically did these experiments on my own, but he would come back, and we'd sit down and go over the data and decide what the next move would be.

The plan was largely the one he had mapped out in the beginning. There

weren't a lot of questions as to what the big picture was, but there were a lot of little pictures that needed to be painted, sampling techniques, experimental techniques and what could we ask the subjects to do. We dabbled over whether to do arterial catheters and decided that was a no-go, because the last time they tried it, they made the doctor go over to the VA for six months to learn how to put in catheters.

INTERVIEWER: You had already been doing that, though?

DR. THALMANN: Yes. I had, but not officially. There was still a lot of credentialing, jumping through hoops.

INTERVIEWER: Sure.

DR. THALMANN: We did decide on esophageal balloons. In conjunction with Clouch, we got into how to make them, how to optimize them, and what kinds of errors, because they were too big or too small, et cetera, et cetera. Hugh Van Leu got interested in gas mixing, so we ginned up a couple of experiments for him with mixtures of gasses with different densities, up to and including an SS-6 mixture. Everybody called it the 'Van Liew strange gas,' because SS-6 is incredibly narcotic in breathing these very dense gas mixes.

INTERVIEWER: That was true even at one atmosphere?

DR. THALMANN: Well, we'd breathe them at 190 feet.

INTERVIEWER: Oh, 190 feet, oh my God.

DR. THALMANN: We had some interesting out-of-body experiences breathing some of that gas.

INTERVIEWER: No.

DR. THALMANN: It was a good time. We had a free hand and could just do things

that we dreamed up, and we could just try stuff. While we were following a plan in this big research study, on the side, we did a couple of studies for some commercial companies that had some unexplained deaths on their UBAs. The only problem was getting the guys to dive with a UBA who had held the head of a dead man.

We did some studies just to determine whether the UBA was at fault or not, and we never did find anything wrong with any of the UBAs. Like I said, we did some stuff for Van Liew. As an aside, a duck took up residence outside one of the lab window. That just fascinated Herman Rahn, who had the lab build a switch so that he could see whether the duck was on or off its egg, and when the duck was trying to get food. He had his graduates go out and either weigh the egg or do some other measurements on it. There was a little box in the lab called 'Dr. Rahn's duck-on duck-off switch.'

There was also a guy there named Bruce Larroway, who was an apprentice jeweler. His father was a jeweler, so he was a jeweler. He could do hand engraving and make jewelry, but he had taken courses in engineering and was a machinist, a draftsman, a very precise individual who could take a piece of machinery and make it do all kinds of things that it wasn't designed to do. He was one of the very, very talented guys who, given a free reign, could just solve about any problem you could think of. I was sorry to leave Buffalo. I really, really liked it.

When I got back to Panama City, I got up to my eyeballs in these Mark 15 dives. They had tried doing 175 footers, but it just didn't pan out because the divers were so narced. They got into a bunch of dives in which they just had a lot of bends, one right after the other, and had to stop, but they didn't know why. It was very frustrating because they were all trying to dive from tables.

INTERVIEWER: Which value were they diving at this point?

DR. THALMANN: Well, these were called 'M Values' at the time.

INTERVIEWER: Which M Value table was it?

DR. THALMANN: Well, there were three M values, M values 1, 2 and 3.

INTERVIEWER: M value 0 was a Navy ----.

DR. THALMANN: M value 0 was the one that computed the Navy tables.

INTERVIEWER: It did so as close as it could?

DR. THALMANN: M value 1 was a slight modification. When I plugged M value 0 into .7, in which you simply changed one line of Fortran, instead of computing the oxygen partial pressure by multiplying the F02 times the ambient, you just put in P02 equals 0.7 and that was it. You just changed that one line in the Fortran program, and whap, you went from air to 0.7. Lo and behold, it began predicting some strange things. For example, you could do repetitive air dives at much, much shorter decompression times than the manual called for. I began reading all the reports and how they computed through repetitive dive tables and figured out why that was. But it also turned out that getting bent on a repetitive dive was fairly rare. That was probably because the repetitive dives always assumed that the 120 minutes you should control, though which we almost never did for most air dives, introduced a pretty healthy shot of conservatism into that second dive.

I had three sets of M value 1 computed tables. The first dive was all based on 190 foot dive for 30 minutes with a one-hour surface interval, or maybe it was two hours. Anyway, let's say it was a one-hour surface interval followed by another 190 foot dive, and that was the basis of constructing M values 1, 2, and 3.

M value 1 was constructed such that the first 190 feet for 30 minutes was pretty close and actually slightly longer than what was in the dive manual. The second 190 for 30 was whatever the model predicted, which was pretty short. Instead of having a 30-minute residual nitrogen time, it was to only like having a five or 10-minute residual nitrogen time. M value 3 was constructed so that the M values were adjusted, so you did the first 190 for 30 and had a one-hour surface interval. The second 190 for 30 was the same schedule as the dive manual predicted. The M values were adjusted to make that long enough, and as such, the first dive got a lot longer.

INTERVIEWER: What did you do about controlling time on the surface?

DR. THALMANN: Well, it was the 120 minute interval.

INTERVIEWER: You just left it at 120 minute?

DR. THALMANN: Yes. I left it at 120. All I did was change the M value such that on the second dive, the decompression schedule was that of a 190 for 60, which was what the tables called for. They called for a 30-minute residual nitrogen time. Then, I let the model predict what the first schedule was going to be, which, as you might imagine, was longer than what was in the dive tables by quite a bit. That was M value 3, and M value 2 was halfway in between. I made the first and second dives each a little bit longer. Basically, the way it worked was in going for M values 1, 2 and 3, I began shifting decompression time toward the first dive and making the second decompression dive longer. I think at the end of the day, we ended up with M value 3.

INTERVIEWER: Now, was that before you got back down there?

DR. THALMANN: No. It was right after I got back down there. If you look at the first

report, you'll see that it is divided up into phase one and phase two, part A and part B. Part A was the part that went on when I wasn't down there.

INTERVIEWER: That was the Buckingham section?

DR. THALMANN: That was Buckingham. When I got down there, I said, "Well, the way to do this is to get the dives in real time," so we spent a month or two getting the software to run in real time. Oddly, one of the problems we ran into was on the PDP-12. The digits were 24 bits long, whereas in the Hewlett Packard, they were only 16, which actually reared its ugly head in several different ways in the software. We did a lot of iterations in which we counted iterations, and I had assumed the digits were all going to always be 24 bites -- bits, and it wasn't. The bottom line was that I spent a lot of time at the computer jacks down there. We eventually ginned up a way to do the dives in real time, and we could actually have the computer monitoring depth. I'll go on record as saying I think those were the first digital decompression computed dives ever done. We actually had a digital depth gauge monitoring depth, a digital computer computing not the fluid mechanical stuff that had been going on up in Canada for some time, but actual digital real time, during which the schedules were computed as the dive was progressing. Once we did that, things went a lot more smoothly. But we did back off from 175 feet to 150. We decided going below 150 feet was a non-starter.

We finished up with the first phase, and lo and behold, we actually got a pretty decent set of tables down to 150 feet, but nowhere had we tested them, because we were told those weren't important.

INTERVIEWER: I remember that.

DR. THALMANN: I remember making a couple of computer runs and telling Bill

Spaur there was a bit of a problem. He asked, "What do you mean?" I answered, "Well, the 60 for 60 involves a 10 minute decompression stop at 10 feet." In the end, we said, "Well, shoot, they got their decompressions, so having to stop 10 minutes at 10 feet is not a big deal. If they dive for only 40 minutes, then it's only a couple of minutes." It turned out we were wrong. So what we did was fit the tables to 150 footers, 100 footers and 75 foot multiple repeat dives that we had done, and we adjusted the M values to fit those dives. Then we let the chips fall where they may based on the dives. Whatever the model computed was fine. Well, we sent those tables off, and there was this great howl and wailing and gnashing of teeth coming from downtown, because at the time, the Navy had decided you couldn't do decompression diving. Somehow, it was inherently dangerous, and the only way you could do decompression diving was if the country itself was under attack.

Then, two things happened at that time. Bill Spaur went on a campaign, saying, "Well, if you're going to do this Mark 15 decompression computer stuff, decompression dives will become a way of life, and we shouldn't be afraid of them." We said, "Gee, guys, if you give us another half a million bucks, we'll be happy to do another set of dive trials and concentrate on the limits to get the limits buffed up." Well, they acquiesced and gave us the money. When we did the phase two testing, which was a separate report, we basically concentrated very heavily on limits and doing multiple no-decompression repetitive dives. When we finished that up, that was the basis for the tables that are in the dive manual, those two dive series.

We eventually went on to do a third dive series, which I promoted and managed to convincingly call it the air algorithm series, saying, "Oh, we have this algorithm that

works on 0.7. Let's see if it works on air." At the time, it gave predictions on air dives, which were much, much longer than those in the manual, and we were under the naive assumption that the schedules in the dive manual were all okay, which we know now not to be true. It was kind of around that time that Paul Weathersby had gotten together with Lou Homer up at NMRI and began looking at the probabilistic model.

INTERVIEWER: Now, as a part of the air algorithm, you went back and tested some standard air tables?

DR. THALMANN: Yeah. The purported reason was to test some schedules out of the dive manual. The real reason was that the computer software wasn't yet ready, and we had dive subjects coming in. We had a little per diem identified, and we didn't want to give it up because it might go away, so I suggested that we try some dives right out of the dive manual initially. We tried the infamous 60 for 180, and since the dive was cold, we came up on a 60 for 200 schedule. That was for three out of the first ten guys we tried. Very rapidly, we found out that the 60 for 180 out of the dive manual gave guys a lot of decompression sickness, which surprised the heck out of us.

By then, we had gotten the software out, so we moved on, but it turned out we increased the 60 for 180 decompression time from 75 minutes to 225 minutes before we finally got a schedule that we thought was reasonably safe. But the whole point of the air algorithm was to take the 0.7 algorithm and plug air back in to see if it would compute air dives. It was during phase two that we went from M values to V values. We went to V values because the decompression model was loosely based on a gas phase forming that kept the over pressure inside the gas phase constant, but since it was a gas phase, I decided the numbers more reflected a volume to volume.

Then, we made some other changes to the model in which we actually looked at AV oxygen differences rather than keeping the venous oxygen the same. We said that the extraction rate was constant. In using the hemoglobin association curve, we actually computed what the venous oxygen tension would be, given the arterial oxygen tension and tissue oxygen consumption. I think we ended up at V value 50-something.

INTERVIEWER: It was V value 50?

DR. THALMANN: Yeah, for the air algorithm. There were a lot of V values in between it. Every time I tried a new one, I just gave it a number. A lot of them never made it outside the computer lab. I tried them and discarded them. But then, the next time I made a new one, I just incremented the number by one. At the end of the series, we had come up with a pretty decent air algorithm, I thought. I guess under one scenario, I could have run off and gotten NAVSEA to use that as the basis for a whole new set of air tables. There were a couple reasons as to why I did not do that. We're moving forward in time, to when I was gearing up to going to England, and we had finished up the 0.7 table. We were happy with it. John Zumrick was coming on board, and I showed him how to use the software, but he seemed incredibly uninterested in it. When I went off to England, the whole thing stopped; nobody was interested in it, though NMRI was investigating probabilistic decompression.

INTERVIEWER: What year was that?

DR. THALMANN: That was in 1985. That was when I left NEDU to go over on exchange to England. All that testing stopped at NEDU. When I went to England, I tried to garner some interest in getting a joint program going with the British and the

Americans to come up with a single set of helium tables, but that didn't work out.

Before I left, we tested some helium oxygen tables for the Mark 16, which were all bounce dives, and we eventually went down to 300 feet for 30 minutes.

INTERVIEWER: So before you went to England, you did the Mark 16 dive?

DR. THALMANN: That's right.

INTERVIEWER: By that time, Frank Butler was there, or was he?

DR. THALMANN: No. He didn't get there until after I got back from England.

INTERVIEWER: Okay. So you did part of the ----?

DR. THALMANN: We had finished up the 0.7 PO₂ and those were published.

Then, EOD came. They wanted some dives. We did that. I finished the study, wrote the report, and those got published. Then it stopped because nobody else there was interested.

I guess it was Tom Hennesy who had ginned up a set of tables that gave them restricted bottom times. If they went outside of those bottom times, they went onto these rather emergency procedures, which didn't help them in their operation that much. What I did was fit the rhythm to the existing tables as best I could, with the idea to interpolate between the tables and give them tables in ten-minute increments, which helped them quite a bit operationally. They went out and tested the tables, and they worked fine.

INTERVIEWER: They tested them in the lab or out in the water?

DR. THALMANN: It was done in the water.

INTERVIEWER: They didn't do any lab testing?

DR. THALMANN: No. They didn't do any lab testing; they did it in the water. We

had a protocol that required them to have a medical officer on scene and a hyperbaric chamber available within thirty minutes. After they accumulated 300 dives, I think, the supervisor of diving would review the data and give either up a thumb's up or a thumb's down. They only had one bend in 300 dives, I think. It was a pretty low number, but they were happy with it.

INTERVIEWER: Now, was David Elliott there at that time?

DR. THALMANN: No. The first year I was there, a guy named Donald Makay was the senior medical officer at INM, and Ramsey Pearson was at the sub school. Then, Makay left, and Ramsey Pearson came to be the senior medical officer for the last year I was there, the second year.

INTERVIEWER: Did you cover all the important stuff there in England?

DR. THALMANN: I thought it was important.

INTERVIEWER: In other words, you just shifted immediately?

DR. THALMANN: No. When I immediately got there, I spent the first month spinning my head because I didn't know what to do. I did get plugged into one thing. They were coming up with the big diving ship they were building, and I can't remember what the heck the name of it was.

INTERVIEWER: *Clansman*?

DR. THALMANN: No. It wasn't the *Clansman*. That was their contract diving ship. This was the one they were building that was going to have the big diving bell in the middle, but they eventually scrapped it. But they had all kinds of computer software. They had written specifications for it and were testing it, so I got involved in that. I was uninterested because the software was all screwed up, as far as I was concerned,

but I was told I was absolutely not allowed to touch it. In England, it was forbidden for anybody but a certified, bona fide, stigmatized software guru to touch software.

All the medical officers had no business touching software, but eventually I got to the point at which I got involved in two projects. One was to extend the saturation upward excursion limits all the way to the surface. They had a ship called the *Clansman*. Though they went out and did 300 meter dives periodically, they spent most of their time at depths of 50 to 80 meters, salvaging airplanes around England, so every time they did a dive, they would come up on an experimental schedule and re-saturate for 48 hours, make an upward excursion, and come out. In doing that, I got enough data that we were able to extend the upward excursion almost all the way to the surface. When I left NEDU, the shallowest upward excursion you could do was from 225 feet to 150 feet. That was the shallowest that was ever tested at NEDU.

INTERVIEWER: Now, you had to sell that concept over there in order to make that project?

DR. THALMANN: Yes. They were very easy going. In contrast to the U.S., the supervisor of diving actually owned all the divers, so he was able to get the divers to do what he wanted. Plus, he ran the *Clansman*. Once I had sold the supervisor of diving on it, we wrote the protocol, and the guy on the *Clansman* had to follow along, even though he was somewhat skeptical of the whole thing. Another big thing I got involved in there was coming up with some pretty major improvements, like the thermal protection garments for the Royal Marines.

INTERVIEWER: You had started out talking about the 75-meter stuff. Was that just a quick and dirty project?

DR. THALMANN: That was a quick and dirty project. They said, “Hey, we've got these tables, and if we go one minute over the table, we go from an hour of decompression to four hours of decompression. We don't want to do that. Can you help us?” I basically took the 75-meter tables and came up with a set of H valves to fit them according to the Mark 16 model. Then, I interpolated between the tables and came up with a set of tables in five and ten-minute increments, helping the operation quite a bit. The tables were used mainly for EOD purposes.

INTERVIEWER: Those were the ones that they tested out in the water?

DR. THALMANN: That's right. The deal was that they could test them in the water. The supervisor of diving did not want to do a big in-house production. I think we did two big dives while I was over there, and those were quite expensive. They were to test bailout systems for some of the deep saturation rigs that they were testing.

INTERVIEWER: Was that for commercial diving or for military?

DR. THALMANN: It was for the military. As I said, they were building this big diving ship, the name of which escapes me. I wish I could remember it. I know somebody will remember the name of it. It was a big, huge dive ship.

INTERVIEWER: Was it ever completed?

DR. THALMANN: Yes. It was completed, and it went out, but as far as I know, they had a whole lot of trouble with the dive platform. It eventually went from being a dive ship to going around, towing sonar. While I was over there, the Royal Navy formally got out of the saturation business. I actually was on board and was present for the last operational saturation dive ever done by the Royal Navy. Then the *Clansman* was put back into Falmouth. I think they went out one more time and did some training dives.

They then brought the ship to Portsmouth, and the diving system was unloaded, and the ship was returned. The *Clansman* was a commercial ship that was under contract to the Royal Navy, and the company crewed and ran the ship. They didn't have a captain; they had a craft master or something equivalent. But the Royal Navy ran the diving facility, and the guy in charge of the diving facility was in charge of the ship. He had pretty much a free reign to tell the craft master, "I want you to take the ship, put it here and put it in a four point moor. Then, we're going to dive." I went on at least two or three aircraft salvages while I was there. It was amazing. Even though they were only maybe in 100 or 150 feet of water, in a day or two of saturation diving, they could do as much work as it would have taken a week or more to do from bounce diving, in terms of finding the right pieces.

The upward excursion was going off pretty much without a hitch. We just did them. We had a few political bumps in the road, but we finished them up. I wrote it up, published it in *Undersea and Hyperbaric Medicine*, and it got written up in the dive manual, so the excursions got extended from 150 feet all the way to the surface. Nothing really ever became of the 75-meter tables. We just kind of did it and worked and never even knew if it ever got written up. But they seemed to be happy with the result.

The thermal garments is another story and involved using a lot of instrumentation and software that John Zumrick, while he was at NEDU that we got NEDU to basically sent the whole system over to England for six months.

INTERVIEWER: Now, was that done at pool or was it ----?

DR. THALMANN: No. We did it over at the experimental diving unit in Portsmouth,

which was across the way from Gosport. They had a cold tank there and the whole thing in ten feet of water. They also had an SDV mock-up that they could put in there. It was just the front part of it. The divers would sit in a space that was more or less equivalent to what they would be confined to in an SDV.

INTERVIEWER: The date is Friday, August 29th, and this is the second interview with Dr. Ed Thalmann. The interviewer is Dick Vann, and the location is Joe & Joe's Tavern in downtown Durham.

DR. THALMANN: We ended the last interview with the beginning of the thermal study of Gosport. You wanted to backtrack a bit and talk about where that came from, now that INTERVIEWER has figured out how to work the recorder. We had started off with a traditional Haldanean approach to decompression modeling.

INTERVIEWER: When did that occur?

DR. THALMANN: Oh, when did it occur? Well, I certainly started thinking about decompression models back in 1975 or before I went to Buffalo. I worked on them at Buffalo and really was working strictly on the Haldanean approach, trying to come up with a decompression model that would compute Navy tables. The ED reports would lead you to believe they developed such a mathematical algorithm that when the testing was finished, it would actually just print out a complete set of Navy tables. I was uniformly unsuccessful in coming up with an algorithm to do that.

I used an exponential compartment with the same half times as those in the report, pretty much the same end values as those in the report, yet was unable to come up with an algorithm to compute all the tables. It was close, but upon closer reading of

the reports, it looked like they may have adjusted some tables by hand without adjusting all the tables.

At any rate, I eventually came up with an algorithm that used exponential uptake and off gassing, much like Haldane. I came up with something called N-Val zero which, when plugged into the algorithm in exactly the same way the Navy computed its table using the same mathematical principles computed in 80 tables pretty close.

The goal was that if the table wasn't the same as in the diving manual, it had to be slightly longer. I came up with an algorithm that computed the Navy table pretty closely. Then, I went ahead and did some repetitive dives on it to see what would happen. Lo and behold, I found that the second repetitive dive on the algorithm was coming out with much less decompression than the repetitive dive groups procedure would have you do.

It didn't take long to find out the reason for that: the repetitive dive groups were based on 120-minute tissue. In fact, in the real time algorithm, very rarely did the 120-minute tissue control [unclear]. The question was whether you could really do these dives. In other words, could you do a repetitive dive that came up much, much faster than the repetitive dive procedures in the diving manual would allow? We came up with three n-value matrices, and they were the matrices that actually controlled how the decompression was done. N-Val 1 computed the first dive. The dive that I used as a benchmark was 190 for 30 with a one-hour surface interval, followed by another 190 for 30.

INTERVIEWER: Had that been tested in the original?

DR. THALMANN: The 190 through 30 had been tested, but I don't know if the repetitive dive had been tested. I can't remember. N-Val 1 kept the first 190 for 30 pretty close to what it was in the dive manual. Then, of course, the second 190 for 30 was much shorter. N-Val 3 was adjusted to keep the second 190 for 30 decompression according to what the repetitive dive procedure would require. Therefore, the first 190 for 30 was longer, and N-Val 2 split the difference between the two.

Now, we never started off testing the 190 for 30. This was just a benchmark that we used to adjust the software. We started off with, I think, a couple of hundred foters. I'd have to go back and look, but the bottom line was that it was pretty obvious that N-Vals 1 and 2 gave decompressions that were too short and caused a lot of decompression sickness. We ended up focusing on N-Val 3.

INTERVIEWER: Did you test N-Val 1 and N-Val 2 during your trials?

DR. THALMANN: We tested N-Val 1 initially, and it was rapidly discarded because of too many decompression signals. The initial testing of N-Vals 1, 2 and 3 was done while I was in Buffalo. I had, as I mentioned earlier, set everything up and turned it over to a guy named Ian Buckingham, who was a Canadian medical officer.

INTERVIEWER: Did he write that up in his report?

DR. THALMANN: It was in the first report, yes.

INTERVIEWER: Those were air dives?

DR. THALMANN: No. They weren't air dives. They were 0.7 PO₂ dives. We were testing them for the Mark 15. Additionally, the specification was that the deepest dive would be 175 feet. Well, that was rapidly discarded because 175 feet was an incredible amount of narcosis, so they backed off to 150 feet as the deepest depth. The series

came to a halt because they just had more decompression sickness than they knew what to do with.

The second problem was that they were using printed tables. They weren't doing it in real time. They would print out a set of tables and dive those. Then, of course, if they had ear squeezes on the way down, or if they had anything that caused them to deviate from the schedule, they always had a problem in trying to decide how to correct for it. It really wasn't a very clean series.

Just after that first series shut down or maybe shortly thereafter, I came back from Buffalo to NEDU in Panama City in 1977. After reviewing the first trial, I came to the conclusion that the only reasonable way to do the trial was to compute all of the schedules to real time. I sat down with the computer guys, and we figured out a way to do it in real time. It wasn't that hard to do, but we figured out a way to do it in real time. We had a digital depth cage hooked up to the chamber that we hooked up to the computer, and on the CRT in front of the dive supervisor's console was a display that continuously told the dive supervisor the diver's first stop depth was, which was called the 'safe ascend depth.' In other words, it answered how shallow he could safely ascend to, and then it gave the total decompression time. That worked like a champ because then, when we had problems on the way down, the computer just automatically corrected for it.

The other reason that we were happy with the situation was because the whole point was to prove that the algorithm was correct, not the tables, so by doing it in real time, we reckoned that we were also exercising the algorithm much more closely to the way it would be exercised in real life, taking into account delays in ascent and descent.

INTERVIEWER: You also had in mind a decompression computer at that time?

DR. THALMANN: When we started testing the Mark 15, from the get-go the thinking was that we were designing it for a decompression computer, because the two individuals from NOSC had come by NEDU earlier in 1974 with a proposal to build a decompression computer.

INTERVIEWER: What was NOSC?

DR. THALMANN: It was the Naval Ocean Systems Center, in Kailua, Hawaii, a Marine base. The Naval Sea Systems Command had given them the go-ahead to try to develop the hardware. The ED was going to develop the software. The whole point of the effort from the beginning was to develop an algorithm that would go into a decompression computer.

However, it was recognized that the computer hardware might take longer than the software, so we decided that in the event that the algorithm testing was finished before the computer, we would come up with a set of printed tables. We also needed a set of printed tables for emergencies anyway, but the original proposal basically indicated that we were trying to man-test a computer algorithm, not a set of tables.

We completed the first phase of testing, concentrating on these deep dives, like 150 for 30 and 120 for 30, because it was envisioned that the divers would be on submarines that had dry-deck shelters on the back. Those submarines also had Swimmer Delivery Vehicles (SDV) in them, and the divers would get into the SDVs and launch themselves from some depth. It would take about a half an hour to launch, so that would be spent at the deepest depth, which initially was going to be 120 to 150

feet. Then, they would ascend to some shallower depth, probably around 30 feet, and on the way back, they would come back into the submarine.

We spent a lot of time concentrating on these deeper dives. When we were done, we thought we had a pretty good algorithm for doing the deeper dives. When then just extrapolated the algorithm to the shallower depths. But since we hadn't tested the shallower depths, the no-decompression limit was rather short, like a sixty-foot no-D limit. It was like ten minutes, and a 60 for 60 required a five or ten-minute stop at ten feet. Well, we thought that was a reasonable trade-off and didn't make much of it until we sent it out to the fleet. They were just terribly upset. At the time, it was a no-no to do decompression dives unless you got dispensation from somebody.

Two things happened. One, you got some money to go back and look at no-D limits. Two, Bill Spaur went out, convincing the powers that be, if we were going to have a decompression computer, the decompression was obviously going to be the norm. There was no way that you could really avoid decompression diving unless you were so conservative that you hamstrung the operation.

In the second phase of the N_2O_2 algorithm testing, we went back and concentrated heavily on the No-D limits. We got a set of No-D limits that were very reasonable and also fit in with the deeper decompression dives that we had done earlier. In the end, we thought it was looking pretty good.

Well, we started out, as I said, with exponential uptake and off gassing. Partway through the dive series, it became evident, especially for some of the repetitive dives, in order to get longer decompression times, the No-D limits began to shrink. We thought that was necessary because we were having too much decompression sickness

on repetitive dives. The no-D limits began to shrink because of the way the n-value matrix was set up. We couldn't reconcile with it. In other words, we couldn't keep the No-D limits, which we thought were safe, and make the repetitive dives long enough to make those safe. I had been fussing with an idea for some time about a decompression model in which immediately upon any reduction of pressure, a gas face formed.

INTERVIEWER: Now, why had you done that?

DR. THALMANN: Well, it was from the literature, which would lead you to believe this happens. It was not any great insight. I was just reading the literature.

INTERVIEWER: What was the literature that you had read for that?

DR. THALMANN: I was just reading the literature in general.

INTERVIEWER: And Hills?

DR. THALMANN: Well, that was part of it, but if you just read the dive literature in general, a lot of the thinking in it was that bubbles formed in the ascent. The other thing that was being kicked around, and there were some experiments to back it up, was the claim that during ascent, the off gassing rate slowed down much more than you would expect from an exponential off gassing. The experiment I remember in particular was one where the theory behind it was that as gas phases form, what they do is reduce the tissue tension and essentially increase solubility, so more gas is retained in the tissues at a lower tension, and it takes longer for that gas to get washed out. I made a model that had those features, and it had something called PBOVP, which meant bubble over pressure, and that would be the pressure inside the gas phase. I assume once that gas phase formed, it would be relatively constant. It just seemed

like a good bet because until you get the very, very small bubbles, surface tension effect doesn't really play a role.

INTERVIEWER: The over pressure was due to what, tissue forces?

DR. THALMANN: I didn't say to what the over pressure was due. I just said that there was an over pressure, and I imagine it was due to whatever forces cause an overpressure, tissue forces, surface tension, or whatever.

Initially, we started out with a PBOVP of zero and a set of n-values that were then fit to the no-D dives for the shallowest n-values. Those were then adjusted to give longer decompression dives to the repetitive dives we thought were unsafe. We tested them during the second phase, and they worked out pretty well. Lo and behold, we came up with the Mark 15 tables based on this asymmetrical algorithm in which the off gassing was much slower than the gas uptake.

INTERVIEWER: It was a second report on the Mark 15 testing?

DR. THALMANN: Right. That was the report with the tables that are in a dive manual. It was the second report. We took the algorithm one step further because it worked well on 0.7, and some of the revelations we had about air dives and the dive manual may not have been as accurate as we thought.

INTERVIEWER: How did you...?

DR. THALMANN: Well, the wisdom up to then dictated that what was in the dive manual was okay, which meant it didn't give a lot of decompression sickness.

INTERVIEWER: How did you come to the conclusion that that might not be so?

DR. THALMANN: I came to that conclusion because some of the predictions of the model gave longer schedules on 0.7, we thought. Some of them were actually longer

than air. We'd say, "If this air schedule is safe, this 0.7 schedule ought to be really safe." It didn't seem to be turning out that way, though. But all we had done were 0.7 dives, so we were in the position of looking at constant 0.7 PO₂ schedules and guessing what would happen on air.

Well, we finally turned around and did something called the 'air algorithm.' We took the Mark 15 0.7 algorithm and plugged in air, and we decided to do a bunch of air dives. Well, because of some technical difficulties, the software wasn't quite ready to go when the dive was ready to go. By that I mean that we had a bunch of divers coming into the command, NEDU, who were ready to dive. We couldn't just have them sitting around with their thumbs in their ears. I said, "Let's start off just doing some dives right out of the dive manual." Completely at random, we picked the 60 for 180 and decided to dive that on a 60 for 200 schedule because we were going to do hard-working, cold dives. That was a random choice. It was not based on anything other than getting a dive that was a couple of hours long.

We wanted something relatively long, so we did the 60 for 180. To our surprise, we had a fair amount of decompression sickness, so we adjusted the model to give a longer decompression time. I think the original decompression time was 75 minutes, and we tested a schedule that was almost twice as long and it still gave too many bends. Eventually, we ended up at like 225 minutes, and that was really the first indication that maybe the tables in the dive manual were not as safe as they should have been.

One of our assumptions was that the algorithm was predicting air schedules much longer than what was in the dive manual, or there was something wrong with the

algorithm. It began to dawn on us that maybe there wasn't so much wrong with the algorithm, but maybe the schedules in the dive manual were too short.

At any rate, we adjusted the algorithm based on the 60 for 180 to make that diver reasonably safe and then embarked on a dive series. This was called the 'air algorithm,' and we basically did air dives. We did a whole bunch of repets, and we did No-Ds. We found we could dive No-D limits either equal to or greater than those in the Navy dive tables.

For instance, we did a bunch of 190 for 15s, which seemed quite safe, though the dive manual says 190 for five. I think we got out as far as 60 for 80 at the 60-foot dive. When we got to some of the decompression dives, the story was different. The one thing that does come to mind is that we really never were able to do 150 for 30 satisfactorily. We always got too much decompression sickness. We were able to do 100 dives okay. We did 100s for 60s, and they were okay. I think we did 120s for 30s, and those worked. When we did 150 for 30, we really were never able to get dives that worked.

Well, during the air algorithm, we not only tested air dives but went back and tested combinations of dives. For part of the profile, we'd breathe air. For another part of the profile, we'd breathe 0.7 to test the algorithm in general, and that seemed to work. At the end of the dive series, we had an algorithm that worked well on air, we thought.

Now, it was slightly different than the V-Val 18 algorithm. The difference was that we began to look at O₂ and the gas tanks, which gave rise to bends. It wasn't

simply the inner gas tension. It was inner gas tension plus O₂ tension plus the venous CO₂ plus the venous water vapor pressure. Those were all constant.

INTERVIEWER: How did you conclude that was the case? What led you to that?

DR. THALMANN: Well, I didn't conclude it was the case. It was certainly evidenced in England that O₂ played a role. There were some goat experiments that were done by...

INTERVIEWER: Those were very, very high. That was 3.5 air.

DR. THALMANN: It played a role. Also, in switching back from 0.7 to air, if you assume O₂ has a role, you get different predictions on the decompression schedules. Not only did we look at inert gas, but we also postulated that each tissue, the 5, 10, 20, 30-minute tissue, had a certain extraction rate. Based on that AV extraction rate or amount, you could predict what the venous oxygen tension would be for any given arterial. As the arterial oxygen tension went up, the venous oxygen tension went up a little bit, and that was actually summed into the decompression risk because the decompression risk now included O₂.

The schedule and test were semi-successful, and when we came out of it, we thought we had an algorithm that wouldn't do too badly with computing air, 0.7, or being able to switch between the two. But I wasn't ready to push it as a replacement for the air tables, because we hadn't looked at things like surface decompression, which is part and parcel to the air tables and used quite extensively.

If we had just come up with a change to the air schedules without the surface decompression, it would have been unsatisfactory. I just let that slide. That was at the point that I went off to England. What I left behind was the 0.7 N₂O₂ tables, which

were published in the dive manual, [as were] the results of the air algorithm.

Nobody at NEDU, at least none of the medical officers at the time, picked it up and pushed it, so that effort really stopped when I left. I continued over in England a bit, using it to help compute some 75-meter heliox tables.

INTERVIEWER: You had not done the heliox dives before you left?

DR. THALMANN: We did the heliox dives before I left.

INTERVIEWER: Oh, you did?

DR. THALMANN: But that was a separate effort. That was very similar to V-Val 18.

INTERVIEWER: How did you adjust the n-values and the tissues or have time when you went from nitrogen to helium? Graham's Law?

DR. THALMANN: No. It was based on what was in the dive manual, and we just plugged in some schedules and adjusted the n-values to give schedules in that ballpark. In the end, a lot of it was empirical.

INTERVIEWER: Well, how did you handle two inert gasses?

DR. THALMANN: We didn't. For the Mark 16, we had the divers do a purge at the surface whereby they exhaled as hard as they could, inhaled and did a washout to get rid of as much nitrogen as possible. We also monitored nitrogen tension during the dive. It was to an underwater habitat the divers would go, and they could actually plug a sample line into it. What we now call H-valves were just an empirical number that took all this into account as a big gemisch . That was the way we dealt with it. We didn't try at that time to get into the realm of attempting to account for nitrogen. We just assumed that everybody would start out with about the same PN_2 .

The helium tables were actually finished before the air algorithm was done. Those got published and were based on the 75-meter heliox tables for the Royal Navy EOD when I was stationed in England for two years.

At any rate, in England, we had the opportunity, as I mentioned, to finish up saturation excursion dives. The other big study we did over there was the thermal garment study for the Royal Marines, who had gotten themselves some SDVs and admitted that they really couldn't do 12-hour missions, as some of their scenarios called for, and stay warm. We did a fairly extensive thermal study, mainly with dry suits, looking at the various under and outer garments and different kinds of gloves. We used the test pool with an SDV mock-up in it. The divers went down and sat for many hours, and they were instrumented with a bunch of thermal transducers, heat flow transducers. It was a 12-point model, so each one of the transducers was at a certain anatomical position on the body, like a forearm, upper arm, thigh, back, et cetera, and the nice part was that we wanted to make modifications to the garments. They could take them over to a wet suit shop in Portsmouth and get the stuff done right off the bat. In the end, we did pretty well.

We came up with a very nice thermal garment, which was based on a rubberized outer garment, one that was fairly thin but very flexible, and a Thinsulate undergarment. I guess the main thing we did was a set of gloves. We used Thinsulate ski gloves underneath what were then sold as windsurfing gloves for windsurfers. We got very large windsurfing gloves and pulled them over the Thinsulate gloves. We made up a sealing arrangement at the wrists, and that didn't put any pressure on the wrists but kept the hands pretty warm. The Royal Marines were pretty happy with that

garment and went out and had a whole bunch of them made up. They used them for quite some time, I understand.

INTERVIEWER: Were the Royal Marines [part of] the Special Boat Section, or SBS?

DR. THALMANN: No. They were Royal Marines.

INTERVIEWER: The Special Boat Section is made of Royal Marines.

DR. THALMANN: I never got the impression they called themselves the SBS. When I left England, I left behind three things. We finished up the saturation excursion dives.

(Interruption)

DR. THALMANN: The 75-meter tables and those were actually just proposed tables. The deal was they had a big meeting over there with the Supervisor of Diving, and we decided that we didn't have to formally test them. We could field-test them, we figured. The tables were issued for use during practice diving, and the only change in their operational scenarios was that they had to have a medical officer at the dive site when they used [the tables] until they accumulated a hundred man dives. After they accumulated a hundred man dives, they would then look at the data and decide whether these profiles were okay to use in the fleet. As I understand it, they eventually accumulated a hundred man dives and decided the tables were okay.

When we got back to NMRI, I found myself in charge of the Decompression Research Group, as it were. I found, and maybe I expected it, that really nothing in decompression had progressed since I had left NEDU, at least in terms of operational procedures. One thing that had happened was that Paul Weathersby and Lou Homer had come up with this probabilistic decompression modeling technique, which they were using to incorporate large numbers of diverse dives. They also used it to compute

parameters for decompression models based on a lot of different dives. Maybe you didn't have a lot of repetitive diving under exactly the same conditions.

Looking at this while I was in England, I didn't quite understand it and when I got to NMRI I immersed myself in it to the point at which I began to understand what was going on. I will admit that in the beginning, I didn't thoroughly buy off on what they were doing, but after a while, I began to see what was going on. At the time, they were using exponential models, the typical Haldanean exponential uptake and off gassing models. Based on those models, they went in and did risk analyses of Navy tables, DCIEM tables and various and sundry other tables. They would take this exponential model and calibrate it against a bunch of man dives, of which they knew the profiles and whether somebody got bent. Once they had a good set of parameter values, they could go ahead and turn around and take any dive profile and put it through the algorithm. It would spit out a probability of bends. Basically, once they were done, they could take any profile they wanted and compute the theoretical probability of decompression sickness. They did that, as I said, for air tables, among others.

Well, looking at their effort and reflecting on the fact that at NEDU, our exponential uptake on an off gassing effort really led us into a brick wall, I injected the V-Val 18 model into it, the exponential uptake and linear off gassing model. Now, in order to convert this to a probabilistic model instead of using n-values, we used time integration, the super saturation ratio, or a ratio of tissue tension. No, it was a difference between the theoretical tissue tension and the ambient, so it was a super saturation difference, or the super saturation itself, and we said the time integral of that

somehow related to whether you got the bends. We took all the dives that we had done at NEDU and any other dives we could find and came up with a set of parameters for what became known as the LE model. Some it actually fit better than anything that had been tried previously.

Therein began the NMRI effort looking at the LE model. Now, once this happened, I began to wonder if we shouldn't go back and have another look at the air algorithm dives, those we did at NEDU that were not quite as satisfactory as we wanted. I was told that there wasn't a lot of NAVSEA interest in doing this. Well, I went down and saw Captain Chuck Bartholomew, and in the end, he agreed that we should begin pursuing a revised set of air schedules, but he didn't want to link it to a piece of hardware.

INTERVIEWER: Do you mean a piece of hardware, as in a dive computer?

DR. THALMANN: The reason he didn't want to link it was not because he didn't want a decompression computer, but he didn't want new air tables to be held up, waiting up for a decompression computer. If the tables had been ready to go before the computer, they would have done that.

He gave us the go-ahead and we wrote some routines that allowed us to actually compute the tables in real time, which was a bit more complicated because of the math. Without going into the details, there are a lot of iterative techniques involved.

INTERVIEWER: Who were the people working on this?

DR. THALMANN: There was a computer contractor names Shalane Shurvansi and a guy named Eric Parker. They were the really two main efforts at NMRI, in terms of getting the software up and running. A big dive series started out with NMRI doing

small numbers of dives to see if it would work. Basically, the idea was to see how the algorithm would work prospectively. In other words, we had gotten a set of parameter values that again would predict certain decompression sickness probabilities for certain dives. Then, we went out and dove those profiles to see how close they were and found they weren't that far off. In the end, we had something called a NMRI 93 model. The idea was to then sell this to NAVSEA.

Well, the problem with the model was that the longer dives predicted very, very long decompressions, and I had my misgivings about whether the fleet would buy off on it. It turned out they didn't. In the end, they looked at it and said, "We're not having a lot of trouble with our air dives, and we're not really interested in having these incredibly long decompression schedules when we don't think we need them."

INTERVIEWER: Well when you say 'they,' whom, specifically, do you mean?

DR. THALMANN: 'They' was the fleet.

INTERVIEWER: Yes, but who, specifically?

DR. THALMANN: Well, it wasn't anybody specific.

INTERVIEWER: Well, was it the command? Was it the master divers? Was it the rank and file divers?

DR. THALMANN: I think it was the master divers, mainly, who complained loudly to NAVSEA about it.

INTERVIEWER: What were their specific complaints?

DR. THALMANN: There weren't any specific complaints. They would say, "Hey, these things are long," and "We don't need them that long. It's going to hurt our ability

to dive.” When we went back and tried to show them that they would very rarely dive long profiles, it didn't make any difference to them.

INTERVIEWER: How about the no-stop limits? Were they happy with those?

DR. THALMANN: The no-stop limits were fine.

INTERVIEWER: They were okay with them even down to forty feet?

DR. THALMANN: I don't want to get into that too much, but the repetitive procedures turned out to be pretty complicated because of the profiles we were computing. Rather than having a procedure in which you came up from a dive, had a repetitive group and used that to calculate some amount of time you added to the bottom time of your second time, you actually came up with a repetitive group and based on the surface interval that would decay but then rather than compute residual nitrogen time or some such thing you actually picked up a new set of tables so that there were eight or ten volumes of tables.

Now, I didn't think this was a bad thing. There were more tables, but you didn't have to do any math. In the end, the fleet divers, I guess, didn't buy off on it. At any rate, the whole thing slipped to the back burner. Eventually, the Navy did turn around and let a contract to build an underwater decompression chamber. Cochran built one, and our model eventually got installed in that. The operators had some misgivings about it. If you look at some of the profiles on paper, there are some that have much longer decompressions than you would utilize for other procedures.

At any rate, this was the procedure they were using for SDV operations because they spent a lot of time shallower than thirty feet. The dive tables had no repetitive groups shallower than thirty feet. I went back to the original reports. Using the same

methodology, I computed a method by which they could get credit for being shallower than thirty feet. That allowed them to compute decompression schedules for SDV operations.

Well, they were reticent to use the SDV decompression computer because they thought that all of a sudden, they would be having a lot of decompression stops. Frank Butler, who's the SpecWar medical R&D officer, leaned on them, I guess, to put it mildly, and got them to start using the decompression computer. Now, they love it. They don't have to keep track of their dive schedules. The decompression computer does that for them, and they almost never get into decompression diving. I don't think they've ever gotten into decompression diving. They've never bent anybody. That has worked out really well.

During the time I spent in NMRI, we had done the big dive series to get to what is known as the NMRI 93 Model, which never really made it into fleet use, as far as tables, but resulted in a very powerful tool for computing the risks of bends. The reason it works one way and not the other is what I call the 'tail.' Since computers are mindless, and if you tell it to compute something to a certain level of risk, it goes out to 14 decimal places to get to that level of risk. The is done iteratively, so it starts with a short table and keeps making it longer and longer until you get to a table that the computed risk is less than what you specified, called the target risk, but it turns out the total decompression time does not increase linearly. It increases very non-linearly.

In the beginning, as you're moving from the high-risk area to the low-risk area, the TDT doesn't increase very much for each unit of risk decrease, but the time gets

longer and longer and longer. As you get near the end, to get that last two-tenths of a risk increment, you can get some pretty substantial increases of decompression time.

The decompression tail accounts for such a small risk that it doesn't make any difference if you're actually computing the risk from a profile. If you have a profile, with or without the tail, that long tail, and you just chop it and then compare the profiles, one might come out 3.5 percent and the other one 3.2 percent. We know from experience that you can't really detect that small a difference in risk without doing thousands and thousands of man dives, which we're not going to do. It turned out to be a very powerful tool for analyzing dives, but it turned out to be impractical, not inaccurate, not bad, just not practical, practical use in computing profiles because you haven't learned how to manage the tail yet.

The second reason that the probabilistic algorithm is impractical is that right now, it is mathematically complicated in the sense that you have to use iterative techniques in order to get to the correct profile. These take up a lot of computation time and it is only now that we are getting small CPUs that are both capable of doing this and will fit in hand-carried or wrist-carried instruments. The v-val 18 is deterministic, and it's dirt simple. You can program a calculator with the tables, so it's very simple mathematically.

INTERVIEWER: When you mentioned the iterative procedure to find the best table, is that defined as the shortest decompression time?

DR. THALMANN: Yes. We're getting into areas about which you could talk for hours. Basically, there are many different decompression profiles that have the same

risk because the risk is the time integral of the super saturation. What is different between these schedules is the decompression time.

You could have some schedules with very long decompressions and some schedules that have shorter decompressions, but they all have the same risk. The constraint of the algorithm is to find the shortest decompression time with that risk. That's where the iterative technique comes in. If it does a trial profile, it fairly rapidly can hone in on getting some kind of a profile that will have a risk near the target risk. The trick is to get from there to the shortest one. What it does is just keeps computing profiles that are shorter by five-minute increments. It takes the five-minute increments off either shallow, deeper or at whatever the decompression stop is and computes risk tables. By doing that iteratively, the algorithm can tell the most efficient way to either shorten or lengthen the table to get to that target risk. Then, it will figure out what the shortest decompression time is. This may become clear if I write it.

We use an NMRI 93 model quite a bit to analyze dives, but we don't use it so much to compute dives because they end up with these fairly long decompression times in some cases. From a practical standpoint, those may not be necessary. We do agree that for most air diving, decompression schedules ought to be longer than what is in the dive manual, as you get away from the no-D limits.

DR. THALMANN: We've beat the NMRI model into the ground, but we ought to talk about some other things that happened, at least during the time I was at NMRI, because that's what I know the most about.

DR. THALMANN: At NMRI, we obviously pushed the NMRI 93 Model and spent a lot of time gearing up and doing the dives associated with that model. We also did a

whole bunch of surface decompression dives on air because the perception was that the tables may not have been safe, so I just tasked the master diver to go out and use these as training profiles. That way, we didn't have to write a protocol or get IRB approval, because they were straight out of the Navy Diving Manual training dives. He picked as many different types of dives as he could, and without going into the details, he did a large number of different dives. There was no decompression sickness that I recall.

INTERVIEWER: Were these dives ever written up?

DR. THALMANN: No. But they're in the database and that's as much of a write-up as you need. All you need to know is that umpteen dives were done, and here are the profiles and the bends. A lot of them, yes, just ended up in the database and never really resulted in a formal report. I didn't see there was a need for one.

The other thing that we looked at was saturation diving and I was working on some different types of models than the V-Val 18. These were very simple-minded models that allowed you to always start saturation decompression with an upward excursion. Then, we got into the issue of how frequently you could make an upward excursion. What we tried to do was make the decompressions a lot more flexible, depending on what time of day you started. In the standard Navy parlance, you decompress at the standard saturation decompression rates, but then you don't decompress from midnight until six in the morning and from two four in the afternoon. This seemed illogical.

Well, we did change it around so that you had to take eight hours of stops, but you could basically take them any time during the day that you wanted for more

flexibility. To that, the fleet balked and really was not interested. As usual, it did so in a passive-aggressive manner, rather than just coming out and saying, "We have all of these simple procedures ground into our Ops, and it would be a Herculean task to change them. Therefore, we're not interested." They came up with all kinds of other stupid reasons as to why it wouldn't work, but I was smart enough to see the handwriting on the wall, and we just stopped.

Another project we were involved in at NMRI was looking into warm water diving, and that was a direct result of Desert Storm. Two things came out of it. Not only was it warm water diving but warm water, hundred percent oxygen diving and we needed to see whether the atropine nerve gas prophylaxis would have any undesirable effects. In other words, would it enhance O₂ toxicity?

We geared up and did a whole bunch of dives, hundred percent O₂ dives, in upwards of 94-degree water. We showed that divers, in their tee shirts and swim trunks, didn't seem to overheat. They seemed to be able to complete the profile. In the small number of dives we did, we didn't see any big effect of warm water or the nerve gas prophylaxis on oxygen convulsions.

INTERVIEWER: Did you have any symptoms or any seizures, any episodes of oxygen toxicity?

DR. THALMANN: I don't think so. I don't think we had any symptoms at all, as I recall. Tom Doubt wrote that up, and it's in a NMRI report. I don't have the report at my fingertips, I'm afraid. Anything else we got involved in was with thermal issues, and those were the same old bugaboos. It seemed that there were garments that could keep a diver's core temperature above some predetermined minimum, but the problem

got to be their hands and feet, so we did a preliminary study in which we just warmed their hands using electrically heated gloves. We got some ammunition handlers' gloves that are used by NATO troops.

INTERVIEWER: Was that in cold water?

DR. THALMANN: Yes. We showed that something in the area of five or ten watts might be enough to keep a diver's hands warm. That seemed like a reasonable amount of energy a diver could carry on his weight belt, but we never were really able to pursue that to its logical conclusion.

I recall a couple of other things at NMRI that I engineered. I convinced Andrea Harriman to have a look at all of the human options in exposure data, going way back to Donald's experiments. She did eventually get all of that coded and into some computer files, which provided an incredible database for hundred percent oxygen diving. Of course, she was unable to use this to develop her oxygen toxicity model. In theory, it's there for anybody to use to develop their oxygen toxicity model.

To wrap up, one of the problems that NMRI was having had to do with a lot of animal data funded, which didn't really seem to make it outside the realm of interesting, scientific publication. I sat down with Drew Dutka and said that a consensus had been developing among the diving medical types that having to initially crash through 165 feet for a gas embolism was probably unnecessary in that it was more reasonable to go to 60 feet and observe the patient's response. Then, you could determine what the pressure profile should be after that, and he did get together to do enough animal experiments to bring that to some kind of reasonable statistical significance. That led us being able to get not only a consensus among diving medical

officers but some animal studies that backed it up. We eventually got some data to back up the fact that going to 60 feet was reasonable. When it didn't seem detrimental, we'd go to 60 feet first and then to 165 if necessary. If symptoms got better at 60 feet, we went ahead and just treated it at 60 feet.

INTERVIEWER: Was that a NMRI report or was that published?

DR. THALMANN: I'm going to say it was published in the literature eventually.

McDermott, I think, was the guy who actually did the work. He was a graduate student at NMRI. That's about all I can think of for now.

(Whereupon, the PROCEEDINGS were adjourned.)

* * * * *

UNDERSEA & HYPERBARIC MEDICAL SOCIETY

INTERVIEW OF
CHIEF ENGINEMAN FRED LIEDER

Kensington, Maryland
Friday, September 5, 2003

PROCEEDINGS

INTERVIEWER: You're an EOD technician?

CHIEF ENGINEMAN LIEDER: Yes.

INTERVIEWER: How long have you been an EOD tech?

CHIEF ENGINEMAN LIEDER: I've been an EOD assistant since 1989. That would be 14 years.

INTERVIEWER: What other assignments have you had?

CHIEF ENGINEMAN LIEDER: When I first came in as an EOD assistant, I was stationed at MOB Unit 4 at Key West, training Mark 7 marine mammals. Then, I went to EOD school and from there to MOB Unit 5 out in Guam. Then, I worked in STILO detective in Indian Head, Maryland. Then, I went to MOB Unit 3 and then moved to Naval Special Clearance Team One.

INTERVIEWER: You've been here about a year?

CHIEF ENGINEMAN LIEDER: It's been one year, almost exactly.

INTERVIEWER: During Operation Iraqi Freedom, what was your job?

CHIEF ENGINEMAN LIEDER: I was the leading chief petty officer for both Mark 4 and Mark 7 marine mammal systems.

INTERVIEWER: Now, what are those?

CHIEF ENGINEMAN LIEDER: Mark 7 is a mine hunting capability that detects mines, usually bottom mines or buried mines. Mark 4 is a mine finding marine mammal system that locates moored objects in water columns at various depths.

INTERVIEWER: They both use Atlantic bottlenose dolphins, correct?

CHIEF ENGINEMAN LIEDER: They both use Atlantic bottlenose dolphins, yes.

INTERVIEWER: Tell me about your deployment to Iraq.

CHIEF ENGINEMAN LIEDER: I showed up in September of last year. At that time, we had gotten the word that we were most likely going to be participating in the war. They wanted a marine mammal system to clear harbors was what we were told. Mark 7 fit that bill exactly. We

were, at that time, just planning, and we thought we might leave as soon as December or January. We were a long way from being ready for that, equipment-wise, and with our training of personnel. We decided to sit down at my office and figure out how the heck we were going to do it. We came up with the idea of changing our whole tactic. We usually operate a large hard hull boat, 22-foot Boston Whalers and other stuff. We decided to switch so as to be more mobile, and we went to rubber boats. We used the Mark 6 inflatable, which is slightly larger than a Mark 5 inflatable, to be our transport boat for our systems. We chose our Mark 5 boat to be our control boat for the animal, in the minefield. It worked out well. We changed our whole footprint size, from very large to very small. We also started conducting harbor clearance operations in shallower water, with multiple targets and poor bottoms to try to prepare the systems for operating in that environment.

INTERVIEWER: How hard is it to train the mammals to do something different than to what they are normally accustomed?

CHIEF ENGINEMAN LIEDER: Well, they are accustomed to doing harbors. Mark 7 can do harbors. It was kind of in their plan when they first started. But they hadn't practiced it in a while. Basically, you can look at a carpet on the floor, and if you put a chair on the middle of it, you are going to be able to see that chair. It's the same thing for the animals. If it's a sandy bottom, and you put a mine out in the middle of that sandy bottom, it's very easy for them to see it. Take that same thing, put it into mud and sink it to where it is halfway buried, with a lot of trash floating around, which we all know is in harbors, trash cans and metal chunks that have fallen over the side or wheat bags or whatever. The animal has to go through and decide what is a mine and what is not, and then report that back to us.

INTERVIEWER: Can the animals discriminate, or do they pretty much mark anything that's shaped like a mine, or anything that's about the right size?

CHIEF ENGINEMAN LIEDER: It is going to mark mine-like objects. An object has to have certain criteria for the animal to mark it and we maintain those behaviors. Now, there are false positives, but very few. Of 2,000 search stations that we did in Iraq, for example, we laid 16. Of

those, 12 were verified as non-mines. The four were buried items that they couldn't find. In less than one percent of the area that they searched they reported stuff that were not mine-like objects. That was not too bad.

We did a lot of work on that. We actually had two exercises between the time I got here and the time we left. During those, the first time didn't go very well. We were using a different set of equipment for marking mines than on normal exercises. We came to the issues there. We swapped back to our original equipment, thinking it would work just with some modifications. In the second exercise, we did tremendously well, with a 93 percent allocation. We missed one mine that we were looking for, out of all of them. That was pretty good.

Then, we deployed in March and flew over there. Normally, what we do is when we land, we take the systems with the animals and we put them into a Miller pen. The pen is a twenty by twenty-foot square pen, and twenty feet deep. We can put it together and inflate the outside, and the net hangs down twenty feet. The animals kind of get used to being in the environment for that. It's usually seven to ten days that we ask for.

For this war, we were not able to do that. Basically, what happened was that they flew thirty hours out of the water. They fly in these big bathtubs, for people who don't know, and they land in a stretcher. The bathtub is about half full of water. We keep them wet the whole time, but they are not swimming in water. For them, it is a little more stressful than being in open water.

We got there and we were supposed to put them in the Miller pen, but that was all kyboshed before we left. They wanted to keep it on the down low, and we needed to get to the North Arabian Gulf as soon as possible so that we could get into the war because our flights were delayed three weeks. We weren't able to do that.

We went straight from the plane to a truck in the pools on board the USS *Gunston Hall*. It's called a 'ship forward deploy pool.' It's three inflatable rings stacked on top of each other. They are smaller as they go up. They wedge inside of each other. There's a whole bunch of straps that hold them together. Then, a liner is put in there and we fill that up with water and it's

a pool. It has a cover over it so that people can't drop stuff on them and things like that, and it gives them shade from the lights.

We put them in there, which was the first time we have ever had to do that. Basically, they stayed in a pool environment. By the time they actually got back to a pen, it had been 37 days, and that was the first operational use, but even for an exercise, it was the longest we had ever had them in a pool and it worked very well, actually. We went on board those pools and then went to the North Arabian Gulf, where we were 32 miles off Kuwait. It was our first time putting them in the water, so we didn't know if they were going to run away, come back, work well, or what they were going to do.

We have is this IDP, which is an intermediate deployable pool, I think. I'll have to look that one up. Basically, it's a ring, one of the rings from of the pool, but it has a net that hangs off of it, so it floats on the surface of the water. You can re-beach in and out of there, which just means we can put the animal in the water and they come back in the boat. Then, we knew we had control. Yes, they were with us and they weren't going to run away.

Then, we took them out into the open water that day, if they showed us that commitment. We took them out in the open water and we worked them on a simulator mine and stuff like that, just to see how their control was. It turned out that of the five systems that Mark 7 brought and five animals that Mark 7 brought, four were up and running within about a four or five day period. They were one hundred percent, luckily, because it was on day nine, I want to say, that we got the call telling us that we were going into the Port of Umm Qasr.

What we did was put in food and equipment first, pools, our rubber boats that we had to build up, life support equipment for the marine mammals, food for the marine mammals, and personnel. We built up three pools. They were different. They looked like an above ground pool that you have at home. We built up three of those inside of a warehouse right off of Pier 2 there, which is all the way down the bottom of the set of piers. There is one through ten. The new port is ten through twenty, or something like that.

We were on Pier 2, which was secure, supposedly. We flew in while it was still kind of hot in the new port. Umm Qasr is divided into two ports. There's the old port and the new port. The old port was secure. The new port still had gunfire going on. But we flew into the old port with the Hassidic MH-53s and set up three pools.

Then, we got in our boats on the next day after we filled the pools and had everything. We had to borrow some fire hose from the Iraqi people to make it happen, because the distance was greater than we ever thought it was going to be from the water to the warehouse. We filled up the pools and got them treated and shocked, just like we do at home.

Then, we got the animals. Two of the systems came in and started working the next morning. So, it was actually about day two and a half when we started working. We had a bad storm. We were supposed to work the night they came in, but we had a terrible storm with forty knot winds and we couldn't get the boats out.

We also borrowed a box loader. If anybody doesn't know what that is, it's like a humungous forklift that holds Conex boxes. One of the Iraqis was nice enough to leave the keys in for us. Because of the 18-foot tide and lack of boat ramps, we were able to use our lifting slings to lower the boats right over the side, and also the systems, the animals, into the boats.

We were required by the President of the United States to clear Pier 5 as quickly as possible. That was for what we used the marine mammals. Mark 7 was declared what they call the 'mine burial zone.' Because it was a silty, soft mud that varied in length off of the sea wall, depending on where you were in the port, we had various lengths that we had to clear away. Then, mine hunters and UUV took care of the actually proud type contacts.

If there was something that was out of the normal, they would use us to go and just re-verify for the second check, to see if it was a popular native in the system, but we weren't really used for the proud area. That was the old port that was a mine burial zone.

The new port was 2.37 miles long and about an average of 500 yards wide. We had to do the entire port because it was just a silty area. We were there, in the old port and the new, for 19 days. We did something like 1560 waypoints, and we did them with basically three systems

because Takoma, the second male that we brought in, decided to run away. He didn't actually run. He kind of drifted away from us when we had a gas attack, so we all went running in to get our gas masks on. Well, we had our gas masks, but we had to put on all our chemical gear. By the time we got back out, after we found out it was a hoax, he was nowhere to be found.

INTERVIEWER: Which animal was that?

CHIEF ENGINEMAN LIEDER: It was Takoma. We spent time the next day, if we weren't working a system to clear a field, hunting for Takoma. A day and a half later he came back to us. We were out working one night and he swam right up to us. It was a bright, glowing body through the water. His whole outline was just glowing from the bioluminescence. It was quite pretty. I wish I'd had my camera to take a picture of it. But he came back to us.

INTERVIEWER: They normally do, right?

CHIEF ENGINEMAN LIEDER: Yes. Normally, they'll come back.

INTERVIEWER: They go UA and come back after a couple of days.

CHIEF ENGINEMAN LIEDER: We try to maintain them in the area. We use recalls and different things like that to try to keep them in the area. With dealing with this harbor, like I said, there was an 18-foot tidal difference. We were also dealing with a four-knot current when it was fully kicking, and the systems were able to work through that.

We were wondering if he would swim with the current out to sea or swim with the current upriver farther. So, it was quite an extensive zone that we had to search. He ended up being a hundred yards away from where we left him. He tried to hide. Macay is our oldest animal. He's currently 34 years old and has been with the program roughly thirty years. They found him when he was around four or five, they say. They guess. They don't know the exact age. He was a captured animal. I worked with him in Key West, back in the late 1980s, early 1990s.

Of those 1500 sonar waypoints, Macay himself did roughly, I would say, eighty percent of that area. Every day, you went to take him out and he did exactly his two or three hours a day out there, hunting his lanes. He got a little slower. All the systems got slower as we went through. Like I said, that was the longest pool time we had ever had. So, it was good to see how hard you

could push him and the different things you could do to keep his energy. When you think about it, your taking an animal that's used to echo-locating off of everything, and you put him inside of a pool. He can't echo-locate off of anything other than the other animal that's in there with him, you know, to get any entertainment. So, we spent a lot of time with the guys in the water with them, keeping them motivated and things like that. We made sure that they got out every day. That seemed to be the key to keeping them okay. We were basically in that port for 19 days. Well, there were two ports in 19 days.

Then, we flew them all back to Kuwait. When they flew in and out we used their beaching mat, which is a gray, gym-like pad that falls over them so that they couldn't fall out. We flew two of them in a 53, side by side, and just lifted them out when we got to the other end. They went to Kuwait and got six days off in the pen. Then, we tried something new. We put them onto a LCU, put one of the shipboard pools, a smaller version of the shipboard pool, on the back of an LCU, loaded our two Mark 5s on there, our little inflatable boats. All our people slept on deck. It kind of looked like the *African Queen* going up and down the river. But it had all these covers on it to keep us out of the sun because it was really hot.

We went back up the river, past Umm Qasr. It was the Kaa River. We went past Umm Qasr another 12 miles to the port of Az Zubair, which is another deep port that they use. The conditions were terrible. We had a tremendous amount of mud and a tremendous amount of oil. They had drifting nets that were coming down on us all the time, like fishermen, and big piles of bamboo. I didn't know where in the desert they got bamboo, but it just came flying down the river at four knots. You were driving this lane on your little boat, driving off of a computer screen, trying to keep on line. You just got the warning, "Hey, bamboo." You had to go around and get back on track again and things like that.

INTERVIEWER: Were you worried about the safety of the animals then, with the contaminant in the water and the obstacles?

CHIEF ENGINEMAN LIEDER: Yes. We had light oil contamination in Umm Qasr. But basically, the vets, and we travel with a veterinarian, told us that as long as we cleaned them off,

they'd be perfectly fine. We had soap to clean them off after every comeback. We didn't have to really do anything in Umm Qasr. They would have a little bit on their control surfaces. When I say 'control surfaces,' I mean their pectorals, dorsals and gluts, which are the tails. They had a little bit and we just cleaned that off. It wasn't a major deal.

When we got to Az Zubair, on the other hand, it was all over them. It was on the control surfaces, the rostrums, which are their noses, all the way up their foreheads, and on their backs. It was nothing that was hurting them, and we would clean them off as soon as they came back. It didn't seem to affect them at all in their performance. They worked tremendously well. They were quite resilient to just about everything in the water. It was amazing to see. We were very concerned, personally. We didn't want to hurt the animals for any reason other than, you know, if we had to save human life. But we were concerned about their safety. We got there and started working. It cleaned right off. We had an eye cleanser, just in case there was some in their eyes. Everything seemed to work fine.

We brought Macay and Spetsnaz, which is our other male, not Tacoma. They did that port. Only two animals did that port because it was smaller. It was about 500 waypoints every day. Again, going out to the mine burial zone was what we had or were tasked with. We didn't find a single thing in that port. It was good. The animals were tremendously better the second time around. Once they got those six days off, they were super fast.

INTERVIEWER: Do some animals work better than others? I mean, do they have personalities?

CHIEF ENGINEMAN LIEDER: Sure, they do have personalities. Some systems will have beaching issues, or coming in and out of the boat. But when you get them into the field, they work like champs. So, there are just little things, and they change. There are set patterns that you can see. There are also times we have to ask, "Why won't he beach today? That doesn't make sense," or "Why is he not finding the calibration target when we're only thirty yards away and he should be finding at fifty? What's up?"

Those are decisions we have to make out there, while we are doing it, like whether an animal is safe to bring into the field. We don't want to go through a field with an animal and say,

“Yeah, it’s clear,” when there’s a mine sitting in the middle of it and a ship blows up when it pulls in with humanitarian aid. That’s just something we don’t need. There are patterns for each of the systems. There are set patterns but they will have off days in there. There is always correction. I don’t have any children, but I would say it’s like working with children, except that all your answers are ‘yes’ and ‘no.’ You can’t say, “Okay, go and pick that tree out or pick that stick out and put it over there next to that rock.” You can’t tell them that. They have to figure out they are going to go do it and then you either say, “Yeah, that was good,” and feed them, or “No, that’s not what we want.” It’s a little harder. Try to train your dog with a clicker. Maybe ‘yes’ is one click and ‘no’ is two clicks. Tell him to do stuff. We are talking about a chain of behaviors that is 12 or 15 steps per signal. It is not something easily learned, so there can always be a breakdown here and there.

INTERVIEWER: How long does it normally take to train an animal?

CHIEF ENGINEMAN LIEDER: Right now, they are up to Mark 7, which is the most complicated of the marine mammals. It is roughly eight years now.

INTERVIEWER: Wow.

CHIEF ENGINEMAN LIEDER: It used to be a lot shorter. Now, we have added a lot more behaviors to them and the Navy was really short on animals, so they trained them as fast as they could to get them to us. We found issues with that. We would have control problems or not the best detection. Now, they keep them longer at SPAWAR before they get them to us, so we get a better product in the end.

INTERVIEWER: Is this your second time as a mammal handler?

CHIEF ENGINEMAN LIEDER: Well, now, I’m more managerial. I don’t really get to put my hands on. Now, I deal with more program stuff, especially since currently, I’m filling an officer in charge billet and we’ve combined all the mammal systems into one. It used to be that Mark 4 and Mark 7 was one group. Mark 8 was another group. Now, Mark 4, Mark 7 and Mark 8 all belong to me. We’re trying to combine Mark 7 and Mark 8 to do the same job because they are so close to each other. They work in different ranges, that’s all.

INTERVIEWER: Do animals ever get cross-trained, like a Mark 7 animal becomes a Mark 8 or a Mark 6 becomes a Mark 7? Do they always stay one thing, for their whole life cycle?

CHIEF ENGINEMAN LIEDER: What it comes down to is the needs of the Navy I think that in Mark 8, right now, we have one animal that used to be a Mark 6 animal, which is an anti-swimmer dolphin. Most of the other three Mark 8 animals were prior Mark 7 animals that we had. We used to have two depths of Mark 7 animals, which means we had four each. Now, we only have one. We gave four back to SPAWAR to maintain. They went ahead and took some of those and made them into Mark 8 animals, because it's easier to train Mark 7 to Mark 8 than it is Mark 8 to Mark 7, which was a new program.

INTERVIEWER: You dive with the mammals also, right, to verify that they are performing?

CHIEF ENGINEMAN LIEDER: Yes. I didn't go to the personnel side of this whole thing, did I? Basically, for the war we took 19 personnel from my division. Of that, three of us were EOD techs and the other 16 were either SCUBA divers or second class divers. All the divers, but not the EOD part, were the marine mammal handlers. They were the guys that were out there, handling the animals every day. They also set up a SCUBA diving office to check marks, to make sure that the training was going correctly and they did dive in the North Arabian Gulf, to verify marks, while we were getting ready to go into Iraq. Actually, I think we did get two SCUBA divers to dive in Iraq in order to locate one of our lost markers, out in the middle of the thing. They were actually two second-class divers. They were pretty happy. They got a 2544 that said they were to dive in Iraq. It kind of psyched them up.

With the EOD techs, because the animals could lay explosives, our main job was the safety of the explosives, and stuff like that. We did not use explosives during this war. We just laid markers that had acoustic beacons on them. They talk to the boat and tell us exactly where a monitored object was. Divers would go down later and check those, to see what was there.

INTERVIEWER: In the end, you didn't actually find any mines. You were able to verify that the port was clear, right?

CHIEF ENGINEMAN LIEDER: That's right. We had four contacts from Mark 7 that were nothing found on the surface by a diver, which meant that of those four marks, we had a buried mine, or something mine-like, just buried. The commander decided to place charges and blow there, just in case. That way, we considered it taken care of. That was how the system worked out. We used the mammals to mark, and we used the divers, since the animals were more time consuming than we were, to verify and take care of those.

Now, if we had found a mine, I think the plan might have changed. Instead of hazarding a diver, the marine mammal was definitely low MEU. The shape that he places is definitely low MEU, so why not send them in instead of taking the chance a whole dive team might go up by mistake? Reducing human casualties is definitely a plus. But the animals did very well. We went over with nine animals altogether, five Mark 7s and four Mark 8s. I haven't talked about Mark 8. I wasn't working with them, but they were placed in Kuwait, just in case they were needed for some sort of amphibious assault on a beach. Their job is the VSW field, the very shallow water area. They weren't needed, so they got a vacation in Kuwait, unfortunately. They were probably not too happy about it.

INTERVIEWER: Are there any other topics that we ought to talk about, or something else you want to add that I didn't think to ask you?

CHIEF ENGINEMAN LIEDER: No. It was just great to be part of the first operational deployment of the marine mammal systems.

INTERVIEWER: It was successful?

CHIEF ENGINEMAN LIEDER: It was, for mine hunting. Of course, we had the anti-swimmers for the Vietnam War. But for mine hunting, yes, it was great. It was a great tool. There is no other system in the Navy for buried mines, yet. The admirals have seen that and they were very happy to bring this over and do it. It turned out really well. I know everybody thinks there are a lot of logistical headaches going along with marine mammals, but it turned out well. I don't think the admirals ever really heard anything that I know of that would make them not call us again.

It's good to see something the U.S. people have paid so much money for be used in a real operation, and it worked so well.

INTERVIEWER: Great. Thank you very much.

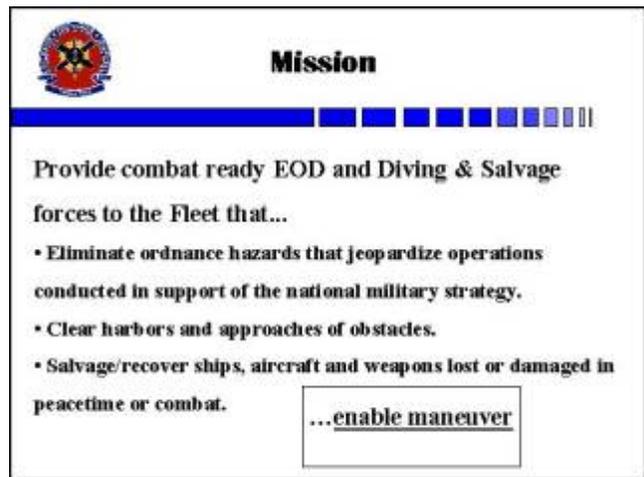
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CAPTAIN DESTEFANO: Good afternoon. I'm Captain Rob DeStefano. I'm here to talk about organizing Navy divers for global rapid response and, in the process, to tell you a little bit about what Navy EOD Groups can and are doing.

I have -- that's on the first slide. I have a lot to say, I have 20 minutes to say it. So at times, I'm going to speak quickly.

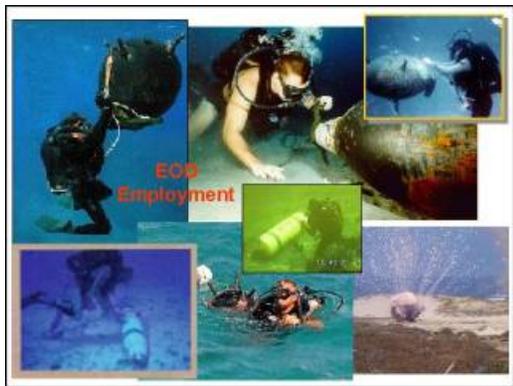
While the file is loading. What you're going to see in a moment is a very condensed Navy EOD Group Mission Statement.

There are two EOD Groups, cleverly named One and Two. One is located in Coronado, California, and the other in Little Creek, Virginia. Each is composed of seven subordinate commands: Three EOD units that are active duty, and two that are Naval Reserve Force, a Mobile Diving and Salvage Unit, and a Training and Evaluation Unit.



The slide features the Navy EOD logo at the top left, followed by the word "Mission" in bold. Below this is a blue horizontal bar with a series of small blue squares. The main text reads: "Provide combat ready EOD and Diving & Salvage forces to the Fleet that..." followed by three bullet points: "Eliminate ordnance hazards that jeopardize operations conducted in support of the national military strategy.", "Clear harbors and approaches of obstacles.", and "Salvage/recover ships, aircraft and weapons lost or damaged in peacetime or combat." At the bottom right, there is a box containing the text "...enable maneuver".

EOD Group One also fields a very shallow water mine countermeasures capability. Now, Navy EOD is a relative newcomer. Here we go. Navy EOD is a newcomer to the very shallow water MCM business.



In 1997, that's 4 years ago, we established a VSW MCM detachment composed of EOD divers, SEALs, Recon Marines, a Marine Mammal Platoon, and Underwater Autonomous Vehicles.

This warfighting lab is developing and evaluating VSW tactics, techniques, procedures and equipment for use in a very demanding underwater environment.

The predecessors of today's Joint Service EOD programs were established during World War II by then-Navy Lieutenants O.D. Waters and Draper Kauffman. The mine disposal and bomb disposal schools they founded, were later consolidated into today's, and evolved into the present-day Naval School for Explosive Ordnance Disposal that's located at Eglin Air Force Base in Florida.

EOD officers and enlisted train together, qualify to identical standards, and wear the same breast insignia. And I suspect from yesterday's SEAL history lesson, that that is another legacy of Draper Kauffmann.

Today's Mobile Diving and Salvage units are the operational descendants of Vietnam-era harbor clearance units. But I believe -- and this is my opinion -- that they're the philosophical

descendants of Swede Momsen's Experimental Diving Unit as it was portrayed in The Terrible Hours.

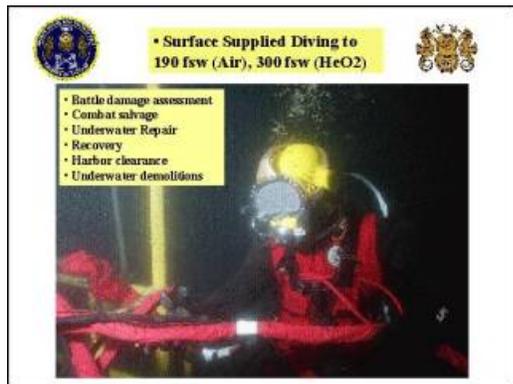
I don't mean this in the sense of the things that they do, but the innovative ways in which they do them. And I will try to convince you of that a little later on.

Our missions include unexploded explosive ordnance response on land and underwater, underwater mine countermeasures, salvage, damage control and repair, VIP protection in support of the United States Secret Service and Department of State, humanitarian de-mining operations, and environmental remediation support.

We routinely deploy in carrier battle groups, amphibious ready groups, and military sealift command TATFs. We respond to emergent tasks from major salvage and EOD operations through underwater inspection and recovery.



We frequently use our recompression chambers to treat civilian diving injuries, aviation-related decompression sickness, and for other medical treatments that require hyperbaric oxygen.



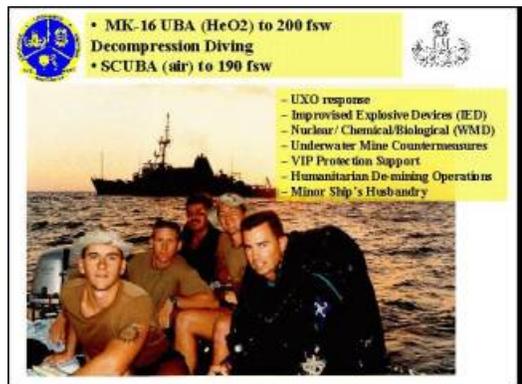
Here you see one of our transportable recompression chamber systems being loaded into a salvage vessel of opportunity. Our detachments can be containerized, as you can see, or break bulk configured, and admin or operationally loaded as required. All detachments are air-liftable complete.

All our surface supplied diving capability resides in the two MDSUs, Mobile Diving and Salvage Units. This slide shows their operational

limits, and some examples of what they can do.

Each Mobile Diving and Salvage detachment, which are the deployable elements of the MDSUs, has its own surface-supplied air system. Each MDSU -- the parent command also has one HeO2 system, the flyaway mixed-gas dive system that you've heard about, that can be deployed with or in support of any detachment when deep dives are required.

This slide depicts EOD detachment capabilities. An EOD dive is half the size of a Mobile Diving and Salvage detachment, but all EOD divers



are trained to dive surface supplied, and can be integrated with MDSUs when necessary.



The Mark 16 is a closed-circuit, very low magnetic and acoustic signature underwater breathing apparatus that we use for decompression scuba diving to 200 feet. It's used primarily in support of EOD mine countermeasures under the sea.

Typical EOD operations involve ordnance. Several of these photos are of ordnance actually deployed against the United States and Coalition Forces in anger. The one in the lower right hand

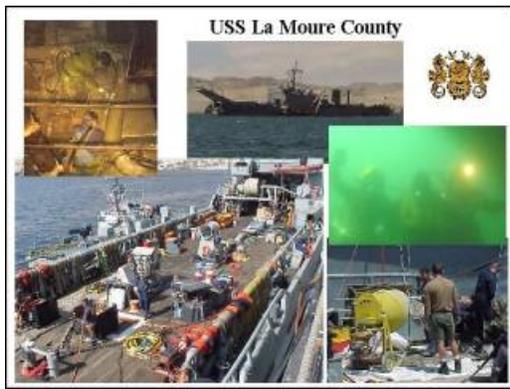
corner, is a reminder that we also operate ashore.

The goal of any EOD operation is to avoid this, or to have it occur at a time and place of our choosing.

Deep-sea HeO2 diving is alive and well. The wreck of the *USS Monitor* is located at a depth of 240 feet. MDSU-Two has been the military lead for planning and execution of two past and one upcoming expeditions in support of Naval Historical Society



efforts to stabilize the wreck and recover artifacts.



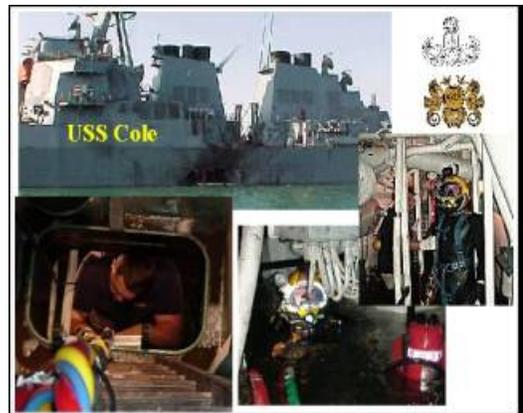
In addition to the public relations and archaeological value of these expeditions, we've also used them as opportunities to test and evaluate new procedures, such as underwater grouting which was used to stabilize the wreck.

which we used operationally for the first time during the 2000 expedition. In 2001, we're planning to try out a portable saturation diving system presently used for commercial diving operations that, if satisfactory, could extend MDSU depth and duration capabilities well beyond the current HeO2 limits.

We also validated our newest HeO2

decompression tables,

In September 2000, *U.S.S. La Moure County* grounded off the coast of Chile, suffering extensive hull damage. A MDSU-2 detachment, 19 personnel,



responded by air from Norfolk. It took 48 hours to get them to the ship.

Here you see divers mixing concrete to use underwater for patching leaks in a manner similar to what we did just a few months before, during the *Monitor* 2000 expedition.

In October 2000, *USS Cole* was attacked by terrorists. EOD divers who were in Yemen, conducting humanitarian de-mining operations, responded within hours, and were quickly reinforced by additional EOD divers who were in Bahrain on other duties.

These were EOD detachments from both EOD groups One and Two, because our areas of responsibility overlap in 5th Fleet. When it became necessary to dive inside the flooded compartments in the ship, MDSU-Two Det Alpha was redeployed to 5th Fleet from the *USNS Mohawk*, a TATF then underway in the Med. That's a 6th Fleet to 5th Fleet inter-theater redeployment on the fly.

Three-quarters of Det Alpha debarked in Bari, Italy, moved overland to an airhead with their portable surface supplied equipment, and were on dive station in Aden within 48 hours. We left four folks behind, so that the *Mohawk* retained a diving capability. Det Alpha subsequently recovered all of our fallen shipmates from *Cole's* flooded spaces.

Over a year before, in February '99, EOD Mobile Unit 2 and SIMA (Shore Intermediate Maintenance Activity) Norfolk collaborated on surface supplied diving operations pierside inside the *USS Radford*. They removed 5-inch 54 projectiles and powders from the forward magazine that had been flooded in a collision at sea.

On 23 August 2000, at about 1930 hours -- that's just about dark -- Gulf Air Flight 72 crashed in 4 to 12 feet of sea water near Bahrain and about 6 miles from where the *USS George Washington* was anchored.



From 23 to 27 August, EOD Mobile Unit Two's *George Washington* Battle Group Detachment, an EOD Mobile Unit Six Mine Countermeasures Detachment deployed to the Gulf on other duties, and EOD Mobile Unit Eight Shore Detachment Bahrain -- three different kinds of detachments -- conducted surface swims, free diving, swimmers in a line, and scuba diving operations during which they recovered both black boxes, NTSB-designated debris, took underwater photos for NTSB, recovered a Department of State courier pouch containing classified material, and helped to recover the remains of all 143 casualties of the crash.

Lake Garda is a deep Alpine lake in northern Italy. During the Kosovo air campaign, an Air Force F-15 with an in-flight emergency jettisoned ordnance into the lake, which is a recreation and tourist destination.

EOD Mobile Unit Eight responded to both Lake Garda and to the northern Adriatic, where other pickled ordnance was being unwillingly retrieved by commercial fishermen, some of whom were injured by exploding bomblets.



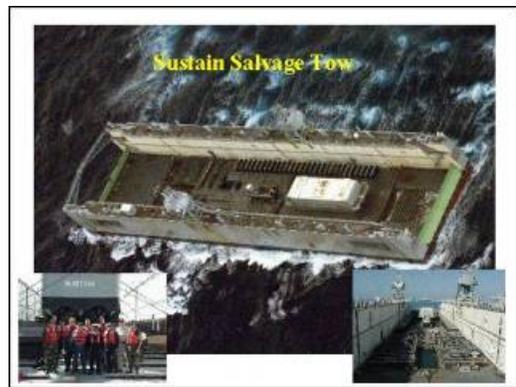
Lake Garda involved high-altitude decompression diving, which presents some unique challenges with respect to dive planning and execution. The three detachments -- three different kinds, all from Mobile Unit Eight -- responded: an EOD detachment; a flyaway recompression chamber detachment, which is manned by diving medical technicians, a master diver, and some other fleet divers; and a sidescan sonar detachment. EOD Mobile Unit Eight also deployed their diving medical officer to this particular operation, because of the nature of it.



slogging through mud, a potpourri of recovered weapons and munitions, and divers standing sentry for self-defense and security. Sometimes, people shoot at us, even when we're trying to help them.

In March 2000, MDSU-Two conducted operations for the EPA that involved this derelict asphalt barge in New Orleans. It had been in this pristine wildlife area for 30 years, and was an EPA Superfund target.

So far, you've seen deep sea, shallow water, in-ship and high-altitude diving ops. During Joint Forge, EOD Mobile Unit Eight made dives in the Sava River to recover mines and other ordnance. These photos show divers in the water, mines under the water, divers



They surveyed, stabilized, and refloated the barge so it could be moved to a place where it no longer threatened the environment. You can see our divers here wading in asphalt, diving in mud, and having a generally great Navy diver day. And I think that you can see the unifying theme in Navy diving today, as in the past, is mud.

In February of 2000, the floating dry dock Sustain, which you saw earlier during Bert Marsh's presentation, broke free of a tow ship off the Virginia capes during a winter storm. She was adrift for 4 days, underway, not making way, at 4 knots.

MDSU-Two and SIMA Mayport divers helped recapture the tow and bring her to Bermuda, where MDSU-Two divers re-rigged her. From there, she completed her tow to Florida uneventfully.

This operation involved 1 percent scuba diving, and 99 percent rigging. And as you know, involved Mobile Diving and Salvage Unit Two divers, SIMA, NAVSEA civilians, and contractors.

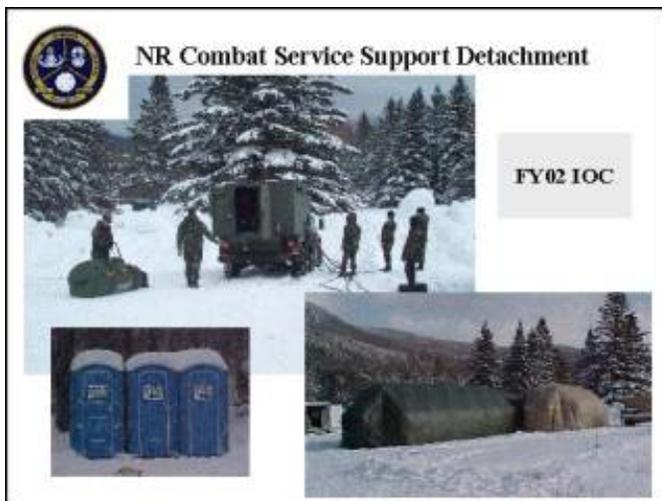


When I was a young Navy diver, we often spent days or weeks looking for things underwater. Often, even usually, we spent more time searching for things than actually diving on them.

Sidescan sonar detachments find things. These small, easily deployable active duty and Naval Reserve operated sonar detachments contain no divers, but they optimize the utilization of our divers. Here

you see some ASD hardware and sidescan images. These systems can be deployed from any suitable vessel of opportunity.

In the lower right hand corner, is a photo of a Marine Mammal System element. These biological sonars are also used to find things. All our Marine Mammal Systems are organized under EOD Group One.



Operating increasingly outside the lifelines of ships, we use this Naval Reserve mobile communications capability to maintain connectivity with other Naval, joint, and coalition forces on the battlefield.

MCDs provide full-spectrum connectivity, including GCCS interface -- that's Global Command and Control System-- for Navy divers in the field.

We have one prototype Combat Service Support Detachment that will formally achieve initial operating capability in FY02. Yes, those are Port-a-Potties that you see there. And believe me, when you're in the field, in the middle of nowhere, with 100 divers and support personnel, and you don't have these, you'll wish you did.

Again, operating increasingly outside the lifelines, we sometimes need basic hotel services that are taken for granted when we're embarked in Naval vessels. Without this limited field service support capability, diver productivity rapidly diminishes when operating in remote or unimproved locations, or on battlefields, where elementary infrastructure, like running water and sanitation are inadequate or totally absent.



Takeaways...



- Dive Ops Involve More than Diving
 - Logistics
 - Field/Combat Service Support
 - C4ISR
 - Side Scan Sonar Operations
 - Self Defense

- Navy Divers Do More than Dive
 - Diving is transportation to and from the workplace
 - Operate, Move, Shoot, Communicate





This slide is the punchline. If you haven't already guessed, diving operations involve much more than just diving. Topping my short list is logistics. We operate more and more outside the lifelines of support ships. The frequency, duration, and magnitude of these off-ship operations are increasing. Consequently, we've had to think about things that rarely concerned us 15 years ago -- things like communications, heads and beds, hot meals and showers in the field, minor vehicle and boat repairs, and self-defense -- things taken for granted when embarked, but that we must be prepared to bring with us when required.

Navy divers still dive in deep water, on and inside the flooded compartments of ships, but also in Alpine lakes, in rivers and in bayous -- wherever the work maybe.

We use everything from surface supplied to HeO2, to snorkels. But diving is just transportation to the place where we employ our real skills. Just like we must be able to dive, we must also be able to deploy and redeploy quickly--to move, shoot, and communicate on any battlefield.

Organizing for Global Rapid Response means organizing for speed. At one time, rapid response was measured in weeks or even months. Today it's measured in days and even hours.

My rule of thumb, and our measure of effectiveness, is to be on station, airlift and weather permitting, within 48 hours of receiving a deployment order.

The operational imperative for rapid response simply means that sometimes waiting for help is not an option in an emergency.



Takeaways...



◆ Organizing Navy Divers for Global Rapid Response means:

- Strategic Mobility (Speed)
 - 48 Hour Rule of Thumb
 - Operational Imperative
 - Speed of News
- Agility
 - Cole re-deployment
- Flexibility
 - Tailorable/Layerable
 - Maritime, Expeditionary, Joint & SOC
- Sustainment





The news media are ubiquitous and unrelenting in their coverage and analysis of military operations. Media relations are not the primary motivation for rapid response, but have become increasingly important.

Now this is an apples-and-oranges comparison, but consider this. The Russian response to the *Kursk* tragedy was panned in the press, or at least by some in the press as slow and inadequate. In counterpoint, the virtual total absence of press comment on the Navy diving aspects of our response to the Cole bombing was, for me, a success story.

To be unnoticed and uncriticized in today's news market is a very good thing. More to the point, the next of kin of those who died in the Cole were entitled to as much consolation and closure as our recovery efforts could expeditiously deliver.

By agility, I mean wherever they're deployed, and whatever they're doing, our detachments can quickly shift gears when necessary.

Flexibility. The basic elements of EOD Group Force Structure are detachments. These detachments are distributed globally, for initial rapid response. They can be tailored for specific missions, making them lighter and easier to move. And when more is needed, they can be layered to produce different mixes of capabilities, as you've seen.

In traditional military jargon, this is called economy of force -- being strong in the right place at the right time.

The Navy is maritime, expeditionary, and joint. So are we. We also have Special Forces customers for our EOD skills. So over the past 12 years, Navy EOD has become Special Operations Capable. That is, we're able to operate throughout the battle space, and across the spectrum of conflict with both conventional and Special Forces.

We cast, rappel, fast rope, parachute, and train in small-unit tactics. We have the same mobility skills, and can fully integrate with SEALs and Army Special Forces operators when required.

We've done this because the Special Forces community needs EOD, but not at the expense of having EOD personnel operating with them who are a liability in the field.

Today, Navy EOD forces are the EOD forces of choice for Naval Special Warfare and Army Special Forces. Let me emphasize that SOC is not synonymous with Special Forces. We are not Special Forces. In fact, we have a ways to go in perfecting our suite of Special Operations Capabilities.

Sustainment. Diver effectiveness rapidly degrades if the operation, whatever or wherever it is, cannot be logistically sustained. A good piece of my force structure is dedicated to sustainment, as well as that of EOD Group One.

I apologize if I've told you what you already know. Thanks for bearing with me. For everyone else, my goal was to describe aspects of Navy diving that may not have been obvious, of which you were not aware. I hope it was thought-provoking.

But I've told you less than half the story. I've limited my examples to a few major operations that have been conducted under the sea by EOD Group Two, within the past 2 years. I've left out almost entirely the other EOD group, and most operations conducted ashore.

In conclusion, let me say I wish I had more time. And that if we ever do this again, I think that this subject could merit an entire panel, or perhaps an entire morning or afternoon.

I'd also like to say that it's really an honor to have walked among the living legends of Navy diving. If I can be so bold, I'd like to speak on behalf of all Navy divers today, that we're standing on your shoulders, and they're very broad shoulders indeed. Thank you very much.

UNDERSEA & HYPERBARIC MEDICAL SOCIETY

INTERVIEW OF

GEORGE W. MARTIN
Captain, USNR (Ret.)

Thursday, February 5, 2004

PROCEEDINGS

INTERVIEWER: First, let me thank you for inviting me into your home. I look forward to the chat this morning. I wonder if we could start off with you giving us a little bit of your background, like where you came from, where you were born and how you got involved with the Navy.

CAPT MARTIN: I was born in Brooklyn, New York, in April 1933, and my background is Irish Catholic. My great grandfather, Bernard Martin, came here with the potato famine immigrants in the 1850s. I found him and his family on the 1860 Federal Census for New York City.

My grandfather, Joe Martin, was just ten months old at the time. He is on the census. He joined the fire department in 1883 and in 1910, became the Assistant Chief of the Fire Department New York, which he was until 1930, when he was forced to retire at an age pretty close to seventy years old. He was nicknamed "Smokey Joe" in 1912 after he was found in a burning smoke filled basement from which all the other firemen had been evacuated.

As for my parents, on the Smith side, my mother's name was Smith and Carey and they came here from Ireland in the 1880s or early 1890s. We're New Yorkers. I was very fortunate; I was able to go to a great high school, one of the best in the country, called Brooklyn Technical High School. They prepared you for engineering, science and college or the trades. It was a great place to go to high school. There were six thousand boys there.

My father died in December of 1949. I was 16. It was time for me to grow up, and in the spring of 1950 my two best friends, Paul Ryan and Ed Hillis joined the Navy Air Reserve at the Naval Air Station, New York. Because I was under 18, I had to have a parent sign my enlistment paper. When I turned 17, they persuaded my mother to sign one, so the three of us, Paul, Ed and I, were members of the Navy Air Reserve.

The idea was to get a job for the summer. The Navy would send you to a combination of boot camp and airman school. It was eight weeks during the summer, which was great. We reported for boot camp on June 25, 1950, the day the Korean War started. We completed boot camp and airman school and were assigned to reserve squadrons.

My squadron was VF833. The aircraft was the F6F Hellcat. The squadron was ordered to active duty. In fact, most of the squadrons at NAS New York and other air stations were ordered to active duty for the Korean War. I was still in high school, so they left me behind and transferred me to the air wing staff. I was working in the shop of the aerographers, or the weathermen.

I had heard that you could get into the Naval Academy from the Reserve, as well as active duty. I applied and took the exam in April and was among the ones who stood highly enough to get orders to become midshipmen.

I found a summer job. My sister called me at work, which you never did in those days. I mean, work was work. You didn't call home and they didn't call you. She said, "Are you sitting down?" I said, "I'll sit down." She said, "There's a telegram here from the United States Navy, and it says that you are ordered to report Monday, July 23rd, to the United States Naval Academy in Annapolis, Maryland, by 8:00 AM."

I went down, and that started my Naval Academy career. I graduated with the class of 1955. I went into surface warfare, which was where you started if you weren't going into the aviation field.

My first ship was the USS *Hunt*, a tin can out of Newport, Rhode Island. The Navy had more than 200 destroyers in commission in the mid-1950s. I qualified as Officer of the Deck (OOD underway) OOD and after three years, I was ordered to submarine school. I had put in for it. The

nuclear expansion was just happening when I graduated in 1955; the USS *Nautilus* had just been commissioned. The nuclear powered submarine world was beginning to greatly expand.

INTERVIEWER: Before we get into the submarine service, can we back up just a little bit to the Naval Academy?

CAPT MARTIN: Sure.

INTERVIEWER: Can we talk about the life in the Naval Academy in the early 1950s? Perhaps there is some comparison you can make about what life was like then, as compared to now.

CAPT MARTIN: Well, back then in the early 1950s, the Naval Academy and the Military Academy were operated much like monasteries. Your time was completely scheduled, from early morning to late at night and weekends. There was very little time off. There was very little money. We were getting three dollars a month for spending money as plebes.

But it was a great deal, especially for somebody like me. I didn't have a family that was going to turn over a business to me. I certainly had no aspirations to become a lawyer or a doctor or anything like that. I wasn't quite sure what I did want to do. I tested well for English, and they said, "well, George, you ought to be an English major." That was before I got into the Naval Academy. My sister was an English major, so she became a teacher in grade school.

I wanted to be in the outdoors and be active. I wanted to be physically doing something out there. The Navy solved that problem for me. Life at the Naval Academy, of course, is very different now. I am not a midshipman now so it is difficult to compare. The expectations of midshipmen now are very different, 50 years after I was a midshipman.

Of course, they have a lot more money now. The Naval Academy is this enormous institution, with budgets in the hundreds of millions of dollars, I guess. I needed that regimented

life, that scheduled life. It was good for me. You had to participate in sports, which was good for me. I was on the gym team and played battalion intramural sports.

The summer cruises were where I really began to love the Navy. My first cruise was on the heavy cruiser USS *Macon* (CA-132). It was a miniature battleship. The designs were scaled down from the *New Jersey*, *Idaho*, *Iowa* and *Wisconsin* classes of World War II. They had eight-inch guns instead of the 16-inch guns that were on the battleships. But the plan, the layout, was very similar. I just loved being at sea; I loved being part of an organization with a purpose and with a group of men. We had a job to do...beat the communists.

Well, it was in 1951 when I entered; World War II ended in 1945. Five years later I had enlisted in the Air Reserve and the following year I went to the Naval Academy.

The World War II culture was the dominant culture. Many of the professors, the teachers, the naval officers had served in World War II. They knew that the more you sweat in peace, the less you bleed in war. It was a very rigid place. There weren't exceptions made in academics or discipline because you were this or that. But I didn't mind.

INTERVIEWER: Your curriculum was pretty lockstep, too.

CAPT MARTIN: Yes. Everybody had the same curriculum. Your only choice was a foreign language. I had taken French in high school, so I continued with that. You could have French, German, Spanish, Portuguese, German or Russian. I continued with French and enjoyed that.

I think I was in the last class to have the course in naval boilers. When I became Chief Engineer on the Destroyer USS *Hunt*, I was so fortunate to have had that course in naval boilers and all the auxiliary machinery, the pumps, the de-aerators, and the steam plant. That course provided me with knowledge that gave me credibility when working with the enlisted men whose job it was to operate and repair that machinery. Anyway, I felt very fortunate to have had that

course. Of course, the Navy was using steam power back then. Then, in the 1960s, they moved toward diesel power for the smaller ships. Then, they moved into gas turbines. Of course, nuclear power for surface ships as well as submarines came into place.

The degree that a midshipman graduated with was a Bachelor of Science degree, and that's all it says. It doesn't say anything about engineering or what science. You had a lot of physical science; chemistry and physics; electrical, mechanical and navel engineering. The courses that were hands-on: wiring motors in the juice labs, for example. If it was hands-on, I could do it. I was not a great student in terms of reading books and that kind of thing. It was just a great place to be.

INTERVIEWER: How many students were there?

CAPT MARTIN: My class, I think, entered with about 1200 and graduated about 760 or so.

INTERVIEWER: That was a very large attrition compared to today.

CAPT MARTIN: There were just great things. It was a real opportunity for somebody like me, who wouldn't have had that opportunity had I gone to City College in New York. I was very fortunate. I knew it at the time. One of the nice things was that they'd send part of the brigade off to a football game in the fall, an away game.

During my first class year, they sent my battalion and another battalion to Philadelphia for the Penn-Navy game. A midshipman in the class ahead of me had gone up there the previous year. He said, "Martin, you go to that nurse's dance at the University of Pennsylvania. They'll have a little tea and dance. You sign up for that." I signed up for that, went to the dance, saw this very attractive young woman across the crowded room and asked her to dance. I invited her for the Army-Navy game, and went to visit her at Christmas. She was working as a nursing student at the University of Pennsylvania. I was hooked, hook, line and sinker. It all happened so fast. You couldn't get married anyway until you graduated, but anyway, we did get engaged. She came to our

graduation. She is up there in the class graduation picture on the right-hand side. My mother and sister are sitting next to her. We've been married 47 years and thank God for that.

INTERVIEWER: Your marriage was during commissioning week?

CAPT MARTIN: Actually, no. It was a year later. She didn't graduate until June of 1956. As a nursing student, she wasn't allowed to get married either, so that was a good idea.

INTERVIEWER: It was love at first sight.

CAPT MARTIN: It was pretty close to that. We know three midshipmen who live in the neighborhood here. There is a set of twins. I actually helped get the second twin into the Academy. They came by at Christmastime, nervous and everything. But they're doing fine. They're both very bright young men. They had superior academic preparation and ten years of competitive swimming under their belts. I met one twin at the neighborhood pool here, the Flower Valley pool. I went over and asked him what school he attended. He said he went to Georgetown Preparatory School. "What are you thinking about for college?" I asked. He looked like a guy you would want at the Naval Academy. He said, "Well actually, I've applied to the Naval Academy." That was the right answer. We talked, and he was concerned because he had really, really poor eyesight. I couldn't believe it. As we were leaving, he said, "I have a twin brother who would like to go there, too." I said, "Well, have him give me a call." A week or so later at the pool, I saw this other young man who was also the kind of guy you want at the Naval Academy. I went up to talk to him and he told me he had just finished his plebe year at the Naval Academy.

INTERVIEWER: You've got a way of spotting these folks.

CAPT MARTIN: I was the Blue and Gold officer for Maryland for ten years, from about 1972 to 1982. Yes, that was a good experience. That was a volunteer position in association with the Naval Academy. I am very proud of it. In fact, I have a book here signed by Arleigh Burke that my

mother gave me. He was Chief of Naval Operations from 1956-1960. I was up there for an award for the Naval Academy Information Program work. Arleigh was, of course, retired by then, but I knew him through a work context. Anyway, he signed my book. I'm just proud to have that.

INTERVIEWER: I served on the admissions board for four years when Jack Renard was there.

CAPT MARTIN: I finished like in 1982 or 1983. He started that next year.

INTERVIEWER: The inputs of a Blue and Gold officer were always very valued in the deliberations.

CAPT MARTIN: Sure.

INTERVIEWER: You left the Naval Academy and went to surface warfare.

CAPT MARTIN: That's right. I was on the USS *Hunt* (DD 674), a tin can, as they say, out of Newport. They really were tin cans. A .50 caliber bullet could go through any part of the hull, and even the gun mounts. But it was a wonderful experience.

It wasn't easy for me. I liked being at sea. I liked being underway. I liked going home, too, but I just loved being at sea. It was where I wanted to be. My first skipper was then-Commander Gene Farrell. He went on to become Rear Admiral. He visited and stayed with us a couple of days last spring and is coming back this year, in April. He and his wife will visit for a couple of days. He did a lot for me. It was the first example of a win-win that I had ever encountered in my life. I had orders to the USS *Ranger*, a pre-commissioning unit, being built in the Philadelphia shipyard.

I had wanted to go to submarine school because both of my roommates at the Naval Academy had already gone into submarines and were sending letters and saying, "George, you ought to get in," and that kind of thing. He called me into his cabin one day, and I was terrified of this man. Commanding Officers were really very imposing figures. This man still is. He said, "Martin, have a seat. I have an advance copy here of your orders to the USS *Ranger*, pre-

commissioning. You could get lost on a big ship like that, with 200 officers," which was true. I didn't know that, but he did. He said, "I've got a alternate plan here for you to consider. How about if I send you to Destroyers Atlantic (DESLANT) engineering school. When you come back, you can relieve Pete Watson, my chief engineer, and you'll be Chief Engineer of the *Hunt*."

I said, "Well, sir, I was hoping to go to submarine school." He said, "I can certainly put in a favorable endorsement for that." I said, "Yes, sir." DESLANT Engineering school was ten weeks long.

It was hands-on and class work, too. It was hands-on and classroom engineering. Captain Farrell had the orders changed to stay on the *Hunt* and in the meantime, he was relieved. The new skipper came on and sent me to the school and I put in for submarine school, which was favorably endorsed.

I relieved Pete Watson as the Chief Engineer of the *Hunt*, and it was just great. Gene Farrell, Pete Watson, Ed Flowers and I are still in touch and visit...even after fifty years. I loved it. These were the 2100 ton Farragut class. They could go 39 knots. The *Hunt* went in for a shipyard period, which was a lot of work. But I loved it in the shipyard. We were in the Boston Navy Yard for three months.

The Chief Engineer was really the go-to guy for everything there is to do in the shipyard. I just loved the organization of the yard. I loved the workers. You don't always get what you want, but it was just a great experience in management, in learning how people, who were not members of the crew, work. It was just great.

We came out of the shipyard and went through refresher training. Then, we came back. It was the end of June by then. Subsequently, we got the Division E, which was a big thrill because

the *Hunt* had not been a great ship when I first got on board. But Gene Farrell had shaped things up and the new skipper came on. He was an experienced skipper, Sam Collins.

He just took it and rode it. That was my surface warfare world. I went to submarine school just down the road a bit from Newport, to New London. I was married. We had our first child, Barbara, who was about a year old. We moved into the married officer quarters, which was just a wonderful place for a young Lieutenant Junior Grade. It was very nice compared to apartments and things like that you could sublet in Newport at the time.

INTERVIEWER: Did you have to select whether you wanted to go to nuclear or diesel at that time?

CAPT MARTIN: No. That decision was always in the hands of Admiral Rickover. It was based on your class, and we didn't have that many nuclear submarines and we had over 100 diesel-electric subs. Submarine school then was strictly for diesel-electric. It was only after you had a year or so in diesel-electric subs and earned your dolphins, as a qualified submarine officer that you were nominated for nuclear and went back for your interview. Based on that, you were selected for nuclear power.

Submarine school was six months. It was mostly classroom work, but you got out on the submarine for a couple of days every other month. But submarine school was great; there was a lot of camaraderie. It was fairly intensive.

Upon graduation from submarine school you could select your submarine and home port. A classmate of mine, Bill Walden, said, "George, you've got to go to San Diego. It's the greatest place in the world." Of course, I grew up in Brooklyn, New York. My wife is from Bethlehem, Pennsylvania. We're east coast people, but after a while, I saw advantages in being 3,000 miles

away from her family and my family. So I took a submarine out of San Diego, the USS *Catfish* (SS-339).

There we were. We drove across country, and I reported to the *Catfish*. Of course, it was a lot smaller, nine officers or so. There was a crew of about eighty to ninety. I had my first Western Pacific (WestPac) cruise, which was scheduled for six months but ended up being seven months long. But that was kind of standard, actually, in those days. Some crisis would develop and we went for some other patrols. But it was good, good duty. I qualified in submarines.

INTERVIEWER: At that time, it was a diesel-electric. You were primarily on the surface the majority of the time.

CAPT MARTIN: That's absolutely true. You dove for exercises, which could last for days. You might have to come up to snorkel, recharge batteries and things like that. Going from point A to point B, though, was done on the surface, unless directed otherwise. When leaving from San Diego, going to WestPac, you went through Pearl Harbor and checked in with Commander, Submarine Force Pacific (COMSUBPAC). The captain got his orders from the admiral, and the staff would give him the word on what your projected deployment was going to be like.

The next stop for us was in Yokosuka, Japan. It was a very large U.S. Navy base and repair facility. It had been a major Japanese navy base and repair facility, so it had dry docks. They had machine shops and electrical shops and everything like that. The submarine probably took six weeks to get over there from San Diego to Pearl Harbor and staying a few days, and then we'd go on up to Japan. There were always things to repair on a submarine or a ship.

At the Yokosuka navy base, the Japanese workers swarm aboard. I was the communications officer, the electronics countermeasures (ECM), the crypt- security and everything like that. We had trouble with our ECM mast. This Japanese man came aboard wearing his hard hat and shipyard

work clothing. He had a blueprint for our ECM mast, which, back in San Diego, the submarine tender didn't have, and the submarine certainly didn't have. It might have had "confidential" on it or something like that. But, as I said, I understood shipyards. I loved them. Of course I didn't speak any Japanese beyond the daijobi (means OK) stage, and he didn't speak any English beyond 'yes' or 'no.'

Fortunately, with blueprints, you can point out things. He'd done this twenty times or more before. He knew what the problem was, and he knew how to fix it. Here is another story: We went through a couple of other ports and things and came back to Yokosuka. We had a noise in one of the propeller shafts. The diesel-electric class I was on was a Guppy II, a converted World War II submarine, had two shafts and two propellers. There was a little noise in one of the shafts. Such a noise could give away your presence to an enemy and you could be sunk..

During a cavitation exercise, we went down to a given depth and increased the revolutions per minute (RPM) until we reached the cavitation point. Then, we stopped, went a little deeper, increased RPM and charted the cavitation point. It was for silencing. Of course, cavitation is a dead giveaway for opposing forces.

The captain went up to the Commodore and said, "We have this shaft problem." We were supposed to go out on a special patrol. There was a time factor. Boy, did he get action. They sent us to sea with an old-time Japanese engineering officer. This man was superb. We went out, ran our cavitation point, and he could tell which bearing it was that created the noise. We went to sea. There was this little man. He was about five feet tall and probably eighty years old. He sat in the corner of the wardroom trying to be inconspicuous. The captain was very gracious to him. Everybody was. Well, anyway, we went out and were in the cavitation trial. The Japanese engineering officer said that it was the number two bearing on the port strut. We came back in and

didn't even tie up. They sent us directly into the dry dock. They had to go through the whole dry dock procedure. Anyway, they replaced that bearing, the number two bearing on the port strut. It was at about the time that the captain went up to make his report when they told him that the Japanese engineering officer was a retired Rear Admiral of the Japanese Navy.

Of course, Japan was a different country in 1959. It was an occupied country in a lot of ways. We weren't allowed to use American dollars. We exchanged dollars for scrip, which was a U.S. printed currency. They didn't want dollars floating around in the black market and things like that. There were very few automobiles. The people were still very short. Everybody was pretty respectful on the street and things like that. Of course, sailors didn't get to go very far beyond the ship.

INTERVIEWER: You didn't detect any animosity from the Japanese toward the Americans?

CAPT MARTIN: No. What would they say? They don't go around expressing emotions anyway. Whatever they thought, they thought, but they certainly didn't tell you about it. We went out and made our special patrol. I always have some interesting stories about that. Of course, it was very cold. We had some surface transits to make that were very, very difficult because the whole point of a surveillance mission is to remain undetected..

We went through something like a miniature typhoon or hurricane in one transit. We were on the surface, at night, with no running lights. We were rolling about 45 degrees to each side. Of course if you were on the bridge it was pretty wet. The lookouts, the port and starboard lookouts, they were just kids.

We were rolling over on one side. There was this fellow. His name was Ford, and he was from Oklahoma, a little, short redheaded guy. He said, "Mr. Martin, don't leave me!" He was dead serious. We were that far over but were strapped in. We had safety precautions and equipment. It

was a good thing that we were strapped in because when the water came up underneath us; it floated us. It had that force, that buoyant force that pushed you upward. If you were just standing there on your feet, you'd be floated off your feet and tumble over the side with the waves. Anyway, I said, "Ford I have no intention of going anywhere."

The other story took place when we were on our patrol station. A storm came up and we were at periscope depth. We were having difficulty maintaining our periscope depth and was concerned that we would broach. In other words, we would be forced up to the surface when it was daylight, and we were required to remain undetected. The captain ordered a deeper depth, so we could use just the attack scope, which was the little 1.4-inch diameter scope, but we still couldn't hold our depth.

He ordered eighty feet, which is below periscope depth. Of course, not using your periscope, you would want to be close to the surface in case you heard anything you wanted to look at. Well, the storm was increasing. Eighty feet wouldn't hold it. Next, we went to one hundred feet. We were rolling around at a hundred feet, and were still concerned about broaching. We went to 120 feet, and I had the dive. We were at 120 feet. You tried to conserve battery power by going at minimum speed to maintain depth. If you increased speed, you could maintain your depth.

With diesel-electric submarines, you had to snorkel and charge those batteries every night. Anyway, we were 120 feet with minimum speed, maybe two or three knots, to try to maintain our depth. A wave came over us. The trough came down and we were on the surface in about ten seconds.

INTERVIEWER: Wow.

CAPT MARTIN: From 120 feet, we were up there on the surface. Well, we were exposed. The captain came running in. He said, "What's the problem? Get it down. Open the vents. Flood

Negative” He put the scope up and looked around. He let me look around, too. Neither he nor I had ever seen seas like that before or since. From 120 feet, the trough of that wave got close enough to pick us right up.

INTERVIEWER: What would you estimate the wave height was?

CAPT MARTIN: Well, it had to be over fifty feet.

INTERVIEWER: Wow.

CAPT MARTIN: Anyway, it all counts on twenty, as they say. We completed our patrol. That was the pinnacle of your deployment. Then, we were scheduled to go home to San Diego. They had another special deployment for us to go on. That was down at the Equator. I was able to see the Southern Cross and Polaris was just above the horizon. I loved all of that.

INTERVIEWER: What was the primary mission of submarines at that time?

CAPT MARTIN: It was surveillance.

INTERVIEWER: Was it surveillance of the Russians?

CAPT MARTIN: Yes. It was surveillance and attack. About that time (late 1950's) the primary mission became anti-submarine warfare (ASW). The Soviets were the big threat, and they were building submarines more quickly than we were. But we had this World War II surplus that had been put out of commission and into mothballs and so forth. Then, we put some of the subs back in for the Korean War. By 1952, we realized that the Korean War was another buildup to further communist expansion in Asia.

I was over there on the *Hunt* when Hungary was forcibly reoccupied by the Soviets. You lived with the Soviet menace every day. I'm not saying that the average American did. But kids went to school and had dive under the desk drills for protection from nuclear bombs.

INTERVIEWER: I remember doing that when I was in elementary school.

CAPT MARTIN: Sure. Anyway, diesel-electric Guppy II was a first-line fighter submarine at the time. We did our job. We had a hundred diesel submarines about that time. They were all working around the clock. The feeling of the constant pressure of Soviet expansion in Europe and Communist China in Asia was very real if you were right there on the front lines.

We were on the front lines. It was very real. But it was a tremendous motivator. You are making sacrifices, as far as being with your family and things like that, but you were doing it to protect the United States. We all understood that.

The missions, then, were primarily surveillance and ASW. But ASW really came in more into the 1960s; that was when the Soviet submarine expansion really took off, whereas in the 1950s, it was their surface fleet that was considerable. Of course, you didn't know anything. We didn't have satellites. The only things you learned came from when you got some information from some aircraft, that was running up and down at the 12-mile limit, listening and learning what it could. It would take that back and filter it, and the information would be added to other intelligence and they would try to put together a picture.

One interesting story happened when it was night and we were on station. We put the scope up for a look, as we so often did. We had the scope up one night and saw this light going on and off, a navigation light. It would go on for a couple of seconds and go off, repeating the pattern. Of course it wasn't on our charts but we knew the Soviet charts available to us were wrong on purpose.

Anyway, that was one important piece of information from our report.. Of course, it told us that somebody had to be transiting in or out of there because they turned on the light. None of their navigational aids were on except when they wanted them on for their ships to go through. That was the story of submarines from San Diego.

INTERVIEWER: Then, you went back to San Diego. Was that when you got into the submersible business?

CAPT MARTIN: I qualified in submarines, I was a chief engineer, and I served three years on the *Catfish*. We were getting ready to work up to go to WestPac for another deployment, and a message came out that Lieutenants Walsh and Shumaker, from the bathyscaphe *Trieste*, were going to be transferred, and if you qualified in certain ways, you could volunteer.

INTERVIEWER: Had they already made the deep dives?

CAPT MARTIN: Yes. That was January of 1960 for the deep dive. They were tied up there in San Diego, in the water, and they went out to sea right there. Of course, it was sitting very low in the water.

I said to myself that I was coming up for rotation. I had three years on the *Catfish*. I might go to postgraduate school or something. But as a lieutenant, I wasn't going to do anything too exciting. I think that by that time, it was pretty clear that I was not going to go to nuclear power school. They needed bright people and that wasn't where I was. I put in for the *Trieste*. I also went over and met Walsh and Shumaker. They were from the class of 1954. I met Andy Rechnitzer, Dr. Andreas Rechnitzer, who was the chief scientist. Larry Shumaker took me to the bathyscaphe. You enter through a narrow access trunk with a little ladder. I think it was about 20 inches in diameter. Larry was something like six foot four. It was a real job for him to get down there. Anyway, we got down into the sphere in San Diego Harbor. You could look out the window but not see anything because the water was so turbid. He said, "I'll be right back." He shut the entrance hatch, which weighs 378 pounds, and went on up topside. I started looking around inside the sphere. My escape had been cut off and I began to feel uncomfortable. Then I said to myself, "I am 15 feet below the

surface, in a watertight steel sphere that has been down to 18,000 feet and returned safely.” I calmed down and looked at the rudimentary instrumentation

This was the Wright Brothers' stage of deep submergence. Not that I was any Wright brother, but we were at that stage at which almost anything we did was an improvement, an upgrade. Well, anyway, I had this really funny feeling. I thought, "Gee, I'm in here all alone. The hatch is shut. I guess they'll come back and get me at some point."

INTERVIEWER: Was this a test?

CAPT MARTIN: It was a test.

INTERVIEWER: Oh.

CAPT MARTIN: Shumaker came back some time later, but not as soon as I thought he would come back. He must have been gone 15 or 20 minutes. If you were down there, of course, it was a long time. He may have just gone up and taken a phone call or something like that. It was a very busy place.

Anyway, I was selected and ordered to go. I was detached from the *Catfish* to report to the Navy Electronics Laboratory in San Diego, in March. At that time, you had like a six or seven-day window to report. Anyway, I got back on the *Catfish* and went over to WesPac. We did pretty much what we did before. We were in Sashibo (?), Japan, which is on the southwest side of the Japanese islands. I was detached, took a Japanese train up to Tokyo, and then a propeller-driven aircraft full of women, children and crying babies. It was a contract flight.

In other words, the Navy contracted with other airlines to run these flights. They had people going back and forth every day. The passengers were dependents, sailors, and other officers of the military. Anyway, we flew from Tokyo to Hawaii, and had a two or three hour layover there for refueling purposes.

Then, we went on to San Francisco. Then I got a flight on PSA (Poor Sailors Airline) to San Diego and got home. I reported to the bathyscaphe, and Don Keach had reported just a week or so before I got there. He was to be the officer in charge. There were just the two of us assigned. He was to be the officer in charge and I'd be the assistant officer in charge. The laboratory was a fascinating place to be after six years on ships and submarines..

INTERVIEWER: Those were submersible pilots three and four?

CAPT MARTIN: Correct. Walsh was one, Schumaker was two, Keach was three...Keach died in 1999...and I was became operator number four.

INTERVIEWER: The *Trieste* was such a specialty service. Did you consider that it would be an enhancement or detriment to your career?

CAPT MARTIN: I knew it was not a mainstream thing. When you were a lieutenant, you did not know a whole lot, but I knew it was not mainstream. Mainstream was nuclear power. I was not going to be in nuclear power, so why not do this? It was sea duty. But at that time, of course, I had six years of sea duty, rather arduous sea duty. This was a shore duty for rotation and sea duty for promotion. You got submarine pay, which was unheard of in those days.

Once you left the submarine and were detached, that day, your submarine pay was cut off. I had a lot of benefits there in San Diego. My wife loved San Diego. Of course, being on a ship, you're certainly not there as much. I didn't get to enjoy a lot of it. But it still was a very nice place to be. Of course we had friends there.

I knew it was not mainstream, but for me, it was just right. Walsh and Schumaker had made the deep dive in January of 1960. Over the next two years, they had spent money on some refurbishment of the bathyscaphe and some upgrades. They hadn't really gotten it back to sea. It

was an experimental craft. Everything was one-of-a-kind...experimental. Everything took time to order, receive, install, and test.

Keach and I relieved Don and Larry. Keach told me our job was to get the bathyscaphe to sea with scientists on board. The public relations phase was over. Everybody knew who and where we were, and our job was to get scientists to sea doing ASW research because 6.1 research funds were paying the bill.

The bathyscaphe had a fair amount of financial support, compared to the submarine. The submarine had reasonable support. But on the destroyer, it was always hand-to-mouth. You would ask, "Do I want to buy this part I need for the pump, or should I buy the line I need to tie up to go alongside." There was always a day-to-day spending question. It was a great job. It was a Mecca for people who were excited about a new venture. Hey, we were going under the sea, and it was not a warship. We were going to find out what there was to find out underwater.

There were more questions than there were answers. But that attracts a certain type of individual such as Alan Vine...Al Vine of *ALVIN* fame, from Woods Hole Oceanographic Institution. He came about every six weeks to see what we were doing and to probe here and there to insert his thinking into our work. He also collected ideas to take back to Woods Hole for design of *ALVIN*. It was an experience.

Industry was interested. How did we build a deep submersible, or a piece of it? It was clear that the bathyscaphe *Trieste* would not be duplicated. Nobody wanted another bathyscaphe. They were too clunky. They couldn't do what scientists and operators wanted. Maneuverability was something they didn't have, for example.

Everybody in American aviation and space industry wanted to get into this new deep submergence arena. They had a lot of engineers, a lot of talented guys trying to figure out how to

do it better. There was competition. It was wide open because nobody knew what the Navy was going to do next. Were there opportunities in commercial work for submersibles?

INTERVIEWER: Everybody was anticipating a wet NASA?

CAPT MARTIN: Exactly. Those were the expectations. I reported aboard in March of 1962.

Sputnik was launched in 1957. By 1962, I guess, John Glenn had spun around the earth. But even the idea of a wet NASA was actually just four years later, in the mid-1960s. The aerospace industry was anxious to see what could be done, essentially starting with a clean sheet of paper. What are the requirements, that sort of thing

The staffing assigned to the *Trieste* included Keach and I, and there were eight enlisted men assigned to us from the Navy Electronics Laboratory. There was Giuseppe Budno, who was the key man, really, because he had worked with the Piccards at the Castelleurare shipyard in Italy when the bathyscaphe was built.

Piccard had brought him along, Jacques Piccard, who sold the bathyscaphe *Trieste* to the United States Navy. Piccard had brought Giuseppe along with him. Then, when Piccard sold the *Trieste* to the Navy, Giuseppe was offered a job to become a civil servant and continue to do the work on the *Trieste*. What he did was maintain the float and sphere systems for ballasting and de-ballasting the air, gasoline, and steel shot. He was in charge of opening the vents so that we could submerge. He was in charge of closing the vents, and when we surfaced, getting the water and air out. All of the mechanical operations that had to do with operating the bathyscaphe at sea were his responsibility.

He did it extremely well and was very conscientious. He was what you would call 'old school.' That is the right way to do it. You didn't do it any other way because that was is faster or somebody thought it was better. No, that was the right way to do it based on experience. There

were fairly delicate things. For example, there was disposable ballast. We had two tubs that held about eight tons each of this disposable ballast. The problem was that the American shot had different magnetic properties than the Italian shot. This was the same shot that is used to sandblast the side of a ship's hull or any surface on which you wanted to take off a lot of surface material. The electromagnets controlled the orifice that discharged the shot which was discharged by gravity, but you had to open the orifice. It was an electromagnet that we controlled from the control panel inside the sphere.

We had a certain amount of the Italian-made shot that they brought with the *Trieste* when they made the deep dive. We ran out of that, so they brought American steel shot for us to use. Well, American steel shot would become permanently magnetized in the orifice and what you needed was shot with the magnetic properties suitable for the design of the orifice and magnet. The U.S. shot didn't work to Giuseppe's satisfaction, in terms of how fast it would stop after you magnetized the orifice. If you had to let go of shot, there were lots of cases in which you had to do that, you didn't want some magnetized shot hang-up so electro-magnetized that it was frozen. That was a very crucial thing.

Giuseppe took care of things like that. But then he had to go order this shot from Italy. Fortunately, in those days, you could do stuff like that.

INTERVIEWER: What was the sale price for the *Trieste*?

CAPT MARTIN: the Office of Naval Research (ONR) paid about \$350,000 for it. It was the best buy; it was a steal. Nobody in America had ever thought of building something like it, you know. We built ships, aircraft carriers, merchant ships and submarines. But what did we want this for? August Piccard, the father of Jacques, was a true genius. His son, Jacques, was extremely

dedicated, and very well trained in engineering. They were brilliant men. The United States was very fortunate to have the opportunity to buy this thing they invented.

INTERVIEWER: Your orders were to take the *Trieste* out into open water and get it working?

CAPT MARTIN: Yes. The scientists were from ONR or universities. They could be either, but because we were at Navy Electronics Lab, the scientists were already there and they had gotten the first call on it. The Scripps Institution of Oceanography was just seven miles up the street, in La Jolla. We were in San Diego Harbor. There were NEL scientists, too. Dr. Eugene La Fond had this Sea Floor Studies Group.

Dr. Ed Hamilton was one of the geologists. In one of his experiments, they were basically trying to figure out what would affect bottom bounce sonar. They came up with the idea of bouncing the sonar signal from the surface warship or later, a submarine, down to the surface of the sea floor. Then, where would it go? What was the predictability of its reflection and refraction, and how could we use that information to recover the signal? Would the return signal come back the same way? Would it go through the water instead? There were a lot of questions were being asked.

Until that time, nobody had worried about it. There was a new problem. The bathyscaphe would take you down and you could stick your instruments into the sediment and bounce signals off and measure it. It was a wonderland for the curious person. The scientists were just beautiful. They were all well trained. They were focused.

Dr. Eric Barham was a marine biologist, and he was working at the lab at the time. As a marine biologist, he was concerned with discovering what all of the marine biota were and how fish showed up on sonar. There was a phenomenon called a deep scattering layer that confused a sonar signal. In other words, there was something in the water that seriously attenuated the sonar signal.

It didn't go through; it got scattered. Then you had a lot less sonar information continuing past that field of biota and you got a lot less signal back.

There were scientists pulling net hauls, trying to pull in nets. There was some kind of marine organism in the net, but what was it? What did it look like? Could we shoo it away and make it go away or something? That was the next part.

Barham went down in the bathyscaphe with instruments and net hauls to capture samples of biota. He actually figured out that the deep scattering was caused by a certain kind of marine organisms. They are called Siphonophora. A Siphonophora is like a long, twenty to thirty to forty-foot long chain that you could see through. In other words, it was almost transparent. It was like a big jellyfish, but stretched out twenty-feet. It was so delicate that when you put a cast down and pulled it back out, you never found any Siphonophora in there. They had been broken apart on the way up. They figured out that these Siphonophora was the deep scattering layer. Then, you could find out what feeds on them and what size they were that confused the sonar.

INTERVIEWER: There were a lot of different questions that you were asking or answering. There wasn't really any typical operation. Can you describe what a typical day would be like, going out, and what the operation was like?

CAPT MARTIN: There was a lot of preparation work. Each scientist had his own instrument package. He had to build it himself, or get the laboratory to build it for him, and that was what they were there for. He had to promote his idea with the superiors in the laboratory and his scientific peers, that their experiment was the smart thing to do.

He would get his instrument ready. It usually involved some kind of electrical/electronic signal information. He had sensors, and they would go outboard. We would carry the sensor

outboard with us. Then, he had control through electrical wires, which came through certain electrical penetrators and went through the hull into the sphere.

This was the tough part of the job. How did you safely get electrical signals from outside, through a steel hull? The wire was inside, but if something broke, you didn't want the water pressure of several thousand tons per square inch pushing that wire through the penetrator, into the sphere and through your head.

Electrical penetrators were very difficult jobs. Of course, this was back in the beginning. The Picards had one that worked down near 35,800 feet, but it didn't work for long. You were always repairing or trying a new design and things like that. The enlisted men were mostly in the electronic field, with some mechanical background. Giuseppe did mechanical work, and the crew did electrical/electronic work, and then, you had to coordinate with the scientists. We were getting underway. We wanted you to have your equipment on a couple of days beforehand, to test it out, to see if it worked with our battery power supply package, and our penetrators.

Then, we were towed to sea. We were not self-propelled, so we had to be towed out to wherever we were going. The day of the trip would arrive and it could be foggy. Well, it is one thing for a ship to go out in the fog if it has to. But it was another thing to take out an ocean-going fleet tug or salvage ship to tow the *Trieste*. The towline would be a mile long! You had little control over where that tow was going. There could be a lot of traffic, Navy traffic or fishing boats, coming in or out of San Diego Harbor. Therefore, on some days, the dives would be cancelled. We only had the Navy ships for one day each because they were very tightly scheduled. Everybody wanted those tugs, for towing sleds for gunfire practice and whatnot.

INTERVIEWER: You didn't have a dedicated support ship?

CAPT MARTIN: No. We were allotted three or four days of tug service every quarter. It was a quarterly conference. You did the best you could. If it was the day to go out, you went out unless the scientist said, "Look, it's not working. My equipment doesn't work. We'd be sitting out there." That happened sometimes. We'd just pass it up. Sometimes, we weren't ready. Usually, we were.

We got towed to sea. Fortunately, in San Diego, on the western side of the continent, they're called 'continental borderlands,' but you don't have a shelf like you do on the east coast. Four miles off the Buoy One off San Diego, you could dive in 2,000 feet of water. At maybe ten miles out, you could dive in 4,000 feet of water. But you had to go out much further [on the east coast] to get deeper than 4,000 feet.

There were all sorts of stuff. You had to get the tug, you had to get the scientist. You had to get the bathyscaphe ready and then, the weather had to break for you. We got scientists out there. Once they went to sea, they were sold. They'd never seen anything like it. They'd never been able to look at the water column. What is it? What are those things out there? To go down and look at the sea floor was amazing for them. Now, scientists have been pulling up buckets of mud and dredging and things like that for hundreds of years or longer. But to go down and see the physical features of the floor was great. We went down and took core samples, and the core samples were right there in front of you. Well, you could move the *Trieste* around to where the scientists wanted a core sample to be taken. They could make very precise measurements of the core. If you dropped it from an oceanographic ship on the surface, and it goes down to 2,000 or 4,000 feet and gets hauled up, you can lose a lot of information about the core.

INTERVIEWER: You must have felt analogous to those people who walked on the moon. There were very few people who had actually been to the bottom.

CAPT MARTIN: Very few.

INTERVIEWER: You were certainly blazing new territory.

CAPT MARTIN: It was very exciting. The people were so professional. I had never met Ph.D.s before. Where would I have come across those people? As I said, I knew it was not mainstream. But it sure was exciting enough for me. That was great.

INTERVIEWER: How safe did you feel inside the sphere?

CAPT MARTIN: Surely, surely. We'd get enough scientists out there, and they were starting to get papers published. The Bureau of Ships said, "We're concerned with the physical welfare of you inside that steel sphere at 4,000 feet. Our engineers have never been able to look at it and analyze its structural capabilities. Is it strong enough? How strong is it?" Well, we knew it had been down to 18,000 feet. It was called the 'Terni Sphere.' Terni is a place in Italy where it was made. It was safe. But the Bureau of Ships was responsible for these things.

INTERVIEWER: This was a different sphere from the deep dive.

CAPT MARTIN: Correct. The deep dive used the Krups sphere made by Krup of Germany, to go safely to 35,000 feet. It was almost six inches thick, actually, whereas the sphere was like three and three-quarters to four inches thick. BUSHIPS sent Pete Palermo from the David Taylor Model Basin, Carderock Division, Navy Lab, and he instrumented the sphere with strain gauges. We went out to dive, and he had an instrument that took the strain gauge readings and brought them back. That gave him real data to analyze.

That winter (1962-63), we had taken the sphere apart at the Naval Repair Facility in San Diego to see actually how it was manufactured and how the two hemispheres were constrained. We did that and put it back together. The flange at the mid-section had been clamped together by rivets. There was a gasket in there, and we put it back together. It took a while. There were other things in process. We were trying to develop new electric motors. We were trying to get better

batteries. We were using Sears' best automobile batteries as our propulsion source and for the external lights. Each light was 1000 watts. In the dark water, 1000 watts doesn't give you very much. You need 4000 to 8000 watts of power. You need electric power, and we didn't have very much. Anyway, we got the sphere back together. It was about March 26, 1963. We filled the float full of gas and were getting ready to make our first post-availability dive, in April. Things were going along pretty well. We hadn't made the dive yet. *Trieste* was sitting in the water at the waterfront. The electrical/electronic equipment, the ballast control systems and depth sounders and the other equipment was in place. Everybody was doing good work to make our schedule to be ready for sea by mid-April.

Then April 10 came. It was a Thursday. I usually left work about six in the evening. That afternoon, the guard at the gate, instead of just waving me on, stopped, came over and said, "Lieutenant, did you hear about the submarine?" He said, "There's a submarine down in the Atlantic." I was a little skeptical, frankly. Submarines surface all the time and the antennas are grounded out.

But I got home and walked in the door. Dorothy was standing there in tears. She said, "*Life* magazine has called. *Time* magazine has called. They told me a submarine is sunk and they want you to give them the story. What's happening?" she asked. I didn't know anything.

INTERVIEWER: Now, *Life* was calling because they knew of your position as the *Trieste's* operator.

CAPT MARTIN: That's right.

INTERVIEWER: They assumed that you would know something?

CAPT MARTIN: They assumed that I would know what is going on. They had inducements, like, "Give us your exclusive story and we'll send you to Bermuda." Of course, we were living in San

Diego. The Navy had sent us to the best home port. Nothing was going to be an improvement. But that was the way the media worked. Of course, with the deep dive, there had been a lot of press activity.

Keach called and said, "You heard the news. Be at the compound at seven-thirty." I went back down at 7:30. Keach and I and the chief scientist, a fellow named Ken McKenzie, were there. His boss, Dr. Curl, who was the head of the sea floor research studies and everything like that was also there. He was a marvelous man and a dedicated scientist. The Executive Officer of the Navy Electronics Lab was there. His name was Captain Peterson. The Commanding Officer, Captain Mason, was in Washington at the time, at the Bureau of Ships. We were a Bureau of Ships activity. The only information that we had was that the name of the ship was the USS *Thresher*, SSN-593.

The last known location was approximately 270 miles east of Boston, Massachusetts. Ed Hamilton had brought the chart over and said, "This is where it is. It's on this continental slope, a six to ten-degree down slope. It's rugged. It's not anything flat, like we have on the continental shelf or with the deep sea." But that was all we knew.

Of course, Captain Mason was in Washington. He'd been up to answer lots of questions. He called Captain Peterson and said, "Tell them to get ready in case they're called." The next day, we were called. It was Good Friday. We then had to take the gasoline out of the float, which was a big job. There were thirty-five thousand gallons of aviation gasoline. We had to tell the crew to pack up. We knew we were going. We did not know how long we were going to be there. But it was going to be a long time, we said. We didn't know. It wasn't a week or two or anything like that. We packed up everything that we could. Of course, they had a wonderful civilian staff there at the Navy Electronics Lab, and those guys packed up everything.

We packed up lock, stock and barrel, and the crew and I and went on the USS *Point Defiance*, LSD, and through Panama Canal. We arrived in Boston on April 28. They took us into a dry dock so that we could get things checked out, and that took a few days. Then, they lifted us up, put us in the water and we filled the float with gasoline. All the steel shot was replenished and we made ready to go to sea. Nothing happened. You know, everything had been rush, rush, rush. The Navy's search was still in the papers. It was disturbing, too. Not only the Navy because of the bad press, but the families were there, of course. Most of these sailors were from New England. One hundred and twenty-nine sailors were lost on the *Thresher*, and the ship had been built in the Portsmouth Shipyard, the Navy's oldest shipyard. They had a lot of tradition there. It was a mighty blow to the national psyche. Plus the term 'atom-powered submarine,' which was part of the headline in the *New York Times*, was unnerving. The public's connotation of atom involved atomic bombs. The idea of a submarine running on atomic power was a new thought, and not entirely a welcome thought because of what might happen if one blew up.

INTERVIEWER: What were the surface assets that the Navy had to send down?

CAPT MARTIN: The immediate effort was sending aircraft over the scene looking for debris. They sent submarines into the area to see if they picked up any sounds of anything. That was within the first 24 or 48 hours. Of course, a surface ship picked up a plastic booty that sailors wore over their shoes when they went into the reactor compartment. There was an oil slick, too, but nothing that said, "USS *Thresher*." There was some skepticism in the press. "What is this about you not being able to find this submarine," they asked. That was carried out in the newspapers.

INTERVIEWER: It must have been a very similar situation to the outcry when the *S4* went down. The Navy didn't have the capability to retrieve it.

CAPT MARTIN: It didn't have the capability, right. That was pretty close to when the *Challenger* and the *Columbia* went up. "What are you guys doing killing people?" The only asset, or capability, that the Navy had was the bathyscaphe *Trieste*. Of course, it had been down to 35,800 feet, so certainly, it could go down to the estimated 8,000 or 8,500 feet where they thought the *Thresher* was. That was true.

The only question was where the *Thresher* was. The bathyscaphe *Trieste* was not a high-powered propulsion system. We were not self-propelled on the surface and had to be towed to the dive site. When you pulled the plug and submerged to the bottom, you didn't particularly know where you were when you got to the bottom because of the water currents. We had a rudimentary compass on board.

Sears' best automobile batteries propelled us, and the electric motors had been built by General Electric and did work most times. But all the electrical wiring between the batteries, motors and control panels was going through electric wires exposed to salt water. Sea pressure at 8,000 feet, and we're talking about a lot of sea pressure there, pushes the water into any crack and any space, into the wires and shorts them out. Then, you end up with nothing. The other concern was about the search capability that we had. Underwater propulsion was about one knot in speed for four to six hours. That was it. Our sweep width, or how far we could see, was about fifty feet wide. That was looking out the forward porthole of the *Trieste*.

INTERVIEWER: It was visual.

CAPT MARTIN: Well, the thing was visual, yes. We did have experimental sonar on board. But that only worked intermittently.

INTERVIEWER: It was like looking for a needle in a haystack.

CAPT MARTIN: That's right. There were surface ships, four oceanographic research ships that had been sent to the scene. They were taking photographs of the bottom. They were taking samples of the sea floor to test for radiation or in some cases, dragging the bottom to see if they could pick up any debris. Some debris was found and photographed. But there was not enough evidence to say, "Here it is."

They kept us in port on standby in Boston until they thought they had enough evidence that was made it worth a shot to tow the bathyscaphe out there, 270 miles. They planted a deep-moored buoy, down to 8,400 feet or so. They used that as the marker out there, in the middle of the ocean. There was one Decca navigation line. Well, the hand-held sextant was still the primary tool for navigation.

It is hard now, forty years later, to think about how primitive things were. As I said, it was really the Wright Brothers stage of deep submergence. Don Keach, the officer in charge, talked with Captain Frank Andrews and said, "If you can get us an area that is about two miles wide, two miles across, we can go down and really, it's a matter of luck. It's as much a matter of skill as it is of chance." They towed us to sea. We started out on June nineteenth. We got there, I think, five or six days later. We could only be towed at a speed of about two or three knots. There was fog and a lot of delays. We got out there to the dive site. Don Keach made the first dive. He didn't find anything in particular. I made the second dive. I didn't find anything. I didn't see anything that could have been part of the *Thresher*.

INTERVIEWER: It was strictly visual.

CAPT MARTIN: It was strictly visual. We didn't have a road, you know. There are no roads down there. A road map wouldn't do you any good. All we had was this very simple compass. We were

not too sure where we were on the bottom. In other words, we couldn't come back. We had no underwater navigation system. We could not come back to a previous place.

We made five dives in that first series. After each dive, the gasoline from the maneuvering tank had to be replenished. The steel shot had to be replenished. We used about eight tons of steel shot on a dive. We descended through 8,000 feet, and that had to be replaced at sea. The bathyscaphe was moving up and down in the seaway, and the little Boston Whaler that was our transport between the dive site and the USS *Preserver*, the Navy salvage ship, our mother ship out there. Anything you're doing at sea is subject to the sea, the spray, and the waves. It's a wet operation.

After five dives, it appeared that we really didn't have much to show for it and decided to return to port, to Boston, to add more battery power so that we had more endurance underwater. The scientists from the Naval Research Laboratory, the electronics laboratory, and other laboratories, had put different sensors on board to detect anomalies. We had radiation counters, and things like that to detect any nuclear radiation. Nobody knew exactly what had happened. Did the submarine break up? If it did break up, what happened to the nuclear elements in the reactor? It was all unknown.

We were fortunate in that there were never any signs of any radiation above background. The subsequent dives that went on through 1993 never found any radiation above the normal background. We returned and got towed back to Boston. We had to go through the whole operation of unloading. Thirty-five thousand gallons of gasoline has to be pumped out. It was a big operation and took a lot of effort, a lot of hard work, a lot of coordination. The Boston Navy Yard was, of course, very cooperative. They had a lot of capabilities, but the bathyscaphe was a one-of-a-

kind, first-of-a-kind laboratory instrument. Everything that went into it was pretty much hand-made.

We prepared to go back to sea. One of the things that Keach had installed on the bathyscaphe during that in-port period was the mechanical arm that had arrived at our facility in San Diego in January of 1963. We had tried it out several times, and it worked well as long as you were on land and nice and dry. But when you put it in the ocean, it turned into a big battery. We sent it back to General Mills and said that they had to do a better job. They did. They did what they could, and it was then flown out to Boston to meet us there. It was reinstalled. It was a very good move on Keach's part to get that.

We went out the second time. It was the middle of August by that point. In the middle of August, off the Maine coast, off Cape Cod, the summer is over and the seas are starting to build up. We knew our days out at sea were numbered, in terms of the days that we could safely get from the salvage ship to the Boston Whaler and from the Whaler over to the *Trieste*.

Keach made the first dive in this second series. I made the second dive. We saw some things, and some things were photographed, like a six or eight-inch in diameter valve and other pieces of debris. There were places on the seafloor littered with something. We never did understand what it was. It looked like aluminum foil all over the sea floor.

On dive three of the second series, Keach happened upon a large area of crumpled steel, obviously from a ship or something. Remember, nothing said "*Thresher*" on it, so everything at that point was speculation or hope. There were large sections of steel. As he was moving around through that area, he had to be careful. You didn't want to get too near it. A piece of that steel could have punctured the thin skin of the bathyscaphe float. The float was about three millimeters in

thickness. You were very concerned over and careful about getting too close to anything that you might bump into, including rocks or something coming up or an underwater feature.

Then, Keach saw this pipe in this field and maneuvered over to it. He got the mechanical arm. There were five functions in the arm, like the shoulder, elbow, wrist, pinchers, and I think that only two of the functions were working. He got the arm through the soft ooze of the sediment, came up under the pipe and cradled it in the elbow. Then, he dropped it.

INTERVIEWER: The pinchers wouldn't work?

CAPT MARTIN: That's right. Then he dropped the steel ballast, the disposal ballast, to rise to the surface. He called ahead on the underwater telephone and said that he had a piece of equipment and was taking it to the surface. He said that he would stop at approximately one hundred feet below the surface. He wanted divers and radiation monitoring equipment down there.

We got ready, and they got a couple of the divers into the Boston Whaler, and I was there. I was the surface safety coordinator. It was after sunset by the time he told me that he was at one hundred feet.

INTERVIEWER: How long did it take him to surface?

CAPT MARTIN: Usually it took a little over an hour to come to the surface from 8,000 feet. It probably took him two hours that day, actually, because if had gone too quickly, the pipe might have become unbalanced in the arm and disappeared. He would have never found it again. It was a long time waiting on the surface. It was probably two hours. When he sent word on the underwater telephone that he was at a hundred feet, we told him to turn his lights on. Then, we could see the lights down there. We had to move around in the Whaler a little bit, but we did find the lights and the divers went down.

Johnny Howchen and Smith put a line around the pipe and brought it to the surface. The scientist was there and tested it for radiation. It wasn't anything above what you would expect. They surfaced, and life went on. That was dive three, and then, I went down on dive four. I didn't find anything spectacular. He went back down on dive five and didn't come across anything.

At that point, a big concern was the deteriorating hull on the *Trieste*. That is, the very thin, eggshell float that contained the gasoline. The gasoline provided the buoyancy for the steel float that the pilot and the observer went in. So the captain, Frank Andrews, and Keach talked things through and decided it was really a safety issue to get the bathyscaphe back to port before anything serious happened to it. There were some cracks in the iron float, but you couldn't do anything to repair those out at sea. You could put chewing gum in them or something like that, but then, when you towed the bathyscaphe in the seaway, there would be waves crashing over it. The craft would be physically warped.

Anyway, it was time to terminate the search and get towed back to Boston. That was what we did. They flew Keach to Washington to meet personally with the Secretary of the Navy, Fred Korth and the Assistant Secretary of the Navy for Research and Development was Dr. James Wakelin. They were very savvy and credible people.

The Navy was very fortunate to have people like them in those positions. Anyway, a couple of days later, the secretary held a press conference. At the press conference, he essentially said that the bathyscaphe had determined that structural pieces of the *Thresher* had been located, the pipe had been retrieved, and the pipe had the words "593 boat" and BUSHIP's drawing number etched into it.

INTERVIEWER: That was evidently the confirmation.

CAPT MARTIN: That was the confirmation for which everybody had been looking. The attitude until then was, “They found some junk in the ocean. What does that prove?” Everybody kind of had a big, collective sigh of relief, and the secretary closed it out by saying that this ended our operational search for the year, and that it would become a research project. We’d go back and check on it, he said.

Actually, the Navy sent us over to Marseilles, France, to discuss bathyscaphe operations with the other bathyscaphe in the world, the *Archimedes*, the French navy’s bathyscaphe. We exchanged a lot of information. But there wasn’t anything that they had that we could use to further our search. Our job was to get back to San Diego. The Navy wanted to build a replacement float. Mare Island Shipyard, in Vallejo, was selected as the building site.

Keach and I spent a good part of fall and winter commuting to Mare Island to give them the design specifications, and cooperate with the engineers and the workmen who were building the replacement float. The idea was a design that could be towed. The original bathyscaphe, built by Picard, had roughly a right-circular cylindrical design, which was inexpensive and efficient for containing the gasoline.

We wanted something with a slightly heavier-gauge metal, and we wanted the batteries in a safer position, not in aluminum cans on top of the light aluminum deck of the *Trieste*. We were trying to get better electric motors. The bathyscaphe, the new float, was transported to San Diego, and the Navy Electronics Lab had a nice ceremony for bringing in the new float and putting it into the water. It was very nice. Then, the work began to assemble the new float with the old sphere that we were using for the science and search operations. They got that together.

Then, Brad Mooney’s new team came on board to relieve Don Keach. Larry Shumaker came back to the project to relieve me as the assistant officer in charge. They assigned a third

officer, John Howland, because there was plenty of work to do. They increased the allotment for enlisted men. It went from about eight up to a dozen or so. We were getting a lot of support.

Keach was detached. We were ordered and sent from San Diego to Boston to start a second summer of search operations. I was there and helped them get ready to go back to sea. When they left port, I was detached and went back to San Diego, or was detached from the bathyscaphe project and went back as the Executive Officer of a submarine down in Key West, Florida. Brad Mooney will tell you the rest of the story. The highlight of that was that on their dive, they actually landed on one of the pieces of the large hull section of the *Thresher*.

INTERVIEWER: Sounds great. Thank you for that. That brings that story to an end at the right time.

CAPT MARTIN: Good timing, huh? I appreciate you going out and walking with me.

INTERVIEWER: This is nice, yes.

CAPT MARTIN: The really important thing that came out about the tragedy was an explanation of the causes of the disaster. What could we do about it? Several groups were formed on the engineering side and the operational side. What happened? Two well-documented and important papers were the Findings of the Naval Board of Inquiry and the Hearings of the Joint Committee on Atomic Energy.

Those are summarized in Part Two of the Naval Submarine League article I wrote. Part One essentially tells you what I just went over here, in terms of the operation on the search itself. The Deep Submergence Systems Review Group came up with a lot of good ideas. They came up with some really clever, innovative ideas. The preeminent one of that was the deep submergence rescue vehicle (DSRV), a vehicle that could go down to the submarine if it was at 2,000 feet or less. That

would be within the structural strength of the hull. There was hope of recovering personnel from a downed submarine. They actually went out and awarded a contract and had two of these built.

The concept of operation of the DSRV is to fly the DSRV to an airfield near a port where a specially equipped submarine would carry it piggyback on top of the deck. The submarine would submerge and transport the DSRV to the sunken submarine. The DSRV would evacuate the crew from the submarine and return to the transport submarine. The entire operation from port to return to port would take place submerged. This avoided the dangerous air-sea interaction that can damage the DSRV or the transport submarine or cause delay in the operation due to bad weather. The men in the downed submarine had a limited number of days before the oxygen became depleted or the partial pressure of the air mix inside the submarine caused it to become toxic. Time is of the essence.

Fortunately, they've never been used in anger, so to speak, or in an emergency. They have gone out for training exercises from time to time. The DSRV-1 was put into service in 1970 and DSRV-2 in 1971. They are now thirty-plus years old. There were maintenance problems, since everything on the DSRV was pretty much one-of-a-kind when it was built. Now, thirty years later, do we have the capability to maintain them? In some cases the answer is "No." and of course everything today costs more. I only have unclassified knowledge about what the Navy is up to. I don't have any special access or anything.

As far as I know, DSRV-1 is essentially out of commission already. The second one will be deactivated, or at least no longer funded in 2005. After that, they will use a submersible suit that each crewman would put on. It is a combination Steinke hood and life preserver. Each crewman would pop to the surface in an individual suit. It would keep them dry on the surface.

Of course, there is no point in popping up to the surface if the water temperature is forty degrees because you are only going to live a few minutes anyway. They are certifying those suits down to about 600 feet, so that is on the shallow end. On the deep end, they have a new system, but it's not a deep submergence rescue vehicle. It is transported to the site on a surface ship, or a ship of opportunity. It will be unmanned, except for a diver. It'll be totally controlled as a remotely operated vehicle (ROV) controlled by people from the surface through sonar and underwater television cameras that locate the submarine and maneuver the ROV to it. Then, the diver will visually check what's going on in the submarine. He can open a hatch, possibly, and at least check if there is water or air inside, and that kind of thing. That is in development. It's supposed to be out in a year or two. We certainly wish them good luck with that.

INTERVIEWER: There seems to be a big controversy between what the DSRV had, not having to worry about the air/water interface, and the remote vehicle, which does.

CAPT MARTIN: You must go back and rediscover the problems with working on the surface of the sea with something that is 1,000 or 2,000 feet below. That's why I say that what we learned on *Thresher* was that it's dangerous and sometimes impossible to operate from the surface. It's difficult to be towed to the site, as opposed to being delivered on a submarine, which can put something piggyback on the exterior and take it there at maybe 15 knots.

The *Trieste* got towed at two knots. All I can say about the hard work that went into the DSRV operation is what are the lessons learned? You want to do it underwater. Avoid the sea/air interface. Avoid decompression sickness of the crew, assuming you got there in time. Just avoid all the problems of working on the sea surface, which is just a very severe operational environment, even in good weather.

As I said, why they went back to that, it is not clear to me. I guess they wanted to save money or something. I wish them well with it because it doesn't seem to be moving forward. The operational concept is with what I disagree. The technology is probably great. I am sure it is great, actually. They spent good money on it, and that part of it will work. But whether the weather, the ocean, and the location will cooperate with you remains to be seen.

INTERVIEWER: It sounds like the Navy has a short memory for lessons learned.

CAPT MARTIN: Well, it's been forty years. If you think of it, a Navy career is twenty years. That's two full careers for a twenty-year officer or enlisted man. That's what you lose in that time span. They have a Sub-Safe Program today, and those submarines are very, very safe. They essentially don't let salt water into the ship, or not very much of it.

But in terms of the rescue operation, of course, we've come a long way with saturated diving and can do wonderful things. I'm just saying that if I had the money, I would certainly build and improve, or at least use, the operational concept of take-it-underwater, perform the rescue underwater. Return the rescue vehicle back to the submarine. Eliminate all of the safety concerns that you have when operating from the surface.

The other thing is this ship of opportunity. Back at that symposium in 2001, there was a retired chief warrant officer who was still working in the commercial world. He said, "ship of opportunity," yes. "But having a captain on there who could lay a moor, a four-point moor in 1,000 feet of water," he said, "I doubt if one in one hundred of those skippers has ever made a moor in one hundred feet of water." This was a man from the commercial diving industry who was familiar with not just the technology. Well, we're still dealing with humans here and they have to have a certain amount of training to do this. Otherwise, every operation and every emergency is relearning, retraining of a new crew and skipper. You are trying to do this four-point moor, or even

a three-point moor out in a seaway somewhere. God forbid it be someplace in the Persian Gulf. If you're doing that on the surface, you're going to have a lot of unfriendly people around there trying to make it more hazardous for you. Those are my opinions. Again, I don't know all of the classified plans and things like that.

The other thing we learned on the Palomares bomb operation was that you had to keep the curious, as well as the menacing, at some distance. Everybody's got these mini subs and ROVs now. Eight new nations, Asian nations, bought diesel submarines in the last four years. There's going to be a lot of company out there, and they may be unfriendly.

INTERVIEWER: I wonder if I can ask, since you've obviously had a very exciting career, could you talk about anyone that you would consider a role model or a mentor in your career?

CAPT MARTIN: I had 12 years of active duty, and then, I left active duty and went to Reserve. There were a few people who made big differences in my life. My first skipper, Gene Farrell, Rear Admiral, retired, was one person. He has certainly done a lot for me, personally, and in every way. Don Keach, who was the Officer-in-Charge of the *Trieste*, was a mentor. He looked at me and gave me a couple of hints as to how to be more effective. He did help me out. Brad Mooney, who followed me on the *Trieste*, was another. But because I was still in the deep submergence world when I left active duty for a couple of years, I was working for Lockheed. Brad was still in the Navy. He was able to guide me and provide opportunities. Not that I was always able to take them. But he was always opening doors and things like that. Of course, John Craven was another individual who influenced me. John and I were good friends. He was not an operator, but he understood a lot of what was required, like what kind of people you needed and so on. Al Vine was important, too. Al Vine had come out to visit us on the bathyscaphe. Of course, the ALVIN was just on paper then. He'd say, "George, this bathyscaphe thing you have here, this is not a submarine.

This is something that needs to be loved and taken care of. It needs to be nurtured, and you need to be really personally involved with it.”

Craven was moving in much higher circles, and he tried to guide me when I left active duty. You know, I didn't pay attention. But we're still friends. It was a long time ago, and I never looked back. That's useless. I had a good working career, and the Navy experience was wonderful. The Naval Reserve worked out for me very well. I was the reserve Commanding Officer of two submarine tenders. If the balloon went up, and in the 1960s and 1970s, that was still a pretty high expectation, that I would have become CO of a 1,000-man submarine tender. That was good. I did get promoted to Captain. That was great. I started my own company called Project Engineering, Inc. in 1977. We worked mostly for NASA and the Goddard Space Flight Center. We closed in 1994, and I've essentially been retired since.

It was the American Dream, to own your own business and that kind of thing. I just feel very thankful for all the opportunities that have been given to me, like the good people I met. There are lots of people that you never hear of. This one officer who ought to be interviewed is ‘Ski’ Dzikowski. Captain Dzikowski, who lives over in Baltimore suburbs. He was at the symposium. He was an engineering duty officer. He was in charge of the deep submergence on the ship side for several years, from 1967 to the early 1970s or so. He knows everything. He’s got a sharp mind and is a good man. There were a lot of good men. There was Pete Palermo, whom I talked about earlier. He was a civilian engineer. He's still alive. Most of the others are dead by now, like B. King Couper who was our sponsor at BUSHIPS. A lot of them, like Keach, are gone. Andy Rechnitzer has been a good friend. He was chief scientist on the *Trieste* during the deep dive. I actually interviewed with him when I went through to the *Trieste*, and he then left and went to industry to work for North American Rockwell and helped them build a submersible called the

Beaver, which was headed for the oil fields to work underwater. Andy Rechnitzer is still alive and in San Diego. There were a lot of good people.

Swede Momsen was another great man as well as Frank Andrews from over in Annapolis. Of course, I did not continue in that world after I left Lockheed. I ended up in the NASA world, which was very different, but I appreciated the chance to come back.

In 1997, I started wondering about who remembered the *Thresher*, what the lessons learned were, and what they were doing about it. I got an invitation to speak to the Washington section of the Naval Submarine League. They were pleased with that. They invited me to speak to the national meeting that they hold in June in the Alexandria area.

That led to the two articles that were published by the Submarine League Review. The first one, actually, won best article for last year. I would just love that the people who are not too senior that they can't involved in details, but are senior enough to put an order in, to say, "Look, this is what we learned forty years go. Let's re-work that and see if we can't benefit from those lessons, or at least have a better understanding of why those lessons are no longer valid."

Of course, in the Navy, everybody's moving around, so it's very hard to get in touch with those people. Things are a lot more complex now. There are lots more layers with which to deal and safety requirements and things like that. We were fortunate that we all survived it, but we weren't impeded. We could do anything we wanted to do. It was up to you to weigh things and act accordingly.

INTERVIEWER: I think this is probably a good time to stop.

CAPT MARTIN: Sure.

INTERVIEWER: I want to thank you, George, for the interview. I certainly have a lot to reflect on from your career.

CAPT MARTIN: Thank you very much.

INTERVIEWER: You have a very, very exciting background.

(Whereupon, the INTERVIEW was concluded.)

UNDERSEA & HYPERBARIC MEDICAL SOCIETY

ORAL HISTORY OF THE MAJOR PARTICIPANTS
IN U.S. NAVY UNDERSEA TECHNICAL DEVELOPMENTS

INTERVIEW OF GEORGE ROCECK

PROCEEDINGS

INTERVIEWER: What I usually do is something rarely simple. What's your full name?

MR. ROCECK: George Roceck.

INTERVIEWER: How do you spell Roceck?

MR. ROCECK: R-o-c-e-c-k. Of course, I have a nickname.

INTERVIEWER: What's your nickname?

MR. ROCECK: It's 'Moon.'

INTERVIEWER: How did you get the name Moon?

MR. ROCECK: Well, I got it twice, once when I was about six years old with the old gang, growing up. Every summer they used to shave our hair off. This particular time, we were all sitting on a curbstone. When the streetlights first came on, if you didn't say, "Pass it up," you were the guy that got the lumps. But anyway, when the lights came on, the light would shine on my dome head. Pixi was the leader of the gang. He said, "Oh, look at that. It looks like a moon shining there." That was the way I got a nickname, Moon. That was the way I grew up. Later on, my mother and dad would sometimes call me Moon. Then, I got the nickname again on the USS *Sculpin*.

INTERVIEWER: How did you do that?

MR. ROCECK: I used to sleep in the torpedo room. I came back one time from liberty, and I stripped. I was laying in my bunk naked, laying on my stomach. Old Clark, the electrician, came in off of liberty, and he was feeling pretty good. When he opened up the door, we had a night blue light, and it was shining on my rear end. He was telling the guy the next day that when he opened up, there were these cheeks. He said that it looked like a moon coming over the mountain. He

called me Moon, and I didn't say anything. This went on for several months. Then, the name caught on, and everybody started calling me Moon on the *Sculpin*.

Finally, I told Clark. I said you won't believe this, but I had that nickname from the time I was six years old. I told him what occurred. I said, "I'll tell you what, Clark. The very next letter I get, I'm going to let you open it." The next letter I received, I gave to Clark. I said, "You open it and see what the heading says." My sister always wrote me. Sure enough, when he opened the letter, it said, "Dear Moon." Then, he believed me.

INTERVIEWER: When were you born?

MR. ROCECK: I was born the 29th of April 1921 in Cicero, Illinois.

INTERVIEWER: That was a wild town.

MR. ROCECK: Oh, yeah. That was Al Capone's stomping ground.

INTERVIEWER: Did you have any problems growing up there?

MR. ROCECK: Well, I mean, they had control of the town just like they did Chicago. They had their houses and everything all sewed up.

INTERVIEWER: Did your dad work for him?

MR. ROCECK: No. My dad was a tailor. He had a little shop. It was about three doors down from the local gambling club. I used to work at a gas station on the main drag, which was the same distance, three blocks away from the gambling club. A lot of them used to come over there with their cars to get them serviced. I stayed around. I got to be a teenager. It wasn't only me, though. There were other teenagers. There were two others who lived in the area. We used to work and hang around that gas station. We would deliver the cars. Of course, we looked forward to that because it gave us good tips. Moreover, you could work all week at the gas station, but if you delivered one car, it'd pay for the whole week's wages.

INTERVIEWER: That was big money. When did you join the Navy?

MR. ROCECK: I joined the Navy on June 6, 1940. I wanted to join earlier, but I had a tooth problem. They wouldn't accept me until I got that tooth repaired. I did. A dentist lived right across the street from the gas station. He used to come over there. I asked him if he could repair that for me, and he did. Then, I went back to the Navy. They accepted me, and I went in.

INTERVIEWER: Why did you want to go in? It was peacetime.

MR. ROCECK: Well, I was looking for excitement. I had a little bit of the wanderlust. When I was 16, a boyhood friend of mine, who lived down the block from me, and I thought we would leave home and go out to California and make our fortunes. As it happened, we got to Salida, Colorado, in the gorge, and it was colder than heck. We almost froze. We got into this town at about two in morning, and it was cold.

INTERVIEWER: You were hitchhiking?

MR. ROCECK: No. We were riding the rails, riding the freights. We thought we had it figured out right. April was nice back in Cicero, but man, it isn't nice out there in the west yet. We decided, "Well, the heck with it; let's turn around and go back home, which we did." But that was a good experience for us. We learned how to swallow our prides. We ran out of money. When you got hungry, you went in and begged for food worked for it.

INTERVIEWER: Did you do that at homes?

MR. ROCECK: We had to do that at both homes and businesses, sure.

INTERVIEWER: It's funny. In those days, that was acceptable. Today, it's a big racket.

MR. ROCECK: That's right. In those days, there were some who had college educations, well-educated men on the road. But they treated us just great. They gave us the ropes and told us where to get these trains, what cities to watch out for so that you didn't drop off too late in the city. They

had those railroad digs there, and some were pretty mean. They gave us a good education on what not to do, which was great.

INTERVIEWER: You were in the late teens at that time, weren't you?

MR. ROCECK: Yes. Sixteen we were. It wasn't that we left home because our homes were bad. We had perfectly good homes.

INTERVIEWER: Did your parents know that you were going to take off?

MR. ROCECK: No. None of our parents knew we were going to take off. We just left a little note, and we left.

INTERVIEWER: But you were walking when you got back.

MR. ROCECK: Oh, sure, we were walking because they were glad to see us.

INTERVIEWER: Alive.

MR. ROCECK: You're darn right. Of course, in those days, you didn't have all that funny stuff happening.

INTERVIEWER: Did you have to wait until you were 18 to sign up?

MR. ROCECK: Yes.

INTERVIEWER: You had to wait until you were 18, then you enlisted.

MR. ROCECK: Yes.

INTERVIEWER: Did you know there was a war coming on?

MR. ROCECK: No.

INTERVIEWER: Where did you take boot camp?

MR. ROCECK: I went to the Great Lakes Training Station. I signed up for six years right off the bat. They brought us up by train from Chicago. The Great Lakes is only about 45 miles north of Chicago. Our first meal was on Saturday morning, and it was beans, baked beans. I'd never heard

of that, eating beans for breakfast. When I got through that line and saw those baked beans being put on that silver platter, my heart just went. I said, "Oh, Lordy. What did I sign up for, eating beans for breakfast?" But in my later naval life, I enjoyed those beans. They were just great. Of course, when you were eating those kinds of beans at a big base, they were not as good. On the submarines, they were ten times better.

INTERVIEWER: You just signed up and went through boot not knowing what you were going to end up doing though, did you?

MR. ROCECK: No. We got through the training, and they came with the request that anybody wanting to volunteer for the submarine course to sign his name on the bulletin board.

INTERVIEWER: How long was boot training?

MR. ROCECK: Boot training, I think, was three months at that time.

INTERVIEWER: But in submarines, you knew that made more money, though, right?

MR. ROCECK: Well, I didn't know that at the time. But to me, it was another exciting way to go. I signed in for it, and then they examined us. We had to go for examinations. The closest buddy I had in that training period was not passed on account of some kind of obstruction he had in his nose. I was accepted, and the training station sent us to New London, Connecticut, for submarine school, and I went through that.

INTERVIEWER: How long did that last?

MR. ROCECK: That was another three months, I think..

INTERVIEWER: What did it consist of then?

MR. ROCECK: Well, it was mostly classroom work.

INTERVIEWER: It was technical.

MR. ROCECK: Yes. We studied the electrical, trend and air systems. Then, they would take you, periodically, on a regular submarine, which were the old R boats and S boats. They would take you out for the day, and on board, they would assign you different positions. Of course, they would have the regular crewmembers there to explain what, when and why to do things. They would be watching you.

INTERVIEWER: Was claustrophobia a factor with some of the other guys?

MR. ROCECK: Yes. There were those who sometimes wanted out. Of course, there were some there, too, who were dropped out. They couldn't go through the pressure tank. They'd go up to a hundred pounds of pressure on that. They took it easy. They boosted the pressure up in a slow matter, and anybody who had a problem would raise their hands. Then, the guy said, "Try and pop and your ears or chew," and all this. If you could do that, then he would increase the pressure. But if somebody couldn't handle it, he would drop the pressure and that person would be taken out of the tank.

INTERVIEWER: You survived all those tortures then.

MR. ROCECK: Yeah. Then, we went through the tower with the lungs.

INTERVIEWER: You used the Momsen lung.

MR. ROCECK: They showed us how to use that. After you graduated, they sent most of us to the West Coast. I went to San Diego. When I arrived there, I was transferred to the *Sculpin*. That was in November of '40.

MR. ROCECK: Then, the *Sculpin* went from San Diego went to Mare Island to the navy yard. Overall, that was three months. From there, she was sent to Pearl Harbor for duty.

INTERVIEWER: What task did you end up doing on the sub, on the *Sculpin*?

MR. ROCECK: When I first went on her, I was a seaman. I was doing topside work, deck work. I stayed as a seaman until well after we got to Pearl Harbor. Then, I wanted to go into the black gate, the engine room. They eventually transferred me when there was an opening. They put me in the engine room, and that was where I stayed for the rest of my Navy career, as an engineman or a motor-mac. At that time, it was called a motor-mac.

INTERVIEWER: You were really learning a trade, though, on top of that.

MR. ROCECK: Yeah, right. Well, the reason I wanted to go into that end of it was because when I was a kid at the gas station, I learned a lot about working on engines, cars. I kind of liked that, and that was the reason I put in for it.

INTERVIEWER: You were one of the motor-macs on the *Sculpin*. You were one of how many guys, about three or four? You went there by yourself?

MR. ROCECK: In the black gate? Oh, no. I think we had about 12 or 15 men in the black gate.

INTERVIEWER: There was that many?

MR. ROCECK: Sure.

INTERVIEWER: This was the diesel, diesel-electric.

MR. ROCECK: That's right.

INTERVIEWER: That was kind of a hot, noisy, smelly place.

MR. ROCECK: It sure was, yes.

INTERVIEWER: How did you hack that? You just did it.

MR. ROCECK: You just got used to it.

INTERVIEWER: Do you remember the name of the first skipper you had?

MR. ROCECK: The first was Wilkins. Wilkins got transferred during the time we were in overhaul at Mare Island. Then, we got another skipper. To be honest with you, we hadn't been able to find out what his name was because he was only there about three months.

INTERVIEWER: You had a third skipper.

MR. ROCECK: When that skipper was relieved, in Pearl Harbor, we got Lucius Chappel aboard. In fact, George Brown is going over to get Phyllis Chappel. She's a widow. She'll be over there. Chappel stayed on there for eight runs.

INTERVIEWER: Wow. Do you mean eight patrols?

MR. ROCECK: He was on for eight straight patrols, right. I think he was the only skipper who did that.

INTERVIEWER: From Pearl, where did you go?

MR. ROCECK: Well, we stayed at Pearl until 1941, when we got orders to go to Manila.

INTERVIEWER: Manila, of all places.

MR. ROCECK: Yeah. That was around September or October, I think, that we went out to Manila.

INTERVIEWER: You had no idea about the Japanese war or anything?

MR. ROCECK: Well, we were told that things are getting a little tense down there when we were in Pearl. That was the reason that we were being transferred to Bolster with the Adriatic Fleet. That was where we went.

INTERVIEWER: You were fully armed then, torpedoes and everything.

MR. ROCECK: Yes. We were fully armed. We took on more chow than we would normally take. The officers wouldn't tell us where we were going. I think it was because the skipper figured it'd be better for the crew's morale to let them guess. There was a lot of talk going around: "We're going

to go here. We're going to go here and there, to Australia and China." I guess that in a way, it was good for morale. But when we got past Guam and started in a certain direction, then the quarter ---- said it was either the Philippines or China. We kind of narrowed it down between those two places.

INTERVIEWER: Were you traveling on the surface?

MR. ROCECK: We were traveling both on the surface and underneath, yeah.

INTERVIEWER: Did you do any test dives or anything?

MR. ROCECK: Oh, yeah. We always did that. You burned fuel, and you had to go down and re-trim your vessel, you see?

INTERVIEWER: That used up fuel.

MR. ROCECK: Right. That was because you were taking on salt water to dispel that fuel, so you were getting more weight.

INTERVIEWER: When did you get into Manila, then, about September or October you said?

MR. ROCECK: It was right about then, yeah.

INTERVIEWER: Did you stay there? Were you stationed there?

MR. ROCECK: Yes. We were stationed there. I think we weren't even there a month, and we got orders more individually, more as a nest. That was another thing giving us a little indication that something was going to happen.

INTERVIEWER: Why didn't they do that with the planes in Pearl Harbor?

MR. ROCECK: That's a good question. From what I read, the admiral in Pearl Harbor wasn't getting all the information that was given to Admiral Hart, out there in the Philippines. I think he was made a scapegoat, but I don't think it was his fault entirely.

INTERVIEWER: I don't think so, either. Where were you on December 7, 1941?

MR. ROCECK: I was still aboard. It was the wee hours of the morning when they gave us the word that Pearl Harbor was bombed.

INTERVIEWER: Actually, that was December 8th for you guys.

MR. ROCECK: Yeah, I think so. Then, we took on more supplies, and we were getting ready for war patrol. I don't remember on what day we left.

INTERVIEWER: How many other boats were there? Do you remember?

MR. ROCECK: Oh, gee. We were one squadron there. We came there in the fall. I think about a month later, another division came out there, with six boats.

INTERVIEWER: That's probably well documented anyway.

MR. ROCECK: Yeah.

INTERVIEWER: That was your first real war patrol.

MR. ROCECK: That was our first war patrol, right.

INTERVIEWER: What were you looking for?

MR. ROCECK: Well, we were looking for whatever, but we were keeping an eye out for transports, primarily. They were afraid of the Japanese troops making a landing on the Philippines. We were fortunate. I think we were out there two or three weeks, and I think we sank one or two.

INTERVIEWER: Did you really?

MR. ROCECK: Yes. The transports had Japanese soldiers on them. The Philippine government gave us the citation for doing that. All the other boats that sank something during that period of time got that. I don't have it here. It's got that gold bar and the blue inside, but it's a gold outline.

INTERVIEWER: How did you feel, sinking a ship like that? You were just part of the team that did the job, but did you feel elated?

MR. ROCECK: Absolutely. I mean, we knew it was war. Heck, we were doing anything we could do. When we heard that explosion, it was great.

INTERVIEWER: You probably weren't out terribly long, then, were you, on that first patrol?

MR. ROCECK: Well, I think we were out there about sixty days, maybe not even that long. But we worked our way on down to Borneo. We went in at Balikpapan to get refueled. That was an experience. We picked up a pilot on the outskirts, and the pilot took us inland to get refueled. It looked like a small river, but it was deep because that was where all their oilers were going in to get refueled. I went up to the control room, and I could hear that Dutch pilot giving orders to the helm, "Left a bit, steady. Right a bit, steady." Well, it looked to me like he could spit on both sides. It was that narrow of a river. It was just jungle, just jungle. Normally, you would hear the pilot give orders, "Left five degrees rudder and steady. Right two degrees rudder." For this, that did not happen. It was left to right, left to right. It wasn't that much to be maneuvering, but he kept it right in the center. We went there at nighttime, all night. We tied up there. Boy, that was good fuel. My gosh, that was the best fuel. It was better than even our fuel in the States.

INTERVIEWER: It was still diesel fuel, only better refined.

MR. ROCECK: We had filters that looked like cream separators on a farm. That was what we used to purify and lube our oil. But we would have to clean that purifier. It was a standing order, anyway. Every four hours, you'd clean that sucker. It would get some dirt in there. But when we used that oil that we got from Borneo, my gosh, sometimes you could run through a day, and there would be nothing in there. It was fantastic. Of course, later on, when we took on another load in Nesmith (sp) Bay, in the Gulf, it was like tar. My God, you had to clean that thing about every one or two hours. You had to take that thing apart.

INTERVIEWER: I think it was getting to a point at which you were lucky to get any fuel at all.

MR. ROCECK: Oh, yeah,.

INTERVIEWER: After that, did you go out on what you could call a second patrol?

MR. ROCECK: No. We were forced out. As the Japanese were advancing, we were forced out. Then, from there, we went into Saribaya and Jabba . That was a Dutch naval base. We stayed there seven days.

INTERVIEWER: I would have thought you'd been bombed.

MR. ROCECK: Well, they were bombing Borneo too, Balikpapan, see?

INTERVIEWER: They weren't bombing while you were there.

MR. ROCECK: No. It was not while we were there. But they had bombed that area. We figured, as they were getting closer, they would be bombing more frequently. Well, it was the same way with Saribaya. While we were there for them, for seven days, we didn't get bombed, but it was only a few days after we left that they did get bombed.

INTERVIEWER: Man, you were one jump ahead.

MR. ROCECK: Yeah, right.

INTERVIEWER: The other problem, I understand, was that the torpedoes weren't too reliable.

MR. ROCECK: That's exactly right.

INTERVIEWER: Is that what happened to your boat?

MR. ROCECK: Yes. All the boats had the same problem, and god darn fish. From what I understand, when that torpedo hit perpendicularly, the firing mechanism folded up some way.

INTERVIEWER: It was really too far forward of the fish.

MR. ROCECK: I don't know exactly. But if you hit that on an angle, that torpedo would explode. It would allow that to fire the torpedo. But when it went directly in, something folded before it ignited the igniter? I'm not too apt on that.

INTERVIEWER: Well, on some of your patrols, you made a run and hit the target, but it wouldn't explode then.

MR. ROCECK: That's right. We were not the only boat. All the boats were having a problem. Also, the fish were running more deeply than what you set them at. That was another problem. They had two problems with those torpedoes.

INTERVIEWER: You had no way of really knowing at your end.

MR. ROCECK: No. Admiral Lock, after he was getting all the complaints from skippers, set up a net. I believe it was in Kurt. Then, they had one of the boats prior to the fish, and when they raised the nets up, they found out that, yes, the fish were running more deeply than what you set them at. Even the admiral was having a hard time trying to convince those people in Washington, D.C. that there was a problem. They wouldn't admit to it.

INTERVIEWER: You said you were on eight patrols.

MR. ROCECK: Right. It was on the ninth one that we were sunk.

INTERVIEWER: Do you want to go through all the patrols? Did anything unique happen on each one or what?

MR. ROCECK: Well, I can't even recall what happened on a lot of them.

INTERVIEWER: You ended up back at Pearl at a lot of times, didn't you? You got kicked out.

MR. ROCECK: Yeah, we went back to Pearl. In fact, when we went back for our overhaul, we went to Pearl. We also operated out of Midway one time.

INTERVIEWER: Why don't we get up to the ninth patrol? Where did you leave from?

MR. ROCECK: We left Pearl, and we were to operate between the Marshall and Gilbert Islands and Truck Island. I think they were going to make a landing on the Marshall or Gilbert islands, and they wanted the submarines to be between the two islands. We were supposed to all collaborate.

That was when we got Captain Cromwell aboard the *Sculpin*. He used to handle the wolfpack. They were going to try that wolfpack setup like the Germans used.

INTERVIEWER: Was he a pretty good skipper?

MR. ROCECK: He was the division commander. Conway was our skipper. That was Conway's first command. After the eighth run, Captain Shackwell was relieved, and we then got Captain Conway. Then, Captain Cromwell came aboard to take care of the whole wolfpack signal.

We spotted one convoy, and the skipper wanted to make an end around. When he made an end around, his approach didn't work out the way he wanted it to. That was what he was going to do. When he didn't make his original, he decided to make an end around and get ahead of the convoy, which we did. But they left the sleeper way back. When we got up to the surface, that destroyer was all the way in the back. It came up on us and its lookout spotted us, so then we had to dive again.

INTERVIEWER: That was what you called a sleeper. He was waiting just for you guys to play your game.

MR. ROCECK: Sure. The convoy went on by, and we thought that was fine, but he was way behind them, see? Then, when we came up to go around, he got right on us. The bad thing in that particular area was that the water temperature was constant all the way down. Often, you got different temperature water, what they call a 'gradient.' Well, if you found one like that, fine, because when you were below it, and he sent a sonar signal, if it hit the gradient, it had a tendency to bounce off. It gave a false reading. But when you had the water temperature constant, and he sent that beam down, boy, he had you dead right. That was what happened there. The water was a constant temperature. We had a heck of a time trying to get away from it. We finally did, in the rain scrawl.

INTERVIEWER: The depth charges were coming down at you then.

MR. ROCECK: No, not yet.

INTERVIEWER: Oh, but you could hear the ping.

MR. ROCECK: Yes. We could hear that pinging. Then, when he got close enough, he started sending his depth charges and kept working us over.

INTERVIEWER: What was it like, to be depth charged?

MR. ROCECK: Well, let me tell you, we were all scared. Don't let anybody tell you that no, they weren't. We were all scared. With us old timers, though, you couldn't afford to let the fear show on your face. Although we were young kids ourselves, we had younger ones with us, and they were watching us. You could not afford to show the fear. But you knew you had to do certain things, and that was it.

INTERVIEWER: I assume the boat just shook.

MR. ROCECK: Oh, sure.

INTERVIEWER: Any leaks?

MR. ROCECK: If you had bulbs or anything, it just shattered the bulbs. The cork that you had would crack and fall down. Lockers would pop open.

INTERVIEWER: Was it noisy?

MR. ROCECK: Oh, yeah. You would hear a click first. After you heard that click, you knew that that thing was going to woof.

INTERVIEWER: You didn't know how close it was going to woof, though.

MR. ROCECK: That's right. When that can came over, you could hear the propellers. Of course, when that 'chu-ga-da' faded, you knew they were going to come down. Then it was click, click, woof! That was why I say we were all scared. But, hey, you had to keep your wits about you

because everybody depended on everybody else. If anything occurred out of the ordinary, you had to take care of it the best way you could.

INTERVIEWER: I assume part of the training on a boat was that you had to know more than one job.

MR. ROCECK: Sure. That was your qualification. They gave you a year to qualify on a submarine. You had prints, manuals and drawings that you had to make, like the fuel system, electrical system, trend system, drainage system and air system. Also, you had to go to each compartment and learn that compartment. The man in charge of that compartment, like an after torpedo room, the senior man had to initial your paper. If he felt that you knew that compartment, he would initial your paper. But if you didn't know it, he would never initial it. You had to learn every compartment the same way, with the senior man in charge of that compartment. Once you got them all signed, the chief of the boat would take you through. He'd ask, "What's that valve for?" or "What's that line?" or "What's this? What's that?" If you didn't know it you had to wait until you learned it. Then, if he OK'd you, you went through with the engineering officer. The engineering officer would take you through the boat and grill you. Then, if he passed you, you went through with the executive officer. If the executive officer OK'd you, he then qualified you in submarines. That qualification assessment was put in your record, and you then got your extra money. You always got, I think, five dollars a month. But if you got qualified, then you got a little more. I forget what it was, fifteen dollars more or something like that. They gave you a year. If there was a guy who was a little slow in learning but showed that he was trying, they went beyond a year. But if it was a wise guy or something like that, someone who wasn't trying, they would drum him out of the submarine force. They didn't want that guy.

INTERVIEWER: If something happened to the boat, you could jump in almost any compartment.

MR. ROCECK: Sure.

INTERVIEWER: On the ninth patrol, you were being depth charged quite heavily.

MR. ROCECK: Yes.

INTERVIEWER: Did that bring you to the surface or what?

MR. ROCECK: Yes. Eventually, as we were coming up, the darn depth stuck. Normally, if you attacked that gauge, it would free up. Now, I don't know if that diving officer -- I guess he did, but that gauge didn't want to move. The first thing you knew, we breached. In other words, we came to the surface. When we came to the surface, the destroyer spotted us again. Although we got down below again, it knew where we were. It never let loose after that. He just kept depth charging us until we couldn't stay down any longer. We were taking on too much water.

During the depth charge attack, I was in the forward engine room. That was my duty station. I heard this water just come gushing in. I went up to the forward part of the compartment, and I looked down. Where the piping through the hull was fastened to the coolers, the flanges, it looked like someone took each nut and unscrewed it about an eighth to a quarter of an inch. Apparently, what happened was that it stretched; it flexed that hull. It was so close, and it stretched out. Actually, all those bolts and nuts that were holding the plane together, they were loose. The water was spraying out between the flange basin.

INTERVIEWER: Like finger ----.

MR. ROCECK: That's right. That was when I called the control room and reported that we had serious leaks in the forward engine room cooling system piping. I figured the compartment was flooding in about 15, 20 minutes. Of course, I presume other compartments had serious problems also, but that was what happened in my compartment. I think that was one of the factors that led the Skipper to decide to battle surface.

INTERVIEWER: What was your rating at that time?

MR. ROCECK: I was a first class motor-mac.

INTERVIEWER: You did surface?

MR. ROCECK: Yes. We surfaced, battle surfaced. After we battle surfaced, the skipper passed the word, "Abandon ship." Things were getting pretty hectic. I didn't really want to leave because we went through a lot of this stuff before and got away from it. Of course, this was worse. Swift, he was in the maneuvering room on the electrical controls. I went back there several times. Some of the men were cracked out from the heat exhaustion. They were just lying on the deck, unconscious. I told Swift that they had passed the word, "Abandon ship," and I said, "We had better get out of here." He said, "Okay. I'll be coming." We had a hatch in the forward engine room. Gee, when I got up to the top, there was a guy sprawled out. I don't even know who he was, but there was a mess of blood. I dropped back down.

INTERVIEWER: You figured that he got shot.

MR. ROCECK: Yeah.

INTERVIEWER: Did you think the bow was being strafed?

MR. ROCECK: Sure. I guess they were firing everything at us. When I finally decided to leave, I decided that when I got up there, I was going to run towards the conning tower and get behind either side. I finally did. I got up there. I started looking around where that can was. Well, it was on the same side as I was. There was a belch of fire coming out of that. They were firing everything. On that boat, you had what was called a 'dog house.' You could go from one side to the other, and it was just an opening.

INTERVIEWER: Right. It was after the conning tower.

MR. ROCECK: Yes. They called it the 'dog house.' Well, I got halfway through, and that was when we got a direct hit into the conning tower. It just stunned me. I mean, I just stopped. Momentarily, when I came to, I looked to see if I had everything. I had my legs; I had my arms. I said, "It's over. I'm gone." That was what I did. I went over the freaking side.

From that explosion, it was funny. But later on, when the can picked us up, I was picking out little watch springs, like if you took a little old wristwatch and the watch springs? I was picking out little curly cues. I think what it was the brass combing from around the hatch or wherever it came from. It stuck all over me. I had a few shrapnel things in my leg. But anyway, that was the only damage I had done to me there. About a year later, I had a piece of metal come out of my knee.

INTERVIEWER: I assume you lost other people.

MR. ROCECK: Oh, sure. I think that was where the skipper, the executive officer and most of the officers got killed in that con. Naturally, that was your fire control system. I guess they killed a lot of guys on the gun.

INTERVIEWER: How many guys did escape?

MR. ROCECK: Well, totally, there were 41.

INTERVIEWER: There was that many? Out of how many men was that?

MR. ROCECK: Well, at that time, we had a complement between 85 and 90 that we used to carry.

INTERVIEWER: Over half the people were gone.

MR. ROCECK: Oh, sure. We had Pete Cabrunis . He was in the control room on the hydraulic manifold. George Brown told Pete Cabrunis, when he was going to scuttle the boat, to pull the vents. I don't know whether he got hung up trying to get out through the conning tower, where all that wreckage was. You couldn't go out to the after-battery hatch. They tried to get Chappel to get

off the *Sculpin* several patrols prior, but he refused to get off. He wanted to stay on the *Sculpin* as skipper. This one time, when we were operating out of Midway, we were having a leakage problem with that after-battery hatch. The skipper was afraid that the longer he hung around there, the more likely it was that they were going to get him off the boat. Finally, he said, "Weld that sucker shut," and they did. In order for Pete to get off, you would have had to go up to the forward torpedo room or all the way back to the forward engine room. But I still think he was probably trying to get through the conning tower.

INTERVIEWER: Well, he probably didn't know how much damage was up there.

MR. ROCECK: No. He probably didn't.

INTERVIEWER: Forty-one were in the water, in the boat.

MR. ROCECK: Actually, there were 42 of us. They picked up a couple of guys. One of them, they carried back to the fantail because he was wounded, and they threw him right over the side.

O'Rourke thought the Japanese were going to take him to the sick bay. He was all fouled up. When he saw what they did to him, he turned around and ran back up to the bow where they kept all of us on the bow.

INTERVIEWER: Wait a minute. Were the Japanese aboard the boat?

MR. ROCECK: No. The Japanese picked us up.

INTERVIEWER: They got you out of the water.

MR. ROCECK: Yes. At first, they were machine-gunning us in the water.

INTERVIEWER: Really?

MR. ROCECK: Yeah. Then, they got orders I guess to stop that. I have no idea how many they killed, if they did kill some of us. But there were 42 guys who were rescued. Like I said, one man was thrown over to the side.

INTERVIEWER: The Japanese were shooting at you.

MR. ROCECK: Yeah.

INTERVIEWER: Do you remember what the Japanese ship was?

MR. ROCECK: It was a destroyer.

INTERVIEWER: Do you remember the number or anything like that?

MR. ROCECK: No.

INTERVIEWER: What did they do, get you on the destroyer?

MR. ROCECK: Yes. They picked us up out of the water and took us into Truck Island. Then, they brought us in on Truck, put us in trucks, and took us to their military compound.

INTERVIEWER: Let's not jump ahead. What happened to the *Sculpin*?

MR. ROCECK: Well, when George Brown gave the orders to open the vents and scuttle the ship, the *Sculpin* made a normal dive. When I was in the water, I saw her go down, just making a normal dive. Then, while I was in the water, I heard the explosion. I felt the explosion. When the salt water hit those batteries, they just blew up. You could feel it in your spine. You were supposed to float. We didn't know that. You were supposed to float on your back, so any explosions in the water wouldn't affect your spine.

INTERVIEWER: I see.

MR. ROCECK: But they never told us that. Nobody knew anything about that.

INTERVIEWER: You didn't have any life preservers or anything around your waists?

MR. ROCECK: No.

INTERVIEWER: You could have drowned.

MR. ROCECK: Well, I was a good swimmer. I was a good swimmer. I played in a lot of water, so that helped me.

INTERVIEWER: Did the Japanese sailors, since you were on board their destroyer, treat you reasonably well?

MR. ROCECK: Oh, yeah. Well, they got orders, I guess, because they herded us all up on the top of the destroyer. Then, they put a tarpaulin over us and gave us a five-gallon tin of water. That was what we had. We stayed down there until the next day, when they came into port to Truck.

INTERVIEWER: But they treated you reasonably well, huh?

MR. ROCECK: Yes. They didn't harm us on there, no. The only thing, like I said, is they threw that one injured man over the fantails.

INTERVIEWER: I thought it was when you were leaving your boat that that happened.

MR. ROCECK: No. They were picking us up with the destroyer, and this one man was injured from a bullet.

INTERVIEWER: Do you know who he was?

MR. ROCECK: I think his name was Weed. I'm pretty sure.

INTERVIEWER: They threw him over the side, huh?

MR. ROCECK: Yeah. They carried him to the fantail, and they threw him over the side.

INTERVIEWER: Geez. That must have made you nervous.

MR. ROCECK: Rourke has since passed away, but he was our gunner's mate. He went with him. He thought they were going to take him to the sick bay to take care of his wounds, but they just threw him over the side. Well, when he saw that, he ran back up to the bow, where we were.

INTERVIEWER: Did you get some reasonable food and treatment at the brig?

MR. ROCECK: No. They give us each a rice ball. That was all right, because we were not hungry. We were in good shape, but we were thirsty. That was what we wanted. We just couldn't get

enough water. All they gave us was a shot glass full of water each. On Truck, they had wells. On the ship, they had to rely on rainwater for their water supply, so they were skimpy on fresh water.

INTERVIEWER: They had to do that even for themselves, probably.

MR. ROCECK: We had several men who were injured. We had one man with a hole in his palm about the size of a half dollar. We had another man that had his arm broken, I imagine, by a .50 caliber. We had another man who almost had his whole calf sliced off. George Brown was trying to get medical attention for these men. They got us in three cubbyholes. In one corner, each cubby hole, the hole in the floor, was your toilet. We had to take turns to let the injured men try to lay down. We gave them as much room as possible, and the rest of us stood up.

INTERVIEWER: There wasn't that much room to sit or lay down.

MR. ROCECK: No. There wasn't. They had three small cells like that split up for the enlisted men. You were squashed in there like sardines.

INTERVIEWER: It probably was hot, too.

MR. ROCECK: It was hot. You're darn right. Then, those wound were starting to smell, being gangrene. Finally, after about two or three days, there was a young officer who came over there. They were questioning us, too. They blindfolded you, and then they led you outside a compound. I could see a little portable desk there, and I guess they had a nip in the back of the desk. They had an interpreter, and then they had another Japanese. Then, this Japanese guy would talk in Japanese, and the interpreter would repeat what he said, in English. They wanted to know different information. If they didn't think that you spoke fast enough, then they would nod to this sailor, and the sailor would whack you with a bat. If he hit you across the spine, you'd just drop like a log.

INTERVIEWER: He didn't hit you on the butt. He just hit you in the back.

MR. ROCECK: Right.

INTERVIEWER: I understand they would have ten questions, nine for which they knew the answers. The tenth was what they really wanted to know.

MR. ROCECK: That I don't know.

INTERVIEWER: That was what the guys were telling me. Did you have to endure that beating?

MR. ROCECK: Well, we were there ten days. That one young Japanese officer told George Brown that he was trying to get him over to the younger side of the island.

INTERVIEWER: They sent a Japanese officer. Did that mean that he was trying to be the good guy and bad guy? Sometimes, they play that game.

MR. ROCECK: No. George Brown was trying to talk him about getting medical attention for the injured. We were on the old side. They weren't about to do anything. They took three men, finally. I think on about the third day, they took them to the hospital. I didn't see them again until we were going to be shipped on the aircraft carriers. The three wounded men were on the carrier that I was on.

INTERVIEWER: Do you know the carrier you were on?

MR. ROCECK: I was on the *Chuyo*. It was not a full-fledged carrier.

INTERVIEWER: Was it a baby flattop?

MR. ROCECK: Yes.

INTERVIEWER: How soon did they put you on the carrier after you were captured?

MR. ROCECK: Well, we were captured on the 19th of November. I think it was around the 2nd or 3rd of December that we were put on the *Chuyo*.

INTERVIEWER: Was that 1943?

MR. ROCECK: Yes.

INTERVIEWER: That was two years after the war started. You were out there for two solid years then.

MR. ROCECK: Yeah.

INTERVIEWER: They put you on a carrier.

MR. ROCECK: They split us up. They split us up and put 20 on one and 21 on another. I was on the one with twenty-one. The guy who had the broken arm had it amputated. They amputated this guy's hand. But they bandaged one guy's calf. They told me that they were doing the amputations without any anesthetic, and they were firing him questions about submarine service. I don't know why they didn't cut that guy's leg off. His calf was almost torn off.

INTERVIEWER: How long was it between the time you were captured and when they put you on the carrier?

MR. ROCECK: It was ten days.

INTERVIEWER: Is that all it was?

MR. ROCECK: Yeah.

INTERVIEWER: They ran you right out of there.

MR. ROCECK: Well, from what I understand, they got orders from Tokyo or Yokohama to ship us up to Japan. Of course, the Japanese navy had this secret camp, their interrogation camp, Ofuna. That was to what we were brought, that camp. While you were there, you were not registered as a Prisoner of War. You were only registered as a Prisoner of War after the Navy turned you over to the Army. Then, the Army registered you as a Prisoner of War. They could do anything they wanted to you at Ofuna, and nobody would know the difference. Most prisoners at that camp were either submarine or aviation men.

INTERVIEWER: That was in Japan.

MR. ROCECK: Yes.

INTERVIEWER: That was where you ended up.

MR. ROCECK: Right. We went on the convoy, and the seas were in typhoon-like conditions. We got hit. The USS *Sailfish* hit that carrier I was on.

INTERVIEWER: How long were you on board before you got torpedoed?

MR. ROCECK: I think it was maybe two, three days, or somewhere around there.

INTERVIEWER: The *Sailfish*, the old *Squalus*, hit you.

MR. ROCECK: Right.

INTERVIEWER: Of course, you didn't know that.

MR. ROCECK: No. We didn't know that, but we knew a submarine got it. They had us in a compartment I don't know how many flights below deck. It was several, because we were below the water line. The room was about this size here. In one corner, they had the head, and they had a bar, and you had to pump your refuse, against sea pressure, overboard. They had us locked in, and they had a guard posted. There again, when we asked for water, they just wouldn't give us the amount of water we wanted.

I estimate that it was around midnight that we got hit. Midnight is pretty close to what the *Sailfish* report reads, too. Those of us who were sitting on the deck, we flew up about two or three feet from the concussion. I think it was pretty close, underneath five compartments. Then we heard the damage control and all the hustle and bustle. You could hear them surveying the damage. It all got quiet, and about a half hour later, you'd hear all the bings, and then the slosh and bang, and you know it broke loose. Like I said, it was tight room condition. They got that damage repaired again, and it was quiet for a while. But then, after about another half hour, you could start hearing that stuff breaking up again. All the power went out, and we could smell smoke. Then, we felt

water seeping into our compartment. Of course, our guard, left. We tried to open the hatch, but he had it locked from the outside. What we did was take off that bar from the head. Then, we got as many guys as could push on one end of that door to where we could get that bar in an opening. Then, on the count of three, we pushed and heaved. On the second try, we did it. We popped the door off of that sucker. We broke the lock.

INTERVIEWER: It was a vertical, normal sea door.

MR. ROCECK: Right. But if it had been an American ship, we couldn't have done that, because our ships were built a lot stronger. But on those, it was flimsy. That was the way we broke out of that compartment. We had already made up a story. If the damage controller, or anybody, wanted to know how we got out, we were going to say, "Well, the damage controller let us out." But we saw all of them running past us. They didn't pay any attention to us; they had their hands full with their own problems.

We didn't all want to go wandering off, because it was dark. We didn't know where to go. Denny Moore asked anybody who had been on a carrier or surface ship to try to lead us out of there. There was one guy. I don't even know what his name was, but he started leading us up. We all held hands. We finally worked our way on up to just below the flight deck. We passed one compartment that had hundreds of life jackets in it, so we all went in there and put one on. Then, we passed another compartment. It looked like a galley or part of a galley system. They had these crates, which were full of bottles of soda. That was where we first got our fill of being thirsty. We drank the heck out of that soda.

Then, a Japanese officer came down, and he gave a bunch of orders. He made us form a line up on to the flight deck. They had these long pine logs lashed underneath the flight deck. We had to pass those on up, and the nips would tie those logs together. They were making rafts. When we

got all of them topside, they brought us topside and kept us in a circle on top of the flight deck. At one time, they had us tied. They tied about 12 of us together with a half-inch line, and then they ran out of rope.

The majority of the Japanese topside did not wear life jackets. Why they didn't just go down there and put one on, I don't know. Maybe they figured the carrier wouldn't get sunk. But the Japanese naval officers not only had on their life jackets; they had on their big, long coats and life jackets. Then, they had their Samurai swords canned in between. Those were family heirlooms to them, and they weren't about to part with those Samurai swords. But you wondered about all that added weight. There was one boat out on the water. To me, it looked like it was only about a 16-foot boat, and they had three high-ranking Japanese officers in there. There was no other method of floatation except these rafts that they were making on the deck.

One time, this Japanese officer came over to us and tried to tell us that there was help coming. He said that they had radioed in for help to come, and they were going to tow us into port. Anyway, that was the drip that we got. But just about the time it got clear and you could see a little bit on the horizon, we saw what looked like either a destroyer or a cruiser coming over toward us. That was when the *Sailfish*, again, pushed a couple more fish into the carrier.

While we were down below, we heard what I thought were internal explosions. It was actually fish that the *Sailfish* was throwing into the carrier. I was invited to a reunion in 1979, with the *Sailfish* and the *Squalus* crews, and Captain Ward, who was skipper then, told me, "What you thought were internal explosions were the fish we were firing into it."

INTERVIEWER: When they did it again, it was beginning to be daylight then.

MR. ROCECK: Yes. It was beginning to be daylight when we were topside.

INTERVIEWER: Was the storm still going?

MR. ROCECK: Yes. The storm, it was raging. The rages, man, they were monstrous waves. Apparently, when the *Sailfish* saw that destroyer or cruiser coming in sight, they figured they'd better send more fish in, which they did, and they got it right in the bow. You could see the big puff of smoke that came billowing up over the flight deck.

Denny Moore and I were hanging to a searchlight. They had one of those collapsible search lights on the flight deck, maybe about 25 feet off from the starboard side. Kerry had a slight list. Most of the Japanese, and then the *Sculpin* men, were all on the high side. Denny Moore and I were hanging on this searchlight.

INTERVIEWER: You were on the low side.

MR. ROCECK: Yeah. Well, it was on the same side, but we had a search light.

INTERVIEWER: You were on the high side then.

MR. ROCECK: Yes. We were still on the high side, but we were trying to call the *Sculpin* men to come over by the search light, to get away from the people in front and back because when you were going to go down, you had people in front of you, and you were going to have people piling on top of you. But they just stayed there. Denny and I just hung on to that search light there. When she hit the last time with those torpedoes, the moat started going down, and then she started going down. I don't know why, but about a hundred feet from the water, I turned to Denny. I said, "Let's go, Denny." I dropped. I slid down the pipe. Although I was a darn good swimmer, I was trying to break that suction. But I couldn't break, and I thought, "This is it," and I started sipping water. Then, I looked. I don't know if the suction subsided as she was going away from me or maybe a bubble blew me up closer to the surface. I had seen the light. I made one last attempt to break surface, and I did. When I did break surface, there in front of me, about ten or fifteen feet away was one of the rafts that they made. I swam for that and latched onto that thing. Meanwhile, these

gigantic waves were hitting me. I knew I couldn't hold on to that son of a gun too much longer, so I worked my hand and wrist to that lashing so that if one of those big waves threw me against the raft, it wouldn't tear me away. After about a half hour, I bet there were 28 men on that same raft with me.

INTERVIEWER: Were they all Japanese?

MR. ROCECK: No. We had one mess boy and one officer off the *Sculpin*.

INTERVIEWER: Who was the officer?

MR. ROCECK: I think his name was Smith.

INTERVIEWER: Do you remember the mess boy's name?

MR. ROCECK: No. I could if I had the roster.

INTERVIEWER: That's all right. Was George Brown on the other carrier?

MR. ROCECK: Yeah.

INTERVIEWER: Okay. That was to where George disappeared.

MR. ROCECK: Yeah.

INTERVIEWER: Just you three survived.

MR. ROCECK: Well, we didn't survive right then, because four or five hours later was when the destroyer decided to pick us up. She was afraid to pick us up. She was afraid the submarine was going to get her, so she just kept circling and pinging. Then, when she felt it was safe, she started going and picking up the survivors.

The only bad thing was that their method of picking us up involved a bunch of lines hanging over the side and one Jacob's ladder. Well, if you picked up that wet line, once she rolled, all your weight was out of the water and on that wet line, and you slid right back down. Your best method was to get to that ladder. Luck would have it that a wave pushed me toward that ladder. I

was still on the raft. I grabbed that ladder. Then, one of those Nip officers climbed on top of the ladder and walked over all of us to get to that sucker. When he stepped on me, he broke my grasp on it, and I went down. Well, then, I lucked out again. When I surfaced, another wave pushed me back up against that ladder. I didn't have the strength then, so I just threw my arm through one of the runs, and I latched on like that.

Well, before they took us on the carriers in the compound, they shaved all our hair off, and they gave us undressed navy blues to wear. Well, I looked like a freaking Nip in the water. All we had was a little rope and a square tag, and I guess our names and our serial numbers were inscribed on that wooden tank.

INTERVIEWER: Were these undressed Japanese navy blues?

MR. ROCECK: Undressed Japanese navy blues they gave us, yeah.

INTERVIEWER: Oh, okay. They took away your work uniforms.

MR. ROCECK: Right. They took all our regular Navy clothes while we were in Truck. They took all of that away from us.

INTERVIEWER: In the meantime, were you still wearing your life jacket?

MR. ROCECK: No. They took the life jackets away from us while we were on top of the carrier.

INTERVIEWER: They did?

MR. ROCECK: Yes. They took our life jackets away, and they gave them to the other Japanese sailors. Like I said, they could have walked one flight down, and there were hundreds in that compartment. I don't think they thought that that carrier would get sunk.

INTERVIEWER: You were hanging onto that ladder with your left arm through and holding on with your right arm.

MR. ROCECK: That's right. Then, they picked the ladder up and flanked me out on deck, face down, and dropped the ladder back down. I guess that I lay there for maybe about ten minutes, and somebody flipped me over. Well, soon, as they recognized that I was not Japanese, I went, "Yer, yer, yer, yo," and all that.

Then, I felt myself being picked up and carried to the fantail. I said, "Uh oh, they're going to throw me over the fantail, too." They got me to the fantail, and I guess they got different orders, because they brought me back up on mid ship and threw me in their little laundry compartment. They didn't tie me up. They didn't shut the door. They just threw me in there and left me.

When they took me back to the fantail, I saw the sailors topside with big, long bamboo poles, and they were going like this over the side of the ship. I don't know if they were trying to help them up or push them down, but heck, they lost a tremendous amount of their own men because they didn't have the proper means to get those men aboard. Now, had it been calm seas, it would have been all right, but not in those kinds of mountainous conditions. Man, when we were in the water on that raft, you could see that destroyer rolling. You'd see most of the builds ----, you know what I mean?

INTERVIEWER: Yeah, turning.

MR. ROCECK: Oh, man.

INTERVIEWER: You were in the laundry room.

MR. ROCECK: I was in the laundry room. I think I stayed there for maybe two or three hours. Then, I heard the turbines winding up. I guess they finally got what they could aboard, and they decided to leave the area. They wound up. They didn't put anybody else in there with me. I figured that if they got anybody else, maybe they took them to the fantail. Maybe they put them in the compartment down there, never realizing that I was the only guy.

INTERVIEWER: I assume the *Sailfish* took off after the last attack.

MR. ROCECK: I think they did. I think they got out of there, if I remember right and according to that report.

INTERVIEWER: I wanted to ask you earlier than this, but they bugged out. What happened to you in the laundry room?

MR. ROCECK: I stayed there all night. They still didn't tie me up; they didn't lock anything. The door was wide open. But what the heck could I do? I was cold. It was nighttime, and I was cold. They had a little tank in there that was filled with water. I put my hand in there, and boy, it was warm. It felt really warm. I crawled up and sat in that sucker all night long, and I stayed warm.

Then, the next day, I got out of there. I had a young Japanese sailor come in there. He was talking and then telling me that he was in the engine room. I told him the same thing. I motioned, and he understood. He came back about 15 minutes later and gave me a little hard cracker. He gave it to me. If he were ever caught doing that to me, they would have killed him.

I was having a problem eating it because I couldn't work up enough saliva. I took a little bite, and I bet I chewed for about ten or fifteen minutes, just to work enough saliva, but I finally got it all down. Then, I had the chief come in there. He was drinking saki, because I could smell it on him. He came in there and yak, yak, yak. Then, he slugged the heck out of me and left. About a half hour or 45 minutes later, he came back again and beat me again.

They pulled into port in the morning. When we pulled in, I was still free. I had seen everything. We tied up. I saw the whole harbor and the ships that they had. Some were badly damaged. Some were half sunk.

INTERVIEWER: Do you remember what port it was?

MR. ROCECK: I think it was Yokohama. Finally, that chief came in there. After we were tied up, he came in there with three or four men and about fifty feet of rope, and they tied me up so that I couldn't even move. Close to noontime, a chief came in there by himself. He picked me up, took all that line off, took the blindfold off, and he tied me at the wrists. He put a blindfold on me so that I could only look down. He was a big guy. Man, he was a big sucker.

Then, he took me out to the gangway. They had a pair of sandals. I put those on. He took me on the launch, and we rode on the launch for about ten or fifteen minutes. Then, we got to land, and I could hear the city's activity. He was taking me to the railroad station. He led me through the streets to the railroad station. I ripped the seat of my blues when I slid down that flight deck, so my rear end was hanging in plain view. First, I felt kind of self-conscious. Then, I said, "Heck, I don't give a damn. I've got more problems to worry about than my freaking rear end." He took me in the railroad station and sat me down. I guess we were there for maybe 15 or 20 minutes. I heard him talking to a gal. He was talking and talking. Finally, he lifted my blindfold. Well, the gal he was talking to, she was built like state side. She was a doll, God. She had on a nice, short skirt, with silk stockings and high-heeled shoes. Oh, she was pretty. I can understand why he was making points with her. Apparently, she wanted to know what an American looked like, and that was why he took that blindfold off. After a few minutes, he put it back on. She left. Then, we waited for a train, got on the train, and we rode several hours.

INTERVIEWER: In the meantime, you got no food or water.

MR. ROCECK: No, I got nothing.

INTERVIEWER: I don't know how you endured.

MR. ROCECK: When we got off the train, he started running me. I tried to explain to him that I couldn't run. He had those boots, and I had these things. He understood that, but he also went like

this. He wanted to get me there in time to eat. We made it in time. But he treated me all right.

There was no animosity there. When he got into Ofuna, there were two gentlemen there. Well, they weren't gentlemen, but they were dressed state side. Apparently, they were a Japanese company.

That was their secret police.

INTERVIEWER: They were the shirt and tie guys.

MR. ROCECK: Yeah. One of them asked me what ship I was off of. I told him I had just come off a Japanese aircraft carrier that was sunk. He replied, "Oh, no. I don't mean that. What American ship are you off of?" I told him, "I'm off the *Sculpin*."

INTERVIEWER: Was that okay to say?

MR. ROCECK: No. They were mad. They knew that the carrier was sunk.

INTERVIEWER: But was it okay for you to say that you were off the *Sculpin*?

MR. ROCECK: Oh, yeah. The other men were already there.

INTERVIEWER: Oh, I see. But you didn't know that.

MR. ROCECK: No. I didn't know that, no.

INTERVIEWER: I thought you were not supposed to say anything more than maybe an American serial number and all that.

MR. ROCECK: No. Denny Moore told us to make up a story and stick with it.

INTERVIEWER: By the way, Moore, the fellow who was hanging on the light with you, did you ever see him again?

MR. ROCECK: I don't know what happened. He never made it, so I have no idea if he followed me. Denny Moore was the chief of the boat. He was giving us orders and telling us what to do and what not to do.

INTERVIEWER: He was doing that when you were captured?

MR. ROCECK: Yes. Old Denny Moore was a rock of Gibraltar as far as that was concerned.

INTERVIEWER: You just played along with the Japanese.

MR. ROCECK: Yes. I made up a story about when I came in. They kept me in New London for a year. Then, they sent me to San Diego, and I stayed there for a year. Then, I went to Pearl Harbor and was working in the ship's service there. Then, they transferred me to the *Sculpin*. That was my first run. That was my story. Everybody made up his own story. If you stuck with it, you really didn't have much of a problem. In their navy, they didn't tell their people anything, either. They kept their people in the dark.

INTERVIEWER: Did you run into the rest of the *Sculpin* people who were on the other carrier, like George Brown, or were you by yourself for a while, when you first got to Japan?

MR. ROCECK: Oh, in Ofuna?

INTERVIEWER: Yes.

MR. ROCECK: We all had separate rooms, and you weren't supposed to talk, but we had ways.

INTERVIEWER: You did meet the other guys.

MR. ROCECK: Oh, yeah.

INTERVIEWER: You didn't feel alone.

MR. ROCECK: Yeah. That was on a Saturday. That was bath day. I got a bath. When I got in that warm water, I almost fell asleep in the darn thing, it was so relaxing to me. They gave me clothes to put on. They put me in one of them rooms, and I got a piece of fish. I got to eat something, anyway. Then, to the guys next to me and around me, I started telling what occurred to the carrier.

INTERVIEWER: You were a prisoner for two years, then, weren't you?

MR. ROCECK: Yes. I stayed in Ofuna, I think, for about three or four months. I was one of the first groups to be transferred from there, and then they took us to Eschu, in the compromise.

Eventually, little by little, the rest of the *Sculpin* men were transferred up there.

INTERVIEWER: The other twenty were transferred with you?

MR. ROCECK: Yeah.

INTERVIEWER: I just saw a guy going up the stairway. He was wearing a *Sculpin* vest. I don't know who it is. How many, out of the twenty, are still with us?

MR. ROCECK: I think there are nine of us left now, and there are some that we don't know. I had another shipmate, Wyatt Earp, who was on there as long as I was, way before the war. He made it all the way through, just like I did. But we don't know what happened to him. We have no idea.

Now, some of them, we do know about. They've passed away.

INTERVIEWER: What did you do in a copper mine?

MR. ROCECK: Well, in a copper mine, I started out as a mucker. In other words, you had a metal tray about that big with two handles. You had like a triangular hole. You filled up this rock and put in a car. A car was maybe about that long, about that wide, and about that deep. You had to fill eight of them a day per man. I worked for about a year doing that, and then they made a driller out of me. Cooper was a driller, too. Ed Keller was a driller. They're here. They were in prison camp with me. But we screwed them as best we could. The drilling guns were all air operated. The miner labs you had those carbide stones, and you'd drip water. It would form a gas. Then, you had a little reflector, which was your light in the mine. Well, when the carbide stones would dissipate, they were like fine talc. We would take that talc and put it in the air supply, the air drill. Then, we'd put that air hose back on. The drill would work fine for maybe two or three days, and then it would gum up.

INTERVIEWER: I kept thinking it was an open pit mine.

MR. ROCECK: No. It was all enclosed.

INTERVIEWER: That was another claustrophobic job.

MR. ROCECK: Well, there was that. They also had a lot of those earthquake tremors over in Japan.

Boy, those scared the heck out of you, too. You were inside, and you felt that thing shake. You had to be careful of the overhead because sometimes that rock would fall. One time, five or six of us were in a group, taking a break. Then, as soon as we felt little particles of sand dropping, we all scattered because we knew something was going to happen; we didn't know what. We all got away, except one man, who was an Army boy. It broke his darn leg. A big chunk of rock fell.

INTERVIEWER: I don't like to jump too far ahead, but I better be sure to do it and get it in. How did the war end for you?

MR. ROCECK: Well, the first sign we saw was the fighter planes, our fighter planes.

INTERVIEWER: You should have seen bombers before that.

MR. ROCECK: No. Everything was south of us.

INTERVIEWER: What part of Japan were you in?

MR. ROCECK: I was in the northern part, north of Yokohama.

INTERVIEWER: Oh, okay.

MR. ROCECK: George Brown was, I think, closer to the cities, but we were up in the mountain area. We didn't even hear bombing or anything. We were too far north.

INTERVIEWER: There were no rumors, no nothing?

MR. ROCECK: The only information we got came to us once in a while from some of those Korean workers who had relatives down in the city. Once in a while, they would go down there to

visit. They would come back, and they would give some of the guys information about the bombing and how bad it was down there. That was the only news we had as far as that goes. We did have a chance to get some news periodically from the mine office. The nightshift crew that went to work passed the mine office. Every once in a while, it would happen where there would be nobody in that mine office. The last guy would dart in there and grab a paper if there was one available and bring that paper back.

INTERVIEWER: It was in Japanese, though.

MR. ROCECK: Yeah. But it had the truth in it because that paper was for the educated people. They had other newspapers for the common people.

INTERVIEWER: Was it in English?

MR. ROCECK: Oh, no. It was all in Japanese.

INTERVIEWER: How could you read the paper?

MR. ROCECK: We had one guy who was an interpreter, an Australian. He could read it, and he could speak it.

INTERVIEWER: You said that you started seeing the Navy fighters coming in.

MR. ROCECK: Right. Some of them dropped some candy and cartons of cigarettes. What they were doing was lining up to where these prison camps were. Then, I'd say about five days later, one of the big bombers came over, and he dropped a pallet of food for us. He dropped it just about a hundred feet in front of the entrance of the camp. He made a couple of runs, and he got it squared away and dropped that sucker. The only problem was that the chutes didn't have a chance to open up fully, and it really buried itself in the ground. We went out there.

INTERVIEWER: What happened to the Japanese guards that you had? Did they dig out?

MR. ROCECK: Oh, no. They were still there. When the American fighter planes came over, that Japanese commander said that the war was over and that Japan was dictating the peace. They still didn't want to admit that they were beaten. That was the way they were. In fact, the people in the mine, they felt, or were told, that Japan was bombing San Francisco, New York, Chicago, and they believed that. But that was the way the Japanese were.

INTERVIEWER: Well, we were propagandized tremendously at our end, also. It worked that way on both sides.

MR. ROCECK: Absolutely.

INTERVIEWER: Eventually, you saw some American troops, later, in August?

MR. ROCECK: They said the Red Cross was going to come there, but no, they never did show up. The next thing we knew, they took us into the railroad station.

INTERVIEWER: The Japanese took you there?

MR. ROCECK: Yes. They had the secret police, the company, posted from the camp all the way into the railroad station. The reason we found out was that they were afraid that the people would retaliate and do harm to us. They were afraid that they would be held responsible if we got harmed. You didn't see one person, not even a dog, nothing. It was like a ghost town. You didn't see anybody looking out the window. That was how deadly afraid they were, the secret police. Then, we walked out through the town and got on a train, and they brought us into Yokohama.

INTERVIEWER: Did the Navy meet you then?

MR. ROCECK: Yes. Well, the Navy didn't meet us. The first ones I saw were two Army nurses. When that train door opened up, there were these two beautiful Army nurses in full uniform. They had two trays, and they had cigarettes and candy bars out there.

INTERVIEWER: How much did you weigh?

MR. ROCECK: We averaged around ninety pounds each.

INTERVIEWER: How much did you weigh when you were on the *Sculpin*?

MR. ROCECK: Oh, I weighed about 180.

INTERVIEWER: You lost almost ninety pounds.

MR. ROCECK: Oh, absolutely. We were nothing but skin and bones.

INTERVIEWER: Will you eat Japanese food now?

MR. ROCECK: Oh, yes. I didn't eat rice for years. I refused to eat it.

INTERVIEWER: Do you have any animosity to the Japanese now?

MR. ROCECK: Not now, no. I wouldn't have anything to do with them.

INTERVIEWER: Do you ever have any nightmares still?

MR. ROCECK: I have nightmares to this day. In fact, I had one a couple nights ago. I just flail and fight. Sometimes, I talk.

INTERVIEWER: It must drive your wife crazy.

MR. ROCECK: Well, I don't have a wife anymore. Both of my wives passed away. I could never have anything around my head like pictures or anything because I go nuts when I have those dreams.

INTERVIEWER: I wonder if your former wives had problems with you that way?

MR. ROCECK: Well, yeah. When I was sleeping, they sure did. But all she had to do was holler out my name. That was what I told the guys, when I'm with my shipmates, to just holler out my name, and I'll snap out of it.

INTERVIEWER: George, where do you live?

MR. ROCECK: I live in St. Pete, Florida.

INTERVIEWER: Thank you. Do you think we pretty well covered everything? It seems like it. I don't want to beat this in the ground. Has the Naval Institute or anybody else ever interviewed you like this before?

MR. ROCECK: No. The only time we had an interview was when George Brown and I were talking with that skipper. I can't think of his name. Grand Adier .

INTERVIEWER: Grand Adier is his name?

MR. ROCECK: *Grand Adier* is the name of the submarine. God, I can't think of his name. He went through some bad times, too. They tortured him, that skipper. They really tortured him badly.

INTERVIEWER: Well, the feeling I get from just being up here with you guys for the last five or six hours is that you all went through hell together, and you're still friends. You're still shipmates. I wonder if there's still that quality of men around nowadays.

MR. ROCECK: That's a good question. More or less, I don't think there is because we were brought up under different circumstances.

INTERVIEWER: Like the Depression years.

MR. ROCECK: Absolutely. We grew to appreciate the smallest things, whereas the modern generation has a tendency to take a lot of it for granted. My gosh. Aboard the boats, you could throw your wallet on your bunk. You didn't worry about anybody stealing it. But I noticed after the war, things start changing, even on submarines.

INTERVIEWER: What happened to you after the war?

MR. ROCECK: After the war, I stayed in the Navy. I made a career out of it.

INTERVIEWER: How many years?

MR. ROCECK: I was in for twenty-two years. I retired in Jacksonville, Florida. I went back up to Illinois, and I stayed there until about five years ago.

INTERVIEWER: What did you do when you got out of the Navy?

MR. ROCECK: When I got out of the Navy, I worked at various factories. I finally wound up working for International Harvester. I put in 17 years there.

INTERVIEWER: Were you a mechanic?

MR. ROCECK: Yeah.

INTERVIEWER: You weren't on the production line or anything.

MR. ROCECK: No.

INTERVIEWER: You retired from International then.

MR. ROCECK: I retired from International, right.

INTERVIEWER: You're getting retirement money from the Navy and from International Harvester?

MR. ROCECK: Right.

INTERVIEWER: Why not?

MR. ROCECK: Yeah.

INTERVIEWER: Well, I think we've pretty well covered everything. I just want to thank you very, very much. To me, it's an honor to meet you guys. Personally, I want to thank you because you've been through so much, even more than some of the other guys. You got sunk twice.

MR. ROCECK: Well, yeah. Like I say, I think that man up there is watching over me.

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UNDERSEA & HYPERBARIC MEDICAL SOCIETY

**Interview
of
ADMIRAL GEORGE WORTHINGTON**

Friday, April 23, 2004

PROCEEDINGS

INTERVIEWER: The date is Friday the 23rd of April, 2004, and this is Dick Vann. I am interviewing Admiral George Worthington. George, this shouldn't take too long, I think. I guess what I'd like to do is just summarize what was in your pre-interview letter, which will be pretty brief. You can comment on it as need be as we go along. Then, I've got a few questions afterward.

ADM WORTHINGTON: Go ahead.

INTERVIEWER: In 1979, you were at OP37, and you worked for Jim Barnes and Ted Lyon after that. The DDS was there. That was managed by Ray Smith and later on by Tim Holden. The basic effort was to keep the funding alive.

ADM WORTHINGTON: That was it. We also sought to gain acceptance from the submarine community.

INTERVIEWER: Yes. But it sounded like sort of a miserable time.

ADM WORTHINGTON: Oh, it was a great time.

INTERVIEWER: Oh. Getting money was difficult.

ADM WORTHINGTON: It always is.

INTERVIEWER: Yeah. That was the kneepad time. In 1982, you moved up to OP954, and that was when the Naval Special Warfare master plan was put together.

ADM WORTHINGTON: That's right.

INTERVIEWER: It was basically a wish list with goals and objectives.

ADM WORTHINGTON: Right. A lot of people said it was simplistic. I, of course, looked at it as the Magna Carta of my naval career.

INTERVIEWER: Indeed, and it turned out to justify the palms thereon in the future. It was a very important document.

ADM WORTHINGTON: It helped. People who didn't have master plans burned with envy.

INTERVIEWER: Yes. Where did the idea of the master plan come from?

ADM WORTHINGTON: That was in OP095. Vice Admiral Kenard McKee set that off a submarine. The CNO set him up as sort of the honest broker between all the warfare groups. For example, some sonars could be used by ships and airplanes. While each union was developing its own, the CNO at the time wanted to see if there was some way we could have economies across the board looking at how we fought. McKee's outfit came up. I think one of the first master plans accomplished was the anti-submarine warfare master plan. I think it was his brainchild that the various unions within the service, like the Airedales, the aviation, the submariners, the war fighting communities, should draft master plans of what they thought their requirements were, and then they would go look at them and see if there were any continuities between them. Do you understand what I'm saying?

INTERVIEWER: Yes. The idea was to get coordination between the different groups in the services.

ADM WORTHINGTON: We call it 'unions' in the Navy, though, the aviation, submarines, and the surface.

INTERVIEWER: Right. But you used it well beyond that. You used it to justify everything you wanted.

ADM WORTHINGTON: Oh, I think that was what they did, as well. We were kind of unique. We were not going to take the huge surface ship sonar and use it on an SDV, for example. The idea of the master plan was just to sit down as a war fighting community and put on paper where you think your direction ought to be. That was it. That came out of Admiral McKee's office. I don't know the exact person who did it. But I think somebody in anti-submarine warfare came up with it,

and they did a master plan. The rubric, if you will, was there. I said, "Okay, it was my idea to do one from the naval surface warfare."

INTERVIEWER: Oh, okay.

ADM WORTHINGTON: I can assure you there was a great deal of resistance from within the field community.

INTERVIEWER: Because it had something to do with paperwork?

ADM WORTHINGTON: They would usually get all their stuff on the back envelopes, and they would rob Peter to pay Paul. They'd never want to stand up and let anybody know what they were really doing. This was, 'Well, we can't tell them that and blah, blah, blah.'

INTERVIEWER: I see.

ADM WORTHINGTON: I remember one time in 1979, the requirements for radios were written on the back of an envelope, literally.

INTERVIEWER: I can believe that. Well, at that time, 1980 to 1982, Maynard Juarez was in OP37, and he was trying to get the Draeger approved for the teams.

ADM WORTHINGTON: The teams came in with complaints. I think that even Ted Lyon on the east coast came in with complaints about the Emersons, because they weren't being repaired properly. The maintenance of them was difficult. People said it was time to get a new closed-circuit breathing apparatus. Maynard was down there, and he got the challenge to do that. He did a study and got about four or five representative closed-circuit rigs from around the world, like the Pirelli. The English had a model; the Germans had one. They tested them down at Panama City. The director of diving got involved with it. It was the supervisor of diving, I guess, at NAVSEA.

INTERVIEWER: Would the Draeger or a closed-circuit oxygen have been in the master plan? I guess not, because that's kind of generic.

ADM WORTHINGTON: They started that before the master plan was published.

INTERVIEWER: Fair enough.

ADM WORTHINGTON: I went up summer '80 to OP95. It was later that year that the Draeger issue happened. I have to really sit down and use the calendar. But Maynard Juarez could tell you exactly. He's back here in D.C.

ADM WORTHINGTON: Where are you located?

INTERVIEWER: I'm in North Carolina. From 1982 to 1985, you were in OP37?

ADM WORTHINGTON: Yes. Then, I went up to OP95 for two years and the detailer called me and wanted me to go down and relieve Maynard. Of course, I had just gotten married and had a brand-new kid at that time, so I was delighted. Then, I went down there and became the program sponsor. The money and the master plan followed me.

INTERVIEWER: Okay, good. You used the master plan to great effect.

ADM WORTHINGTON: I think so.

INTERVIEWER: You used it to get lots of good, new stuff. Now, things were going pretty darn well, and then along came Grenada.

ADM WORTHINGTON: That was sort of a parallel effort. SUPIN6 went down and needed some stuff. They came in with the after action report, which got the attention of the CNO. He said to do it. I think it was some five million dollars involved in getting communications gear for SUPIN6, who was Bob Gormley at the time. They came up with that money by delaying the procurement of a radar for one of the new construction destroyers. They took the money and gave it to us.

INTERVIEWER: That must have made a lot of people happy.

ADM WORTHINGTON: In a matter of months, they got it back.

INTERVIEWER: Then, there was the Thayer memorandum and the SOF revitalization. Then, things began to happen. SOLIC and SOCOM came along as a result of the various external events.

ADM WORTHINGTON: That's right.

INTERVIEWER: Your big efforts within the programmatic realm, and you were commodore of group one from 1985 to 1987. You had some influence on the ASD DV in the palm in 1986 or 1987.

ADM WORTHINGTON: Right.

INTERVIEWER: Just sort out a couple of things for me. OP37, exactly how did that fit in? What was its role?

ADM WORTHINGTON: At the time, OP37 worked for OP03, and it was the amphibious warfare division. I had worked for two admirals there. My shop was called 371, which came out to be a stand alone. I got some reserves in there once in a while. But basically, it was a one-man shop.

INTERVIEWER: That was basically SPECWAR underneath?

ADM WORTHINGTON: The amphibs.

INTERVIEWER: OP37, yes?

ADM WORTHINGTON: Yes.

INTERVIEWER: Then OP954?

ADM WORTHINGTON: That was the amphibious strike warfare section, which was under 095.

INTERVIEWER: Oh, okay.

ADM WORTHINGTON: That was headed up by the naval aviators - rear admirals.

INTERVIEWER: Now what was the relationship of the earlier plans, 3801 and 3802, to what you were doing?

ADM WORTHINGTON: As I recall, those were plans that were done at NAVSEA for weapons, and they cited and were good. They were cited. They were letters. Instead of big ORs, they were just letter requirements for SEALS. They were diving gear, letters, and weapons, the stuff that you used in the water and stuff like that.

ADM WORTHINGTON: My master plan was to subsume them.

INTERVIEWER: Yes. Give me a perspective on the relationship that you had with the supervisor of diving and the supervisor of salvage.

ADM WORTHINGTON: Diving and salvage were the captains. We had good relationships with them. They were responsible for all of the diving equipment and had to make sure that stuff was certified, like the diving gear, the Draeger.

ADM WORTHINGTON: We had a working relationship with them because their authorities were spelled out. To get our stuff, we had to get approval from them. It was not a problem.

INTERVIEWER: Basically, it was just approval on equipment and procedures for diving.

ADM WORTHINGTON: We tried to use them as required, especially the dry deck shelter. It had to be fore-certified, which is a term that resulted from the USS *Thresher* accident. There was a company mate of mine from the Naval Academy, John Grafton, who was killed on that. I had a working relationship with them.

INTERVIEWER: That's pretty much all I have regarding questions, follow-up from your long e-mail. Is there anything else?

ADM WORTHINGTON: Just give me the opportunity to blow the whistle, as O'Reilly says. The diving gear was the open-circuit and the closed-circuit. They don't use too semi-closed too much any more, the SDVs, the dry deck shelters, and the ASDS. I recall doing some documentation on the advanced systems, saying that we needed a dry system. I can't remember if

that was called out in the first master plan or later. The idea was to make the advanced seal delivery system like a dry deck shelter that flew away and left a clean submarine.

INTERVIEWER: Yes.

ADM WORTHINGTON: That's what we have today.

INTERVIEWER: Yes. Okay, I think that pretty well covers it then.

ADM WORTHINGTON: Call Maynard on the Draeger stuff.

INTERVIEWER: Well, thanks very much, George, and I'll send this stuff in to UHMS and see where it goes.

ADM WORTHINGTON: If you would go to the records, you might be able to get a copy of those. I think there were two master plans. Obviously, they could be declassified today. I think they were secret at the time, secret from us as much as the enemy.

INTERVIEWER: Yes.

ADM WORTHINGTON: Then, Noel Cooke , who you recall I mentioned was one of the original architects of the RESOF revitalization, is alive and well.

INTERVIEWER: Well, I appreciate your input on this and I will pass it along.

ADM WORTHINGTON: Okay, Dick, thanks.

INTERVIEWER: Thanks a lot.

Let me add as a postscript here that there is a rather long e-mail that should go with this tape, and Don Chandler already has it. I will send up another copy as well as a hard copy with this particular tape.

(Whereupon, the INTERVIEW was concluded.)

* * * * *

Dick:

Would be delighted to speak with you next week. May not require 2/3 hours...hopefully. You could probably stash my diving knowledge in a thimble in spite of previous qualifications in open circuit, closed and semi-closed SCUBA (Emerson/*Draeger* and MK VI), several submarine lock-outs (underway and bottomed), DDS lock-out (underway off Hawaii), a couple of SDV passenger rides (sucked!).... Programmatically, here's a brief "diving summary" from my positions in the Pentagon: three tours with OPNAV (OPs 37 and 954) and SECDEF (SO-LIC, Irish's old job, too).

1979, OP-37, working for Jim Barnes and later Ted Lyons. No significant diving involvement excepting the ongoing NAVSEA effort on the Dry Deck Shelter (DDS) program, managed at that time by Ray Smith, later Tim Holden. Effort was to ensure sufficient funding to keep the program alive and submariners interested. They weren't. Didn't want extraneous gear hanging off their ships. Main SSN effort was anti-submarine warfare against Soviet threat, plus the Boomers. The Los Angeles Class was gaining more prominence.

1980-1982, OP-954, sponsored a "Naval Special Warfare Master Plan," which was subsequently signed out by Lee Baggett in 1982 (fall). This document was essentially a "wish list" set out in a "goals and objectives" format. OK, it had some supporting arguments, etc. You can probably find a copy of this publication somewhere. It got great mileage during POM deliberations, to wit: I would fashion budget submissions based on the NSWMP objectives, typing the "NARM Data Entry Sheet," a computer-based form the budget guys would use to input line items into the prospective (proposed) Program Objective Memorandum, i.e., "POM." One of the objectives was mobility. In this we treated the need for better SDVs, and if I recall—although it may have developed sometime later on—we cited a need for a dry SDV, the Advanced SEAL Delivery Vehicle (ASDV). If ASDV didn't appear in the first Master Plan, it made its entry in POM documents very soon after as one of our RDT&E lines. I do remember supporting it from my spot as Group ONE commodore, 1985-87.

1982-1985, I moved downstairs back to OP-37 as a stand-alone shop, OP-371. Let me back up; whilst I was "upstairs" in "954," Maynard Weyers was in OP-37 fighting to get the *Draeger* (German) system introduced in the Navy. They did a lot of testing among available worldwide closed-circuit gear, U.K. and Italian, among others, and located on the *Draeger*. The NAVSEA certification people weren't particularly helpful, as I recall, although this may be unfair, I'll admit. The Supervisor of Diving help his turf very closely. But if SEALs have any alluring traits, persistency is one of them. We won....

During my OP-371 tour, I was extremely lucky to have the Master Plan, which followed me "downstairs." I was a fairly simple task to organize a POM submission based on it. The Master Plan objectives had all been vetted through the two fleets and SpecWar Groups, and signed out by a Deputy Chief of Naval Operations. It was a hard document for our OP-03 budgeteers to argue against. "Ah, gees, guys, CNO said do it,

and you don't want to fund it.... Let's go talk to Admiral Trost." That usually got their attention. Another thing happened in the spring of 1983, which was also helpful.

You may recall we had a couple of war like events take place during the early eighties. One was the Grenada operation, from which SEAL Team SIX emerged with a bunch of requirements that got CNO's personal attention. The Congress was beginning to get energized, too, owing to the sub-rosa efforts of a civilian staffer named Lynn Rylander, RIP. Lynn came to my office in, March, I think, and asked how SEALs did in POM 85. I said fine owing to the Master Plan: we had gotten out-year approval for another SEAL Team (EIGHT), *inter alia*. Lynn said he (they, the SECDEF guys) were going to fix the SOF problem in POM 85. One year, I asked? Yes, he replied. Well, I had had by then four years watching POM and budget execution crap, so I told him it would be impossible for the services to execute a one-year budgetary pump-up. Why?: none would be able to spend the money. The labs were already ceilinged out, that is engineers and scientists were already assigned to programs, and the labs couldn't hire more. Furthermore, all the people involved outside of SOF would have to have a learning curve to understand what we needed, etc. Also, the salient fact that we procured things in such small numbers, the budget impact wouldn't get anybody's attention. For all these reasons and more, I explained to Rylander that he needed to take a piece of paper, line out five years on one axis, monies on the other.... This way, he would be able to demonstrate budget and spending ramps that would be acceptable to the "green eye shade" guys and have a decent chance of being accepted by the services. If the services felt they could continue to push something out, they would feel more comfortable with the effort; most of the principles would be reassigned by the time out-years came to roost.... You know, someone else's problem, the old switch the chair routine.

So, on 3 October 1983, the Deputy Secretary of Defense, Paul Thayer, signed out the SOF revitalization memorandum addressed to all the services and the joint staff dictating that SOF revitalization would commence with POM 86 and be completed by POM 90. Fine, it's still going on, and you probably know the rest. Congress finally got involved, SOLIC and SOCOM got stood up, etc. The rest is history, as they say.

The Naval Special Warfare Master Plan and the Thayer Memo were hard documents to argue against. I might add, too, that before the 3 October memo was released, I had occasion to brief Noel Koch, Principal Deputy SECDEF for International Affairs (under Rich Armitage) and brief the Master Plan in the JCS tank. Koch wanted all services to have a SOF Master Plan. Anyway, armed with Thayer's memo and our NSWMP, POM deliberations were a walk in the sun...and a lot of fun. Winning is always better than getting it broke off in your ass. I remember the late seventies drills, running from office to office with knee pads begging for a dime....

Diving gear was certainly discussed in the Master Plan. Again, can't remember the ASDV in it but do remember starting the program later on in POM 86 or 87, as an out-year R&D effort. I may have caused it when I was NSW Command guy, sometime in the budget events or 1989-90. Chuck LeMoyné reminded me when he became the SOCOM budget guy that the preponderance of SOCOM fiscal impacts were Naval Special

Warfare programs—boats, SDV upgrades, AND ASDV. It was during this time, to conserve money, that I cancelled the SDV MK IX program (the two-man SDV) using the argument that the job could be done by the MK VIII SDV (and as an aside, that the MK VIII could carry Army guys, too!). I saved a bunch of dough! Millions in upgrade monies.

It is interesting to review a little of post-Cold War history, too. When the Soviet Union “went away,” we got more submarine services than we had ever enjoyed before. SUBLANT was all over us. SUBPAC, the same. They were both looking for new missions, their anti-sub task abated. (The B-52 Air Force guys were also looking for work, wanting to fly their bombers at 500 feet on SOF insertions....) They were halcyon days for Naval Special Warfare. And I would opine they have continued: ran the SOF war in Afghanistan, did well in Iraq (continue to), have two three-star admirals, are finally looked on with respect by the other Navy “unions” (Airedales and Bubble Heads), and SOCOM is, today, a “supported” command in the war on terror.

I might add another very important policy turn that occurred in 1983. Irish came up with the idea that it was time to move all the frogmen and SEALs into similar units, eliminate the UDTs and make them all SEAL Teams. This was momentous. I recall up in my OP-954 days explaining to my admiral the difference in UDT and SEAL missions, that one ended at the waterline, the other continued inland. He didn’t know the difference between IUD and UDT! So, the recommendation to merge into one naval commando unit was received with total commitment by all the assembled commanders at that particular “Cross Tell Conference.” I said, as sponsor, I would need letters from both fleets concurring with (and recommending) the “name change.” This last is important. Changing the name of a command is one thing; but we were actually changing the mission(s). Name changes are simple; changing missions is another, and we didn’t want to find out how hard it might be. For example, OK get rid of UDTs, change their name to SEAL—but there were equipment implications, as well. SEAL Teams require more stuff than UDTs. Without putting too fine a point on the effort, I got the fleet letters which were specific enough to enable me to get it done. I think the fleet commanders recognized there would be equipment implications, they’re not dumb. I just didn’t want to have to make all the rounds required to stand up a “new” entity. You have to place 30-day notices to Congress to ascertain any political ramifications, etc. Happily, it all worked out faster than I ever imagined. You know, “Sure, guys, come on in with your letters...” never thinking I’d see them before the Second Coming. It was all Flynn’s idea and it’s paid off handsomely over the years. In fact, I’m not sure the NSW community could have survived much less competed with Army and Air Force had we stayed so fragmented. It was hard explaining our “Blue” mission versus our “Purple” employment.

I know I’ve taken too long, here, so I’ll sign off for the moment. I look forward to hearing from you next week. I’m at (619) 216-1009.

Cheers,

George

UNDERSEA & HYPERBARIC MEDICAL SOCIETY

**ORAL HISTORY OF THE MAJOR PARTICIPANTS
IN U.S. NAVY UNDERSEA TECHNICAL DEVELOPMENTS**

**INTERVIEW OF
GERALD McLEES**

Portsmouth, New Hampshire
Saturday, September 27, 2003

PROCEEDINGS

INTERVIEWER: I am at the home of Gerald McLees in Portsmouth, New Hampshire. First, thanks for inviting me to come in to give the interview.

MR. McLEES: I appreciate you folks coming, yes.

MR. KNUCKES: Can we get started, Matthew? Do you mind if I call you Matt?

MR. McLEES: No. That's what I go by now. I don't think half the people around here know my first name, even.

INTERVIEWER: Basically, what I'd like to do is to get your story. Let's start from the very beginning. Where you were born? What was your childhood like and how did you become interested in being in the Navy?

MR. McLEES: Well, I was born in Richmond, Kansas in 1914. My folks had a farm there and of course, I was a farm boy and went to high school and graduated. We lived about, oh, six and three quarter miles from Richmond. My transportation to high school was a horse. I rode a horse morning and night, to and from high school.

I graduated in 1938, I guess it was, from high school. I got out of high school. Times were really rough then. There was no work or anything, so this friend of mine with whom I ran around said, "Why don't we go out and join the Navy?" Without even telling my folks or anything, we hitchhiked up to Topeka, Kansas. I think we had about fifty cents in our pockets. When we got up to Topeka, the chief at the recruiting station was just about ready to go home, but we talked him into giving us the pre-examination and everything. I zoomed right through it, but my friend's eyes were bad. He kind of flunked out right away.

INTERVIEWER: You were 18 at the time?

MR. McLEES: Well, yes, I was 18.

INTERVIEWER: We can really relate to that; our son just turned 18. I can't imagine him going off on his own.

MR. McLEES: Well, after we came back, my folks were just happy that we did come back. About a month later, I got a call to go to Kansas City for my final exam, and I went. That evening, I was on a train for San Diego.

INTERVIEWER: Why did you decide on the Navy? Kansas doesn't have a whole lot of water.

MR. McLEES: It didn't make much difference. That was the first recruiting station we came to. I didn't know one from the other, the Marines or the Army. The kid that I went with was kind of in favor of the Navy, too. That was one reason. As far as I was concerned, I didn't know one from the other.

INTERVIEWER: Was war imminent at that point?

MR. McLEES: Not that I know of, no.

INTERVIEWER: It was primarily just to get on your own, then.

MR. McLEES: Yes, it was something to do. I think it was in August of 1934 that I left Kansas and headed for San Diego. That was when I joined the Navy.

INTERVIEWER: I just got back from San Diego the day before yesterday, as a matter of fact.

MR. McLEES: Is that right? I haven't back there since, actually, I came out of the recruiting station. After three months of sitting in the recruiting station we were put in the transfer unit, which was waiting for orders from someplace. One day, we came in from our work detail and found quite a group of names on the bulletin board, including mine, of guys who were being transferred to Pearl Harbor. We were running around like crazy, trying to find out where in the heck Pearl Harbor was. In those days, nobody had ever heard of Pearl Harbor. We found out. We got on a transport, and that was why I ended up at Pearl Harbor.

INTERVIEWER: Pearl Harbor is a long way from Kansas.

MR. McLEES: Of course, being just a boot, they put lot of us right on mess cooking. One day, I got acquainted with one of the guys who was mess cooking with me and he was on a submarine there, an S-30 boat. He said, "Why don't you come down in the boat? The chief is looking for another seaman." After we got our work done there, I went down. That evening, I had a .45 strapped on me and was on topside watch, on the submarine.

INTERVIEWER: Were you then officially assigned to the S-30?

MR. McLEES: Yes, I was assigned to the S-30 boat.

INTERVIEWER: Today, submarine duty is strictly a volunteer service.

MR. McLEES: That's right.

INTERVIEWER: Was it voluntary then?

MR. McLEES: Yes, I guess it was voluntary then. Normally, most everybody was going to New London to submarine school. I always said my folks couldn't afford the tuition and that was why I didn't go to submarine school. In 1938, the S-30 came back to New London.

INTERVIEWER: The S-boats were relatively small, I guess.

MR. McLEES: Yes. We only had a crew of about of probably forty or fifty men.

INTERVIEWER: The typical daily operation would be what? Would you go out?

MR. McLEES: We just went out from the submarine base in Pearl Harbor. We would go over maybe to Lahaina Roads for gunnery practice maybe once a year, and anchor off of Lahaina. Lahaina was nothing in those days. Now, it's a big tourist center.

INTERVIEWER: You were on the surface most of the time?

MR. McLEES: Yes. The diving was for short periods of time. It was not like it is today, where they go down and stay underwater for days at a time.

INTERVIEWER: Can you talk a little bit about the features were on the S-30 boats, as far as the human comforts or lack thereof?

MR. McLEES: Actually, it wasn't too comfortable. We had no air conditioning in those days. Everything was kind of crowded.

INTERVIEWER: Were there sleeping facilities?

MR. McLEES: Yes, we had sleepers, but I think our bunks were four-tier high.

INTERVIEWER: I'm trying to think of the submarine that sank off of Honolulu. It was an F-boat.

MR. McLEES: It probably was, yes. I think one sank off here, the S-52.

INTERVIEWER: Was that the S-51?

MR. McLEES: It was the S- 51 or something like that, I think. The S-4 sank off of Rhode Island or someplace out there, because I know that while I was in Pearl, they toted it out there and sank it. They used it as a target ship. It was sunk off of Pearl Harbor.

INTERVIEWER: You didn't go to submarine school, you said.

MR. McLEES: No.

INTERVIEWER: Did you ever go through the escape towers?

MR. McLEES: Yes, I went through that in Honolulu. Pearl Harbor had one. It was the same thing. Before I qualified, I went through that. In those days, I think our submarine pay was thirty dollars a month.

INTERVIEWER: That was probably pretty good money at that time.

MR. McLEES: Yes, it was.

INTERVIEWER: If you weren't in submarine service, what was the comparable pay at that time?

MR. McLEES: I think when I first enlisted in the Navy, my pay was \$21 a month as a recruit seaman. Then, it went up after three months. It went from \$21 to \$35 or something like that. Then, you had to make a rate before you could get up to seaman. First it was \$56. I think the highest rate there was paid to chiefs, at \$99 a month.

INTERVIEWER: Then, you left Pearl Harbor, you said.

MR. McLEES: We came back to New London on the S-30 boat. After I was in New London for a short while, the squadron got a request for four third-class electricians' mates to go to the USS *Raleigh*, a light cruiser. That was over in Europe. It was supposed to get relieved over there by the USS *Omaha*, another cruiser, but on the way out there, the *Omaha* went aground and had to go in for an overhaul. They had several people on the *Raleigh* whose time was up and had decided they were going to get out of the Navy. They wanted replacements for them. I figured I had about a year to go on my enlistment and it would be a good chance to get some overseas duty, so I volunteered and transferred to the destroyer, the USS *Claxson*. Then, we met the *Raleigh* over in Gibraltar. I went aboard the *Raleigh*. I made second class on the *Raleigh*, second class electrician's mate.

I think that just before my enlistment was up, we were relieved and came back to the States. I decided that I didn't want to stay on a surface craft. I wanted to get back to submarines. I'd already agreed to extend to go over my enlistment for two years to go over to the *Raleigh*. But when I got back to Norfolk there, my enlistment was not quite ready, so my extension hadn't started. I gave them a big line of baloney that I'd been offered a big job with Standard Oil or somebody, and I got my extension cancelled and got out of the Navy. On the way back to Kansas, I stopped in Washington. There was an ex-skipper there who told us when he left the submarine that if there was anything he could do, were he at the Bureau, to stop by and let him

know. I stopped there and told him I was out of the Navy, but I wanted to go back for submarines. He said, "You go on home. When you get ready to ship over, give me a call. I'll send a letter to the recruiting station." That was how I got back on submarines.

INTERVIEWER: What was the attraction of submarines? You already had submarine experience and then you went to the surface Navy.

MR. McLEES: Well, of course, there was the extra pay and the social relations on submarines. You knew everybody and they knew you. You were family and all that business. It was really more homelike. On the cruiser, I didn't know more than just the group in my division.

INTERVIEWER: Was it in New London where you signed back up?

MR. McLEES: I signed up in Kansas City, at the recruiting station. Then, I transferred right back to New London. I got on another submarine. I got on an R-boat, an R-14.

INTERVIEWER: Were the R-boats bigger?

MR. McLEES: They were smaller than the S-boats. The O-boats were the smallest, followed by the R-boats and then the S-boats. While I was in New London, they started to building the fleet boats and I put in for the USS *Squalus*. I got transferred to it in February of 1939 or so. It was still being built in Portsmouth.

INTERVIEWER: It was a modern submarine.

MR. McLEES: That's right. It was really something to get on one of those fleet boats, or what we called the 'fleet-type' boats.

INTERVIEWER: Were you continuing to keep your training?

MR. McLEES: While I was in New London, I went through the tank and the pressure chamber and all that.

INTERVIEWER: You were continually being educated and refreshed.

MR. McLEES: Yes. Of course, when I came to the *Squalus*, it was quite different from the R-boat or the S-boats that I was on. I had to re-qualify. Of course, on a trial run was when we went down, flooded out the boat, and laid on the bottom.

INTERVIEWER: Before we get into that, because that's a part on which I'd really like to focus, were you aware of any rescue equipment at that time? Were you aware of the bell, the rescue bell?

MR. McLEES: I was not too aware of the bell, but we did take the lung training and all that. We had that in the tank. We used the lungs to come up from a hundred feet. That was the only thing that we had.

INTERVIEWER: It was really quite an advancement in itself.

MR. McLEES: That's right, yes. To be able to come up from a hundred feet was an achievement. The tank had an escape chamber at its bottom, and you went on in there and opened the hatch and came up through the hundred feet of water.

INTERVIEWER: You transferred then to Portsmouth, I guess, where the *Squalus* was?

MR. McLEES: I came to Portsmouth, yes.

INTERVIEWER: What was your job on the *Squalus*?

MR. McLEES: I was a second class electrician's mate.

INTERVIEWER: You were going out on a daily basis from Portsmouth?

MR. McLEES: Yes. We'd go out. We went out and operated one day, and the next morning, we were supposed to make this crash dive, or whatever they called it. It was putting full power on the main engines and then shifting the motors and trying to get down to fifty feet in fifty seconds, or less than a minute, I think. That was one of the Bureau's qualifications, to be able to go down to periscope depth in so many seconds.

INTERVIEWER: Where were you during that dive?

MR. McLEES: I was assigned to the forward battery. It was going to be a one-hour full-power discharge on the battery. I was to take gravity and temperature readings every five minutes during the hour-long discharge.

INTERVIEWER: You were just forward of the control room?

MR. McLEES: Yes. Boyson was on the telephone in the forward battery. He was the one who received the word that the aft engine room was flooding. I think I was down in the tank at the time, down below the deck.

INTERVIEWER: You were in the battery.

MR. McLEES: Of course, since you had little clearance, you were done. You couldn't stand up down there. I think I came right out of the tank and passed the word, but the chief was taking readings from the individual boat meter up on deck. Of course, he was a little more qualified on submarines because he'd been on them for quite a while. He rushed right down to the tank and pulled a big disconnect switch to disconnect the battery from the after battery. The after battery was flooded and the forward battery was discharging fully into the after battery. He had one switch on each side. When he pulled one, the arc didn't break on it until he pulled the other one.

INTERVIEWER: Who was that?

MR. McLEES: That was Chief Gaynor.

INTERVIEWER: Can you just walk through your recollections of what actually happened from the time that you first started to dive?

MR. McLEES: As I said, I was down in the tank and soon as Bryce got the word that the engine rooms were flooded, the word came that we were to secure the after battery, forward battery, and

go into the forward torpedo room. They figured that we might start getting chlorine gas from the battery.

We went in the forward torpedo room, and then got word to conserve all the oxygen we could. I crawled into one of the bunks there and lay down and covered up, because it was cold. Later on, it got really cold. We had no lights or anything.

INTERVIEWER: When did the lights go out?

MR. McLEES: The emergency lights went out when Gaynor pulled the disconnect switches in the forward battery. Of course, that was one of the things that were changed. After the *Squalus* accident, when you pulled the disconnect, you still had emergency light.

INTERVIEWER: It was pitch black.

MR. McLEES: It was pitch black, yes.

INTERVIEWER: Did you have flashlights?

MR. McLEES: We had flashlights and battle lanterns. We didn't want to use them unless we had to.

INTERVIEWER: What was the sense of the crew as the flooding happened?

MR. McLEES: There was no panic or anything that I knew of. You never heard anybody start hollering and then snap. I, at least, sort of figured, "Well, what the heck, maybe we are on the bottom, but we'll get rescued in no time at all."

INTERVIEWER: That was something that you had thought through beforehand.

MR. McLEES: I guess, yes.

INTERVIEWER: You realized that it could happen?

MR. McLEES: Yes.

INTERVIEWER: The majority of the crew then went to the forward torpedo room.

MR. McLEES: Yes, they went there after they got settled down and everything. Everybody who was in the control room secured the control room and went into the forward torpedo room. Meantime, Maness closed the bulkhead door between the control room and the after battery when that started flood. He got that closed. I think there were two fellows who came from the after battery who got into the control room before we closed the door.

I think that after the boat was raised, they found a first class electrician's mate who had been assigned to the after battery to take readings. His body was still in the after battery, and a mess cook was also still in the after battery. They never found the body of a third class cook, Thompson. He got into the skirt of the after battery hatch and was trying to open the hatch. He got it undone, but the pressure held it shut. He passed out after the air was all gone in the normal space in the hatch there. When they first raised the *Squalus* and it went back down, the pressure pushed the hatch open and they figured that his body went out through the hatch. They never found it.

INTERVIEWER: Was it just the luck of the draw that you weren't in the after battery?

MR. McLEES: Yes.

INTERVIEWER: I assume that you had served back there before.

MR. McLEES: Yes. That's right. Badick and I were sitting in the crew's mess and having a cup of coffee when the diving alarm went off. He said that he wasn't finished with his coffee yet and for me to go on forward. Because he was first class and I was second, I was to go forward and he was to take the after battery. That was why he didn't finish the after battery compartment, where he hadn't finished his coffee.

INTERVIEWER: Are most of the things written in Peter Moss' book, *Narrows*, accurate?

MR. McLEES: That one is really true to what happened. He was right out on the USS *Falcon* the all the time. I don't know if you heard the story about him or not.

INTERVIEWER: No.

MR. McLEES: They said that after the boat sank, the *Falcon*, which was a salvage ship, was there. He got some boat from Portsmouth to take him out to the salvage area. They weren't letting any of the small boats into the area, but he talked the guy on the boat into taking him up by the *Falcon* and he jumped onto the *Falcon* and made them pull the boat and shove off. Then, he got acquainted with the admiral and lived right aboard the *Falcon*.

INTERVIEWER: In fact, I think there is a chapter in his book that describes how we actually got out there.

MR. McLEES: He was later killed during the war, in a plane accident or something.

INTERVIEWER: Was he an aviator?

MR. McLEES: No. He was a war correspondent. At the time, he was with the *Boston Globe* or the *Boston Post* or something.

INTERVIEWER: Let's get back to the *Squalus*. You were going down. Maness, you said, closed the hatch, and you all moved up to the forward torpedo room and everything was pitch black. What was Captain Naquin doing at that point, or what were his instructions to you?

MR. McLEES: I guess he was the one who told us to secure the forward battery on account of the chlorine. I don't think it ever had chlorine in it, but they were afraid it would get in there. After we got that secured, the people in the control room decided to vacate the control room and go to the forward torpedo room.

INTERVIEWER: There were a total of how many people in the forward torpedo room?

MR. McLEES: Oh, I guess there must have been 33 of us, because the number of those rescued was 33.

INTERVIEWER: That had to be pretty cramped.

MR. McLEES: I guess it was, yes. I was lucky. I came up in the first bell trip.

INTERVIEWER: I've never been inside of a submarine like the *Squalus*. How big was the forward torpedo room?

MR. McLEES: It was a good-sized room.

INTERVIEWER: Were there bunks all around?

MR. McLEES: There were bunks on both sides.

INTERVIEWER: Were there bunk over the torpedoes?

MR. McLEES: There were bunks over the torpedo tubes. I think the bunks were two-tiered or something. I don't know for sure. Maybe they were just one-tiered. There were not too many bunks up there, because normally, there were about a half-a-dozen people sleeping up there.

INTERVIEWER: Was there any water in the torpedo room?

MR. McLEES: There was a little bit in that got in.

INTERVIEWER: It was water from the vents, I guess. Were the vents secured?

MR. McLEES: I don't really know whether they were or not. But there was hardly any water.

Of course, a little water got in when they first opened the hatch. When they blew the water out of the bottom of the bell, before they opened the hatch, a little water got into the escape drum there, and when they opened the lower hatch, some got into the torpedo room.

INTERVIEWER: What time was it when you actually settled into the bunk?

MR. McLEES: I would say it was around nine or so in the morning.

INTERVIEWER: It was pitch black and nine in the morning with 33 people crammed into the forward torpedo room. It was getting cold. You were not wet, though?

MR. McLEES: No.

INTERVIEWER: You were just cold.

MR. McLEES: Actually, we must have all been in the torpedo room when they made the first bell trip. We must have been. I won't say for sure as to whether we were all up there then.

INTERVIEWER: How long did it take before the bell actually arrived?

MR. McLEES: It was probably the next morning sometime, the next forenoon that the first trip was made.

INTERVIEWER: It was more than 24 hours that you were all there together.

MR. McLEES: It was about 24 hours.

INTERVIEWER: What were you doing during that time?

MR. McLEES: Oh, I don't know. They were sleeping, I guess.

INTERVIEWER: There was no sense of urgency?

MR. McLEES: No. Nobody was saying much and it was pretty quiet.

INTERVIEWER: I know carbon dioxide build-up was a concern. Were you doing anything to sort of keep it down?

MR. McLEES: Yes. We laid down one of the sheets or something, a mattress sheet or something, and spread out the carbon dioxide absorbent. It was a white powder.

INTERVIEWER: I'm familiar with lithium hydroxide. When you breathe that, the fine dust, it actually makes you start coughing.

MR. McLEES: No. I don't recall that at all.

INTERVIEWER: You didn't have any sense that the atmosphere was becoming stale?

MR. McLEES: No.

INTERVIEWER: Everything was fine?

MR. McLEES: I don't think anybody had any breathing problems. I think there was one person who was getting sick. I don't know whether it was on account of his breathing, or whether it was just nervousness. I didn't know what it was, but it was only one person. They had one of the enginemen, the machinist's mate, carry him off when they came out of the bell. They had to carry him off. His health may not have been too good anyway. He was one of the oldest fellows on the boat.

INTERVIEWER: He was actually physically sick.

MR. McLEES: Yes. They put us all in the hospital after they got us off of the boat. They put us all up in the hospital, which was against our wanting to go there.

INTERVIEWER: After you are freed from a submarine, you don't want to be confined somewhere else. What was going through your mind while you were waiting for the bell? You didn't know for sure that the bell was coming. There wasn't discussion of the bell, was there?

MR. McLEES: Well, no, there was not. But we hadn't been down too long before the sister ship, the USS *Sculpin*, came out. We could hear her screws and her engines running when they finally located us. First, they picked up our marker buoy. When they brought it on deck, the marker buoy, they tied the line around the railing and the boat swayed away from us and parted the cable. That was one of the things that they showed in the movie. It seems that the cable broke. Swede Momsen was diving over the sides, trying to get the other end of the cable.

INTERVIEWER: That had to have burst your bubble somewhat, I guess, because you finally had communication with the surface, and all of a sudden you lost it.

MR. McLEES: They said just say "Hello, Naquin," and this and that. That was about as far as they got, just a few words. Of course, the *Sculpin* started to use their sonar. We could hear them pinging, and we were signaling back by hammering on the hull the dot-dash.

INTERVIEWER: In Barrow's book, or Peter Moss' book, it talks about how fatiguing that was.

MR. McLEES: I don't remember that at all. I don't think we were using as big a hammer as they write about. In the movie and the book we use a big maul to hammer with.

INTERVIEWER: Spirits were still high?

MR. McLEES: Yes, they seemed to be high, very much so.

INTERVIEWER: Did it ever go through your mind that you might actually have to make an escape?

MR. McLEES: I guess they were talking about that. In fact, they had us, the skipper or whoever it was, put on the lungs. We had the lungs strapped on.

INTERVIEWER: Was that due to the potential for chlorine?

MR. McLEES: No. It was done just to be prepared. They figured that at a hundred feet or so there, with the temperature of the water, we wouldn't have much chance.

INTERVIEWER: You said that it got very cold in there. What do you think the temperature was?

MR. McLEES: I don't know what the temperature was. I don't know, but it must have been forty degrees or less. I don't know. It was really cold down there.

INTERVIEWER: You were being told, I assume, to be very still.

MR. McLEES: Yes. I know that I was lying in a bunk. In fact, there was another guy lying in the bunk, too. We had a big cover and blankets over us to keep warm.

INTERVIEWER: Finally, they located you again after the parting of the line.

MR. McLEES: Yes.

INTERVIEWER: The *Falcon* wasn't there yet.

MR. McLEES: No. She wasn't there yet. The *Sculpin* was the only craft that was there. I think the *Sculpin* located us the first day. The *Falcon* ended up the next morning sometime.

INTERVIEWER: I want to get to the escape, but were you aware of the S-50, S-51 or the other submarines that sank before?

MR. McLEES: No. I don't think so. I don't remember anything about them.

INTERVIEWER: The scenarios were not that different. Well, of course, I guess both of the others were actually collisions, but they were in murky, shallow water. They were in very similar situations. Of course, none of them got out.

MR. McLEES: That's right, yes.

INTERVIEWER: But you weren't aware of those?

MR. McLEES: No.

INTERVIEWER: I suspect that would have changed the spirits of the crew quite a bit.

MR. McLEES: I don't remember seeing even the escape bell before.

INTERVIEWER: That wasn't a routine part of the training?

MR. McLEES: No.

INTERVIEWER: The *Falcon* finally arrived the next day with the bell.

MR. McLEES: That's right, yes.

INTERVIEWER: Can you describe what the operation for the actual escape was?

MR. McLEES: I think as soon as the *Falcon* arrived and they made the mooring over our area, the crew from the *Sculpin* actually went out in the small boat and used the grappling hook and located us after the cable for the small buoy had broken. They located us with the grappling

hook. The grappling hook so happened to hook on the railing of the forward torpedo room hatch. Of course, when the diver came down on that line, he landed right by the hatch, which was where he was supposed to be. It made it very easy to hook onto the hatch area.

INTERVIEWER: The first bell came down the next day. About what time was that?

MR. McLEES: I can't remember what time it was, but it must have been around noon or before noon.

INTERVIEWER: It was close to thirty hours then, about 28 hours after the sinking.

MR. McLEES: That's right, yes

INTERVIEWER: Do you recall when you first heard the diver hit the deck? Could you hear the diver up there?

MR. McLEES: When they came down to put the cable on, you could hear him walking on the deck.

INTERVIEWER: That had to raise your spirits.

MR. McLEES: That's right. He was easy to hear because divers wore those big lead-loaded shoes. He went clunk, clunk on the deck. Another good feeling occurred when they opened the hatch and the guy from the bell hollered down. In the movie, it showed Swede Momsen was the one who took the bell up and down, which he didn't do.

In fact, the guy who was operating the bell was a Polish fellow, Mikalowski or somebody. I forget what his name was. In fact, I did a television movie with him in 1938 or sometime.

INTERVIEWER: What was this movie about?

MR. McLEES: It was called *Place the Face*. It was just like one of the game shows. I was a guest. No, that was after the war, by golly! It was after the war that they had that. I was in New

London in the 16th fleet then. I got a call from Hollywood, and a guy wanted to know if I would come out and do the movie. I said I would if my wife could come with me. He said okay.

Anyway, went out there and did this movie. I was on TV there, and they were asking me questions about this and that. They had this fellow. You saw his picture as though it was in a picture frame. You just saw his head. They were asking questions, like from where I knew him and all that. It just so happened that he was one of the divers who had made the dive to the *Squalus*. His name was Mikalowski.

INTERVIEWER: What was the first thing he said to you when he opened the hatch?

MR. McLEES: I don't remember that.

INTERVIEWER: I think in the book there were certain statements like, "Did you bring down a steak?"

MR. McLEES: Yes, and "What took you so long?" was another. I remember that the movie showed Swede Momsen over the hatch, though he never went down there.

INTERVIEWER: Was it very organized? What determined who went up first?

MR. McLEES: Well, the captain was the one who assigned guys to go up. He'd say, "You, you, and you," just like that.

INTERVIEWER: I know that in the book it said that he wanted to have an officer go up on the first ride so that the officer could describe the situation.

MR. McLEES: I think Lieutenant Doyle was the first one. Maybe he was, maybe he wasn't. I don't know. In fact, I'd been with Lieutenant Doyle before. He was on the S-30 boat when I came back to New London.

INTERVIEWER: You climbed up the ladder into the chamber.

MR. McLEES: Yes.

INTERVIEWER: Then, they closed the hatch. It had to be very cramped, right?

MR. McLEES: Yes. I forget how many could get in there. It had room for four or five. I guess there must have been eight or nine in there, plus the operator. Then, they'd close the hatch going from the escape place down in the torpedo room. They closed the lower hatch. Then, they would flood the chamber and open the upper hatch into the bell. The people down in the torpedo room, with a big lever they had there could close that upper hatch of the submarine after the bell had left, and they could then drain the escape chamber and open the lower hatch so that people could go back up in there again.

INTERVIEWER: What was the whole operation like, from leaving the *Squalus* to getting to the ship?

MR. McLEES: It probably took no longer than 15 or so minutes, or that was what it seemed like. We moved right along. We didn't have to stop for decompression or anything like that. We moved right on up, slowly.

INTERVIEWER: Were there any ports? Could you see outside? Could you see the *Squalus* as you were leaving?

MR. McLEES: No. I don't think so. I don't believe there were any, none that I know of anyway.

INTERVIEWER: You got to the surface and they were able to open the hatch.

MR. McLEES: They were able to open the hatch, yes.

INTERVIEWER: What were your thoughts when you got out?

MR. McLEES: Like it said in the movie, I said something about the fresh air and the sunshine.

INTERVIEWER: It had to be quite a contrast, after breathing that relatively stale air.

MR. McLEES: That's right, and we had been in darkness.

INTERVIEWER: When you came up, it was a bright sunny day?

MR. McLEES: I remember now. It was a bright sunny day.

INTERVIEWER: You arrived in heaven.

MR. McLEES: That's right, yes.

INTERVIEWER: Did they keep you around after you got on the *Falcon*? Did they keep you there?

MR. McLEES: No, we weren't there too long. I think that after they got the first two trips aboard, the Coast Guard took the first two loads of us to the hospital.

INTERVIEWER: You weren't out there when the fourth trip came up?

MR. McLEES: No. We were at the hospital by then.

INTERVIEWER: Do you recall what happened? I'm sure you heard about what happened on that fourth trip?

MR. McLEES: Yes. They had trouble with the cable. It was almost parted.

INTERVIEWER: Who was in the last party?

MR. McLEES: It was Boyce, Pearce, Pursico, and I don't know who the rest were.

INTERVIEWER: Obviously, Naquin was one of them, I guess.

MR. McLEES: Naquin was one. He was the officer. He was the captain. He stayed until everyone else was able to go up.

INTERVIEWER: How long were you at the hospital?

MR. McLEES: I think that right after we got in the hospital, Harold Prebel, the civilian naval architect, started to get on the phone and we had more food and stuff coming up to that hospital. He actually ran the Navy Yard, almost, I think. What he said really went. We got more stuff coming up there. People were bringing stuff in.

INTERVIEWER: Were you married at that time?

MR. McLEES: No. I hadn't even met my future wife.

INTERVIEWER: I'm sure some of the crewmembers were married. Were the wives and the families trying to get into the hospital?

MR. McLEES: I don't remember any. I don't know. I don't think there were many guys who were married. But there were some. I don't even remember anybody coming to visit while we were in there. There was no one I knew of, anyway.

INTERVIEWER: I suspect that the press was trying to get to you at that point.

MR. McLEES: I know that right after we got out of the hospital, they were. They had so many telephone lines running in there, from the outside into the Navy Yard and to the main building. After we got out of the hospital there, we weren't allowed to leave the area until after the inquiry.

They had the inquiry there, and they found out the accident was by no fault of the crew or anything. I had bought a car from the first class electrician named Bland, but I forget what kind of car was. It was probably a hundred bucks, and I probably gave him a ten-dollar down payment on it and was supposed to give him so much every payday. I don't know whether I said it or whether he just made it up as a joke. The first thing I supposedly said to him when we got together after getting off the *Squalus* was, "Gee, you would have to be one of those who were saved," because I owed him money. He made quite a joke out of it. Every time we had a convention later on, he'd tell that joke.

INTERVIEWER: Did the crew stick close together after that?

MR. McLEES: Yes, we did.

INTERVIEWER: I know you've had several reunions.

MR. McLEES: Right after that, they had a big memorial for us out here. Where was it? Hampton Beach? No. It was right out around Rye. Yes, it was right around Rye or someplace that they had

a big memorial service. Some big shot had a big mansion out there. They had a big orchestra playing and all that, right there on the beach. The brewery in Lowell, Massachusetts, the Harvard Brewery, threw a big party for us.

INTERVIEWER: That was immediately after the accident?

MR. McLEES: It was shortly after, before anybody got transferred. I know there was about a dozen or so of us who went down to the Harvard Brewery. They gave us a big dinner and all the beer we could drink. I got a kick out of it. When we got ready to leave, I had my car and was driving. A couple of us had cars. We got ready to leave. We gave the guy the 'heck, you know,' because we were trying to get about three or four cases to take back with us. We were calling them cheap and everything else for not giving us any beer.

INTERVIEWER: Were you at all involved with the salvage operation of the *Squalus*?

MR. McLEES: It probably wasn't long after we first started before they sent us out. We'd come in at night and go back to sleep in the barracks and go back the next morning via the Coast Guard. They had a small Coast Guard boat that operated back and forth.

We'd go out there, and they had us handling the hoses because they had all of these hoses hooked up to different salvage compartments, fittings and buoyed out. We got to bring them back in every morning and every day. They'd hook them up to the air manifold and check the pressures to make sure they still had pressure on them. That was our job. A lot of times we'd go out in the morning on the Coast Guard freight boat, stay aboard there and come right back in with it. Out there, nobody really knew who were.

INTERVIEWER: I know the famous picture of the *Squalus* with the bow up. That had to be very heartbreaking.

MR. McLEES: It was hard.

INTERVIEWER: I was in San Diego a couple of days ago, and I was interviewing Rear Admiral Brad Mooney. He was telling me that when he was eight years old, he was living here, in Portsmouth, New Hampshire. For some reason, his father took him out there that morning when the bow came up and sank.

MR. McLEES: When I went down to Annapolis, I had quite a talk with him. I didn't know who he was. I had never heard of him. He was telling me about some of the experiences he used to have up here, and asked whether I knew this gal or that gal.

INTERVIEWER: I assume there were a lot of boats around there.

MR. McLEES: Yes.

INTERVIEWER: It was this whole salvage operation.

MR. McLEES: Yes, there were a lot of boats there. There were planes flying over. People were getting with reporters. A lot of times, the Coast Guard boat would pick us up in the morning and take us out to the area. We'd actually go aboard the *Falcon* and make sure the skipper and some of the others saw us and then we would get back aboard the Coast Guard boat and hide down in the engine room and ride that back in. That Lieutenant Sharp, he was the skipper. He was pretty good. But like in the movie, now, *The Terrible Hours*, Smerge showed him with a chief petty officer signature on his hat. That was one of the things that I noticed.

INTERVIEWER: Hollywood messed up.

MR. McLEES: Yes.

INTERVIEWER: How long did it take from the sinking to actually resurface the *Squalus*? It was several months, wasn't it?

MR. McLEES: We went down on the twenty-third of May. I think it was September before they got the boat back into the shipyard.

INTERVIEWER: Were you there?

MR. McLEES: Yes. The skipper was going to have all of us go out there and ride the boat back in. Of course, they never got her out of the water far enough that we could ride her in. We were going to clean the deck all off and everything else when they brought her in.

Anyway, we were there when they brought the boat in. We were right at the pier at the Navy Yard. As soon as they brought the *Squalus* in and tied it up alongside the pier, they had these big tripod cranes on the pier. It seemed as though the deck was half-underwater. They hooked it onto the sail, cut a hole in the sail and hooked the cable in there to straighten the boat, and as they pumped the water out, they brought it up. As soon as they got the bow out of the water, we opened the torpedo room hatch, and I went back down as far as the after battery but didn't go in the control room.

INTERVIEWER: Did you have flashlights?

MR. McLEES: Yes, we used flashlights.

INTERVIEWER: That had to be a stressful experience.

MR. McLEES: That was, yes. We were living in the barracks then, I guess. They sent us all off the boat before they started taking any of the bodies off that night. None of us were around there then.

INTERVIEWER: All of the human remains were still in there after three months.

MR. McLEES: Yes. They said that the bodies were in good shape because they were in that cold water all that time. I escorted Ciphers' remains back to Abingdon, Virginia. He was the first electrician's mate

INTERVIEWER: You were a very good friend. That's what part of being in the Navy is about.

MR. McLEES: I think the only relation he had was his mother. I remember when we got into the funeral home there, his mother couldn't get it through her mind that that was her son, because the caskets were sealed. Actually, I saw her point. After I left the funeral home and went to my hotel room that night, I think she finally convinced the undertaker at the funeral home to open the casket so she could make sure that was her son in there.

INTERVIEWER: The surviving crewmembers escorted the bodies to their hometowns. Each person escorted someone different.

MR. McLEES: Yes. We left Portsmouth by train to Boston. Then, they had to go from North Station over to South Station and you had to make sure the casket got on the train that you were on and everything.

INTERVIEWER: Was it the responsibility of the surviving crew to go into the *Squalus* and refurbish it?

MR. McLEES: All we had to do was go in and get all of the personal gear off the boat and all of the portable equipment, like typewriters and stuff like that. We took all of that stuff off and put it in a storeroom. We went through all of the lockers and got all of the personal gear of the deceased so that we could give it to their dependents.

INTERVIEWER: What was your feeling as you went back in there?

MR. McLEES: Well, it was kind of scary.

INTERVIEWER: I would imagine it would be. After the *Squalus* was refurbished, it was actually renamed and sent back out, I understand.

MR. McLEES: Yes. It was renamed the USS *Sailfish*.

INTERVIEWER: Did you continue in the submarine service after that?

MR. McLEES: In fact, I fought hard and finally got it. There were three of us who went back on it as the *Sailfish*.

INTERVIEWER: You were back on the *Sailfish*?

MR. McLEES: Yes. The three were Gunner's Mate Cravens, Torpedoman Maderas and myself. The three of us went back on it as the *Sailfish*. I made the first several war patrols on it as the *Sailfish*.

INTERVIEWER: You had no hesitancy, or you didn't have any concerns after going through that experience?

MR. McLEES: No. I just wanted to get back up to Portsmouth, because I was due to get married shortly. In fact, I came back to Portsmouth in 1940. I got back in toward the end of 1940 and got married in January of 1941. The boat left again in February. We left for Pearl Harbor then. My wife was supposed to come out to Pearl Harbor after we got settled, because that was going to be our home base for the *Sailfish*.

Of course, sometime around October or November, the *Sailfish* got orders to ship to the Philippines. We had to cancel the idea of her moving out there. We were in Manila when the war started. We went out right away. We went out the next day. The first day after the war started, we lay on the bottom of Manila Bay while the Japanese were bombing Manila.

Then, we went out and started to operate, and right about the second or third day of the war, cloaked in the dark, we started out to someplace and contacted the Japanese destroyers. We fired on them and got a hit, an explosion, but we couldn't see what happened because we had to go deep. An underwater sound started. The officers had been told the Japanese didn't have underwater sound equipment, so the Captain got it in his head that maybe he had fired on one of our own destroyers. He cracked up. The Executive Officer had to bring the boat back into

Manila. We came in about midnight and, of course, everything was blacked out. When coming into Manila, Baylor flashed a light on one of the buoys for a few seconds. We headed for that. Then, on the next buoy down, he flashed a light. I know I was on the controllers in the maneuvering room and was getting an 'all ahead full, back down full' all the way through there.

We finally got into there and tied up, but the tender was still there. The next morning, they called us all up to quarters, and the captain had big tears in his eyes, and he told us that he had cracked up and the execs had brought the boat in. We were then given the captain of the *Sea Lion*. The *Sea Lion* was alongside in the Cabiti Navy Yard. She was being overhauled and wasn't able to get underway. When the Japanese bombed, they got a direct hit on the after engine room and sank it right alongside the dock. They lost several of the crew. We got the skipper, Lieutenant Bogey, and he became skipper of the *Sailfish*.

INTERVIEWER: I notice the *Sculpin* had a sister boat in the *Squalus*. There was a relationship between the *Sailfish* and the *Sculpin* in World War II, wasn't there?

MR. McLEES: Yes.

INTERVIEWER: Do you want to talk about that? Wasn't the *Sculpin* sunk?

MR. McLEES: The *Sculpin* was sunk and then the crewmembers were taken prisoners of war. They were put on a Japanese aircraft carrier to take back to the mainland, I guess. While they were headed there, The *Sailfish* came in contact with this aircraft carrier, not knowing that there were any Americans prisoners of war aboard, and sank it. A good friend of mine, George Roshek, was one of the only survivors. I still contact him all the time. He is down in Florida, but he's in pretty bad shape. His legs are all banged up and everything else. He used to come to all of our conventions, but I haven't seen him for several years.

INTERVIEWER: I've got an interview that someone else did with him during on which he tells his story.

MR. McLEES: He's a very nice fellow.

INTERVIEWER: You were on seven war patrols?

MR. McLEES: Yes, I was on the first seven war patrols. I wasn't on the *Sailfish* when it sank the carrier. I had already gotten off. That must have been on the eighth or ninth war patrol. I don't know which one it was. I got off when the boat came back to Maui, after the first seven war patrols, for an overhaul.

We were due to get an overhaul in Pearl Harbor. We came into Pearl Harbor one day and that afternoon they transferred all of us but one section, up to the Royal Hawaiian Hotel. We probably got there in the evening. On the next morning they called us back to the ship. The overhaul at Pearl Harbor had been cancelled and changed to San Francisco. We got to San Francisco after we'd been there about maybe four or five days, I got orders to go to Portsmouth to commission the USS *Crevalle*. I put in time on the *Squalus*, the *Sailfish*, the *Crevalle*, and the *SeaLeopard*. The *Sailfish* was the 192. The *Squalus* was also the 192. They didn't change the number. I went to the *Crevalle*, the 291. When it first started out, the *Squalus* was the S-11. Then they changed the hull number to 192. I think that one of the TV movies, the first one, showed it as an S-11. It showed the *Squalus* as an S-11, I believe.

INTERVIEWER: Now, going back to those war patrols, were there any times during those patrols that you were being depth charged?

MR. McLEES: Yes.

INTERVIEWER: Can you tell us what that was like?

MR. McLEES: Heck, we got depth charged on the first trip out. After we went out and fired on the destroyer, we got depth charged. But it wasn't too bad. In fact, there, I think before the war we didn't get any depth charges. I didn't remember any, anyway. In Pearl Harbor, they would take a boat out and tell it to dive to maybe a hundred feet. They had this destroyer dropping depth charges. But you could barely hear them; they were so far off.

INTERVIEWER: Was that just to get you familiar with depth charges?

MR. McLEES: Yes. But we had several pretty close ones during my time. I made three runs on the *Crevalle*, so I had a total of ten patrol runs. On the third run on the *Crevalle*, we were operating someplace off the Philippines. We got word to go into some bay or something and pick up some American survivors. We pulled into this, and I can't think of the name of it, but it was someplace in the Philippines. We pulled into the bay and they told us if everything was clear, there would be a big white sheet on the side of a mountain there. We saw that, pulled in and then surfaced. We were surfaced for no longer than about five minutes when what we called 'bug boats' headed out toward us and we took aboard thirty-something passengers, I think. They were American women and small kids. We took them aboard and brought them to Australia. I forget where in Australia. During the time that we had them aboard, we got one of the worst depth charges I took in all ten war patrols.

INTERVIEWER: Can you describe what it was like to take a depth charge like that?

MR. McLEES: Well, you were down there. You were hanging onto something. The old boat shook and water started dripping in here and there. A valve ruptured or something. The kids were getting a big kick out of it. They were hollering, "Did we hit them? Did we hit them?" every time a depth charge went off.

INTERVIEWER: The kids weren't afraid at all.

MR. McLEES: No. They didn't know the difference. To this day, at our national convention every year, several of those people that we picked up that come. They are all American citizens. They say their husbands were out there on business or something. They spent days out in the wilderness trying to get away from the Japanese.

INTERVIEWER: After three patrols on the *Crevalle*, you came back to Portsmouth.

MR. McLEES: I came back and put the *Sea Leopard*, 483, into condition. I was on the *Sea Leopard*. We were in New London training, ready to head for the war zone when the war ended.

INTERVIEWER: I would think that after having survived the *Squalus* sinking, depth charging and World War II for some time, you might think that it was probably time to give it up.

MR. McLEES: Of my 22 years in the Navy, all but about 8 months were spent on submarines. In fact, even then I didn't have enough. After I retired, I went back to Portsmouth and worked for 13 years out in the shipyards.

INTERVIEWER: You did that as a civilian?

MR. McLEES: Yes.

INTERVIEWER: You've lived here in Portsmouth since the war?

MR. McLEES: Yes. My wife is from here in Portsmouth, so this is where we settled. In 1948, when I got out of the Navy, I had this house built, and I retired from the Navy in about 1956. In about 1960, the state decided it was going to build a new highway through where the overpass is there, and that was where my house sat, right on the corner where the overpass is now. I had to pick it up and move it to here.

INTERVIEWER: I'm sure this area has grown considerably since World War II.

MR. McLEES: Yes. This was the second house in this area. There was nothing here.

INTERVIEWER: It seemed that after the symposium, Helen Hart Momsen has a very close relationship with you and Carl Brightson.

MR. McLEES: Yes. In fact, I didn't even know her until I went to the symposium.

INTERVIEWER: Is that right?

MR. McLEES: I had never met her or talked with her. Her father was there, wasn't he?

INTERVIEWER: Yes. I got the feeling that it was almost like a family.

MR. McLEES: No, but down in Washington, she was there then. I don't know whether she came up for the christening of the USS *Momsen*.

INTERVIEWER: I think she did.

MR. McLEES: One or the grandsons or something is a crewmember, a fire control man. In fact, about three weeks ago, the USS *Albacore* had its fiftieth anniversary, I guess, so they had a little shindig over there. There were eight or ten people from the *Momsen* there for that and this kid was there.

INTERVIEWER: It's been 64 years, I guess, since the *Squalus*. It sounds like you've had a very colorful and exciting career.

MR. McLEES: Yes, I've had a very good career, I think.

INTERVIEWER: Is there anything else that you'd like to share?

MR. McLEES: Well, I'd like to say when I got invited down to Washington, the producer, the guy who produced the show, was the one who invited us survivors down. In fact, it was only Bryce and me. My daughter and I went down, and we had dinner at the White House, out on the White House lawn. They had tables set up. We sat down out there and the guy started coming around asking, "Do you want a beer or wine or anything?" We sat there and had a few drinks, and there were several senators and representatives with whom we shot the breeze. Then,

President Bush came out and we had dinner. We had a very nice visit with his wife.

INTERVIEWER: It is a picture of President Bush. That's great.

MR. McLEES: That was in June of 2001, I guess.

INTERVIEWER: That would have been 62 years since the *Squalus*. You were married. How many children do you have?

MR. McLEES: We have no children. We adopted my daughter after I retired in 1956. She was 8 months old. We had to go all the way to Canada. I was too old to adopt in the United States, so we went to Canada, to an orphanage there. Now, she takes care of me.

INTERVIEWER: They always say that adopted children are the most loved children. They were handpicked.

MR. McLEES: Yes. I can remember that my wife and I went up to Canada that day and went to this orphanage. There was a tremendous big room with many beds and many kids. It was a Catholic home and a Sister brought my daughter out. She was all dressed up in a nice dress, 8 months old. The next morning we went to pick her up. When the sister brought her out, the sister had big tears in her eyes.

INTERVIEWER: There is one other question I'd like to ask you. You saw, at the symposium, the systems that are being developed for submarine rescue. Do you have any thoughts on these new systems that are being developed?

MR. McLEES: The one that I couldn't get over was this diving uniform that they have now, the diving suits with helmets and everything. That's something.

INTERVIEWER: There's been a lot of advancement.

MR. McLEES: Well, I guess so. I think I've got a picture of a chamber there. Is what it is, a decompression chamber?

INTERVIEWER: Yes.

MR. McLEES: I have a picture of Scott Carpenter and myself, too.

INTERVIEWER: I'll be sure to send you that book when I get back to Annapolis, because it's got a lot of the photographs from the symposium. It's very nicely done and I think you'll enjoy it.

MR. McLEES: I still have a couple of the little pamphlets they put out, the programs.

Remember the pamphlets with the people who spoke? I still have a couple of them. Then the Navy Yard, I don't know, must have got sent to the Navy Yard, give me a picture that picture that's always showed there of the symposium there. I don't know what that is.

INTERVIEWER: Yes. That's actually the front cover.

MR. McLEES: Yes. I really enjoyed that.

(Whereupon, the INTERVIEW was concluded.)

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UNDERSEA & HYPERBARIC MEDICAL SOCIETY

ORAL HISTORY OF THE MAJOR PARTICIPANTS
IN U.S. NAVY UNDERSEA TECHNICAL DEVELOPMENTS

GENERAL DISCUSSION AND
INTERVIEW OF LEONARD GREENSTONE
WITH JACK TOMSKY

PROCEEDINGS

INTERVIEWER: Leonard, where were you born?

MR. GREENSTONE: I was born in Los Angeles, California.

INTERVIEWER: Tomorrow's going to be something.

MR. GREENSTONE: It's going to be my birthday. I'll be eighty years old tomorrow.

INTERVIEWER: Welcome to the ninth decade.

MR. GREENSTONE: By the way, at one time, I thought that I was the youngest person involved in the salvage of the *Normandie*. I have found out since that there were several guys there who were younger than me by one or two years.

INTERVIEWER: You were 18.

MR. GREENSTONE: Yes. That's right.

INTERVIEWER: Did you play sports or participate in any extra curricular activities in school?

MR. GREENSTONE: I participated in sports, but not too successfully. With extra curricular activities, I really a dunce. Most of the guys had extra curricular activities, which I would have enjoyed. I didn't have any.

INTERVIEWER: Where was school?

MR. GREENSTONE: I started, of course, at John Mere Junior High School after I was kicked out of McKinley Junior High School. I went from there to Jefferson High School. I was kicked out of Jefferson High School. Then, I went to Manual Arts High School, where I had to leave in my B semester prior to graduation, which I finalized at age sixty. I became a graduate of a high school at the age of sixty, with a few college courses prior to doing so.

INTERVIEWER: What influenced you to join the Navy, and what year was that that you went into the Navy?

MR. GREENSTONE: I went into the Navy in 1942 as a transfer from the California National Guard which I got out of to become a sailor. I think it was a matter of my uncle being in the Navy for twenty years, I guess, at that time. He finished up another fifteen years after that. He spent a lot of time in the Navy. My purpose for going into the Navy was getting out of the National Guard.

INTERVIEWER: We'll clarify any gaps in history of naval forces. Let's get into diving.

MR. GREENSTONE: Ah, it was sort of like being in the wrong place at the right time, I guess.

When they shipped me to Pearl Harbor in 1942, I went to the Navy yard, and while I was there, a truck had backed into a fire hydrant. By the way, we were all in line, ready to be shipped someplace in the world to do our thing in the Navy. The guy who was running the program at that time was a Lieutenant McKegan, who was in the yard. Water was shooting up everywhere. He was running around, making all kinds of noise and trying to get the thing shut down. I walked over to him, as this humble little kid, and said, "There's a valve on each side of that fire hydrant. All you have to do is dig down and there's a flat head valve. You just turn them contrary to the flow of the pipe. You'll shut that system off." Then, he used nasty language to tell me to get off my behind, go down there and get it done, if I could do it. We got a couple of guys and dug some trenches around the valves. We got the valves and the water turned off. They would have put me to work the following day out on the docks, cleaning up all the mess. At that time, he had no intention of putting me -- but that was not the way it happened. The next morning I went out at his direction, and I met some guys out there of whom you probably know. There was the gentleman who later wound up being a commander. Ed Reimer had a vessel that he had taken over out in Pearl Harbor. They had converted it into a diving boat. There were four of them on the boat. I was out at the docks. They came in and picked me up. They were going out to the USS *Oklahoma* that day. I went out with them as a ride, as a worker, to help clean up some of the mess. They were dressed in the diving

gear. I was watching them with a lot of enthusiasm. They asked if I cared to get involved, although I wasn't too anxious. But the other guy who went along with me volunteered me. They dressed me and put me in the water. They sent me down with what we now know as a descending line, attached to a particular area of the vessel where you were supposed to go into the water. They gave you this little bag that had holes on the bottom. You were supposed to pick up all the junk, throw it in the bag and signal them. They brought the bag back up sent you another. Well, I didn't get very far. I got to the bottom and said, "This isn't for me. Jewish boys don't go for that kind of stuff." My father told me that one thing Jewish boys don't do is that they don't cry when they're frightened. I just peed in my pants. I decided I could hardly wait to get out of there, and they brought me up. I figured that was the end of my diving career. Then, Ed asked, "Are you coming in tomorrow?" I said that I had no idea. He said, "Yeah, show up here tomorrow at 0700 hours." I said, "Well, there must be something with that." That started my diving career. He then got me involved and kept me moving in the water. We had the opportunity to get through. From that day on, some of the more involved and memorable activities happened with the vessels that were still there.

INTERVIEWER: Heavy gear?

MR. GREENSTONE: Yes. The first time I ever dove, I dove in full dress. I had no knowledge as to what diving was, other than jumping off a board and doing fancy things with your hands and feet. After some five or six days of working together, they decided to send me over to the submarine base to get some training so that I wouldn't be a disaster to them, I guess. At least they'd have the backup to prove that I had some practical or educational experience to help me do what I was doing. But it was not to offend anybody. It was a partial thing anyway. I'd go to the Navy base. They would teach us some of the physics and physiology and stuff that they were involved

with. I'd go to school for three, three and a half, four hours, and then go back out and go to work.

That went on for some three to four weeks, I guess.

INTERVIEWER: That was at Pearl Harbor?

MR. GREENSTONE: It was at Pearl Harbor, yeah. They ultimately classified me as a second class diver. I never took a test. I got a funny looking document.

INTERVIEWER: You completed the course.

MR. GREENSTONE: I completed the course, right. Thanks.

INTERVIEWER: That was all it required.

MR. GREENSTONE: Yes. But I got the opportunity and memory. Some of the memory was worth remembering. I got a chance to work on the *Oklahoma* and the USS *Oglala*. I had a lot of time on the *Oklahoma*. The *Oklahoma* was the one vessel they were still working pretty diligently on and trying to get it cleaned. There were ugly things that were going on in the *Oklahoma* at the time. Of course, I also met Frank Prepazich, who was a second class diver and doing salvage work there. Prepazich was going back to New York. He was the guy who told me that I should really apply myself. He actually gave me the idea that I could get back to the States by going to New York to work on the *Normandie* because they were looking for people like me, he said. I applied. It didn't take very long, only a couple of months. I was back in New York at Pier 92, which was where we lived. We marched from Pier 92 to Pier 88 every day. That was how I got involved with the *Normandie*. It was really because of Frank Prepazich. I guess that when I first got there, I found it exciting. The training was a lot different. They took a guinea pig and created problems when they did not ascend properly after time on the bottom. The little guy got bent. After you watch him for awhile you understood the dangers. They spent a lot of time with us. You have to remember that

they were trying to develop divers at pier 88 quickly because they needed them. You went back to work where you came from.

INTERVIEWER: What was the most difficult part of that diving?

MR. GREENSTONE: I think it was the change from Pearl Harbor, where we had sedimentation, but it was nothing like New York. In New York, when you went into the water, you buried yourself in mud. I think the difficult time for me was -- contrary to most, from what I had talking to the people I knew who have gone through one of the diving programs, they were restricted from blowing themselves up. Every one of us had to blow ourselves up. You got into the mud. Then, they taught you how to work your way out of it by working your chin button and kicking around until you freed yourself by creating buoyancy in your dress. Once you get out of there, you were on your way up. Then, you had to dump your gas as fast as you could so you didn't just go to the surface and explode. You tried to learn to control your ascent to the surface without having assistance.

INTERVIEWER: Do you have any questions of him?

MR. TOMSKY: Well, no. There's a danger to making yourself light -- your arms may go out and you can't use them.

MR. GREENSTONE: You might have no control.

MR. TOMSKY: You couldn't get your hands back to your control valve. All you had is your chin button.

MR. GREENSTONE: Well, you couldn't reach it sometimes.

MR. TOMSKY: But you couldn't control your air coming in. You were going to the surface.

MR. GREENSTONE: Yes, and you also couldn't control it going out.

MR. TOMSKY: You were going to blow...

MR. GREENSTONE: You couldn't get to the button to dump your gas and make yourself heavy again.

MR. TOMSKY: The danger of blowing up was twofold. First, obviously, there could have been something up above and you hit it. Second, you could rupture the suit, fill up with water, and down you would go.

MR. GREENSTONE: Yes. I don't know if this is totally true or not, but I understand that no other diving educational program provides that. As a matter of fact, most of them disallow it.

MR. TOMSKY: That's true.

MR. GREENSTONE: Yet, in salvage, everyone had to participate controlling themselves out of the mud. You didn't try to wiggle yourself around and have somebody help you up. You made it to the surface on your own. There were many who came out spread eagle on the surface. Through the graces of the good Lord, they didn't blow their dresses to kingdom come, and/or their own lives. You were told and shown the kinds of problems that could take place if you screwed up. Most of the guys handled it pretty well. Yes, there were some mistakes, but nobody died or got hurt.

MR. TOMSKY: But you learned to work in mud.

MR. GREENSTONE: There was nothing like it.

INTERVIEWER: What do you think of the beginning of salvage diving in the Navy?

MR. TOMSKY: That was on the *Normandie*.

MR. GREENSTONE: I really think that salvage diving began in Pearl Harbor. I think the work we did on the *Oklahoma* was salvage work. I was not the ship fitter. I wasn't a great welder. They didn't teach us as well as they taught us at Pier 88. But we learned to weld. You have to remember that the burning tools and equipment that we were using in Pearl Harbor were greatly increased in

their proficiencies at Pier 88 because the guys there were experimental. They developed equipment that we didn't have in Pearl Harbor.

MR TOMSKY: Salvage diving was created by necessity. In the Navy, there was deep sea diving, which was primarily mixed gas and submarine class divers who were restricted, I think, to ninety feet. I don't recall, but when you got into the war and salvage became obvious, it was necessary to then create another group of divers. Pier 88 and the *Normandie* happened to be the schools that became available to create the Navy Salvage Diving Corps.

INTERVIEWER: Was that with Admiral Sullivan?

MR. TOMSKY: That was Admiral Sullivan's group. He was a commander at the time. When he took it over -- in the Navy of salvage diving.

MR. GREENSTONE: Yes.

SPEAKER: You had salvage divers.

MR. GREENSTONE: Salvage diving in the Navy actually started it before Sullivan got there, but Sullivan really started the Navy program.

MR. TOMSKY: He also got the Bureau of Naval Personnel to designate another diving entity named 'Salvage Divers', second-class divers, salvage divers, who could go, I think, to 150 feet, and deep-sea divers, who were the mixed gas divers.

INTERVIEWER: Were they related to what the British called clearance divers?

MR. TOMSKY: Clearance divers were SCUBA, like our EOD, and were related to our EOD group of divers created. EOD and SEALS were created because there was a need. The *Normandie* became the *Lafayette*, and the troop ship. But the salvage navy was designated at that point. That was 1942.

MR. GREENSTONE: The very first document given out for a Navy salvage certification was in February 1943.

MR. TOMSKY: Okay.

MR. GREENSTONE: You had schools going and the whole bit, but there was no written certification. I got my certification for February 22nd, 1943, by mail.

MR. TOMSKY: You had the designated divers, the first-class diver, who had the insignia, the second-class diver, who had the same insignia, but with a second on it, and the salvage diver, who had the same insignia with an S on it. You had those three categories of divers, and the salvage diver was the last one to come along. The basic training facility was the *Normandie*.

MR. GREENSTONE: Yes. Where you got certified was from an educational program or a school, where they trained you. It was, of course, the *Normandie*. Nothing existed before. A fellow named Sullivan was working for Merritt, Chapman, and Scott.

MR. TOMSKY: He worked for the Navy. He was a Lieutenant Commander in the Navy. The Navy had a contract on the east coast with Merritt, Chapman, and Scott, and on the west coast with one of the maritime groups on the west coast. It might've been Murphy - Pacific. It was one of the groups on the west coast. The navy didn't have any salvage capabilities, so they had this contract with the east coast group, Merritt, Chapman, and Scott. Sullivan was the Navy's liaison officer to monitor that contract.

MR. GREENSTONE: Most of his salvage experience, up to that time, really came from England.

SPEAKER: Yes. He had very little.

MR. GREENSTONE: He had very little, but it was really what gave him any backbone.

MR. TOMSKY: He was the administrator.

MR. GREENSTONE: He was successful on some very interesting salvage programs out of England, which is what excited the president and the calling him. Let me tell you something. President Franklin Delano Roosevelt, and maybe nobody even knows, was the Secretary of Navy at one point in time in his political career. He was the guy who came up with the idea of compartmentalizing the *Normandie*. He was the guy who said, "Let's do it this way." Along with him was a Russian, who came into the program and had his own idea about the use of the compartmentalization and/or filling and dumping these compartments in order to right the vessel before raising it. In our business, we used to call it 'par buckling.' This guy had all these ideas. Sullivan had a whole flock of people helping him to come up with different designs and philosophies on how to salvage the vessel. The Russian and the President of the United States were the two most effective people in providing him information on the systems he used to go about salvaging the *Normandie*.

INTERVIEWER: Well, you know, when he was the Secretary of the Navy, he dreamt of this naval facility way out in the country in Bethesda, Maryland.

MR. TOMSKY: But then, when the war started and the Navy realized they had a problem in Pearl Harbor, they sent Sullivan because he was the Navy's salvage expert.

MR. GREENSTONE: That's exactly right.

MR. TOMSKY: They didn't have another officer in the Navy with the experience that Sullivan had.

MR. GREENSTONE: Yes.

MR. TOMSKY: He ultimately went to New York and got promoted.

MR. GREENSTONE: You're right.

MR. TOMSKY: The salvage of the *Normandie* was his baby. Ultimately, he got promoted to rear admiral and he did all Navy salvage, worldwide, during World War II.

MR. GREENSTONE: He built more than one school. He had others going, too, because we had guys from Merritt, Chapman, and Scott, like Moynihan and the Italian guy, who moved over from Merritt, Chapman, and Scott. One of them went to the Army and the other went to the Navy. They never went through any other training experiences.

SPEAKER: Sullivan started in Pearl Harbor.

MR. GREENSTONE: No. He started way before Pearl Harbor. He was sent there in salvage because of Pearl Harbor. At the time, they had nobody like him who could to handle that problem.

SPEAKER: Where was he before that?

MR. TOMSKY: He was in BUSHIPS. He was the Navy salvage contract officer with Merritt, Chapman, and Scott for all of the east coast and Atlantic area.

MR. GREENSTONE: I wish I had that historical knowledge. Our trouble is that we don't drink enough because you would know if gave me a chance.

INTERVIEWER: Why did they want to salvage the *Normandie*?

MR. GREENSTONE: Why?

MR. TOMSKY: Because the thing was taking up all of Pier 88. They had the whole harbor screwed up. They had to get it out of there. The easiest way to get it out was to salvage it. They had to get it out of there and pick up the pieces.

INTERVIEWER: Was the troop ship also a predominant issue?

MR. GREENSTONE: No. The troop ship had nothing to do with it.

MR. TOMSKY: The city of New York and New York Harbor had to get that thing out of there one way or another.

MR. GREENSTONE: Yes. The real benefit of Sullivan was when he went in there, he talked about the benefits of getting that ship out of that area, which he said would be a two-year experience. He said, "In two years, we'll spend four million dollars and we'll have this ship out of here. It'll be ready to put airplanes on the deck." It wasn't to be a troop transport with Sullivan. He wanted an aircraft carrier out of it. The people before him were talking about a troop ship.

MR. TOMSKY: The whole purpose was to get it out of there.

MR. GREENSTONE: Yes. They had to get out of there. That docking space was extremely valuable. They needed it not only as a ship. They needed the area to bring other ships in that would get troops out. There was an article that I read when I was a youngster about how many troops would be unable to reach an offensive position in Europe because of the fact that they didn't have that one area to get ships in and out of.

MR. TOMSKY: If a disaster can be a blessing, the *Normandie* was, because they were able to provide the Navy with capable training facilities and send divers. All the ARS's, salvage ships and diving personnel were trained, for the most part, at Pier 88, on the *Normandie*. They manned the ships that went worldwide during the war for salvage purposes.

MR. GREENSTONE: We'll get on to the stories later, and these pictures will verify it. The fact is that probably as many salvage divers who went to that school went out to areas without vessels and traveled where they were sent to clean up harbors. They lived and survived in those areas in order to prepare for vessels to come in.

INTERVIEWER: Well, they assisted the origin and the harbor clearance.

MR. GREENSTONE: You bet. There are some pictures over there.

MR. TOMSKY: The origin of harbor clearance arose from capturing harbors. You captured an island or a harbor. There were scuttled ships and so forth. You had to get them out of there so that

you could clean up the harbor and bring your ships in. Hence, harbor clearance became an essential part. But harbor clearance in the Navy in World War II was not part of Navy salvage, see? There was another entity that they created, and it was under the service forces. They used all kinds of divers, including salvage divers.

MR. GREENSTONE: Yes. We went over there. There were six of us who went over into the MacArthur part of the Navy in New Guinea, for Pete's sake, to clean up a harbor.

MR. TOMSKY: It's a different entity, harbor clearance. Look up Service Squadron Six in the Pacific. They were responsible for the harbor clearance. They had all the dredge equipment in the Pacific. When they got a harbor, they wanted to dredge it to bring deep draft vessels and things in.

INTERVIEWER: We were talking about the reason for salvaging the USS *Normandie*.

MR. GREENSTONE: There were four major slip areas that you could get into.

MR. TOMSKY: You were trying to shift war materials in every space.

MR. GREENSTONE: That's right. You wanted to ship them into an area, like where those ships were, where you could get in trucks and equipment.

SPEAKER: Everything there was...

SPEAKER: An outsider thinking...

MR. GREENSTONE: Pier 92 was turned into a receiving station. You lost Pier 92. That was where we all lived, ate, and the whole bit.

SPEAKER: Yeah.

MR. GREENSTONE: But Pier 92 was useless. They had that old cruiser tied up alongside. Half the guys lived on it, for Pete's sake. If you went to Pier 88, you went to work.

MR. TOMSKY: I forget the name of that.

MR. GREENSTONE: I don't know. Anyway, they had these old ships in there. You couldn't use that dock. If you went past there, you had 90. You had 88 and 86, too.

SPEAKER: You have a picture of the harbor?

MR. GREENSTONE: Yeah, of course I do.

SPEAKER: Where is it? Is it up there?

MR. GREENSTONE: Yes. It's there, in the middle.

SPEAKER: Oh.

MR. TOMSKY: It may be salvaged.

MR. GREENSTONE: Here we go. A place there, and a place here, a place there, a place here.

Then, you've got a minimum kind of storage place over here. But that was really all you had in this thing.

SPEAKER: Where that one ship is, where do you put that one?

MR. TOMSKY: They assigned the ships. They built the ships. They had to have trained personnel to man them.

MR. GREENSTONE: Then the X one was the *Normandie*.

SPEAKER: They were put to good use.

SPEAKER: They were put to good use all over the world.

SPEAKER: During World War II.

SPEAKER: The ships were also used after the war, too.

MR. GREENSTONE: That was 90. There was a big ship. That was 88.

SPEAKER: I got it.

MR. GREENSTONE: The techniques and the equipment that people had took over when Sullivan left. Sullivan was only there a few months, you know?

INTERVIEWER: Is that right?

MR. GREENSTONE: Yes.

SPEAKER: That was a short period.

MR. GREENSTONE: No, no, no. It was a few months. Then, they went out to the rest of the world. We went out to Africa. He traveled around the world, establishing and helping their salvage programs. The guy who took over was Chandler. The guy who worked with Chandler very closely thereafter, if you read my letter, was a guy named Anderson. Anderson became my diving officer. He was a nothing. He was a reservist. I was a reservist, also. But he was a reservist who came into the service with all kinds of decorations because of whatever his activities were out in the free society. He was a nice guy but didn't know his behind from a hole in the ground. He was probably a pretty fair administrator. He was probably in the job because he was an administrator. My envy is the fact that the guys who succeeded in the Navy were administrators. You know, the workers, guys who worked with their hands, did okay. They might have come out with some beneficial successes. But they didn't have the guys who were the thinkers. The guys who were a little bit older, two years older than we were, thought differently from us. We were kids. They succeeded, you know. We just went to work. We did what we were told to do. We were overjoyed when we were successful. We made the most of letting people know how good we were. You know, it was a matter of ego.

INTERVIEWER: Well, one of the things that has always come up about the *Normandie* has been whether it was sabotaged or not.

MR. GREENSTONE: Oh, that's nonsense. After all the stuff I saw on that ship, I don't believe there was any sabotage. If there was ever any sabotage on that vessel, it was done by the mayor of New York.

SPEAKER: Wasn't the ship in a fire? When they tried to put it out, the water shifted?

MR. GREENSTONE: They didn't just try to put it out. They had vessels on the beach shooting water on that thing. They had vessels on the dock shooting water on that thing. They had fire vehicles on the highway shooting water on that thing. Nobody ever took the time to go down and close the portholes in the E and D decks. As this thing started to come around from all of the water they were pouring on it, the water started pouring into the portholes.

SPEAKER: But it was sabotage?

MR. GREENSTONE: Huh? No. It wasn't sabotage. It was stupidity.

INTERVIEWER: Well, was the fire started by electric spark?

MR. GREENSTONE: The fire wasn't started by electrical spark.

MR. TOMSKY: It was a welding spark.

MR. GREENSTONE: It was a welding spark, yeah.

MR. TOMSKY: The firefighters who fought that fire didn't know what they were doing.

MR. GREENSTONE: Yes.

MR. TOMSKY: They capsized the vessel.

INTERVIEWER: They did that by pouring all this water in?

SPEAKER: Exactly.

MR. TOMSKY: But who the heck had experience in fighting those kind of fires?

MR. GREENSTONE: Did you ever see the room that the fire started in?

INTERVIEWER: No.

MR. GREENSTONE: Well, I'll show you the room that it started in if I can get through all this stuff. This is a beautiful room. Hold on, Arthur. Look at this magnificent room. I wish I had better light. That's the room that it all started in, right there. It all started in their attempts to cut these

lights out. That's the room. This stuff has been up here waiting for you, as a matter of fact. I wouldn't believe the money that I've spent cleaning up this room and getting my diving history out of this room. Now, I'm putting these pictures back up because Jim said, "Len, if you have any pictures, put them up because pictures do best for our purposes."

MR TOMSKY: What the heck does he know?

SPEAKER: I agree.

MR. TOMSKY: That's right. What the heck does he know?

MR. GREENSTONE: Well, the thing is that when you love a guy, sometimes, you'll believe anything he says.

MR. TOMSKY: Oh, God Almighty. You don't believe what I tell you. You told me that you loved me, but you don't believe what I tell you.

MR. GREENSTONE: The heck I don't. I believe everything you tell me.

SPEAKER: Oh, the rumor got out on you.

INTERVIEWER: What happened to the *Normandie* after they floated it?

SPEAKER: They put it into commission as a troop ship.

INTERVIEWER: How many years did she serve as a troop ship?

MR. GREENSTONE: She never served as a troop ship.

SPEAKER: Wasn't she the USS *Lafayette*?

MR. GREENSTONE: No, no, no. They moved her to Elizabeth, New Jersey. From there, they took her to the...

SPEAKER: Well, where's the *Lafayette*?

MR. GREENSTONE: They renamed her the '*Lafayette*' while they were in the process of reviving her.

SPEAKER: They never commissioned her as the USS *Lafayette*?

MR. GREENSTONE: No. She never went to work. In fact, they sold her off to the men of a steel company. They chopped her all up. As a matter of fact, I've got a picture of the last piece of her hull that they brought up, the keel. It was 520 tons or some crazy thing. I don't know. It was a massive piece of steel, the last piece they brought off of the bottom after they chopped her up.

SPEAKER: Why did they change and rename the ship?

MR. GREENSTONE: Oh, when she caught fire, the U.S. bought the ship from France. The *Normandie* became the USS *LaFayette*. It was going to be converted. As Jack said, it was going to be converted into a troop transport, which was their first thought. The work was being done at the time to convert her for a troop transport. The fire changed the whole plan. Then they decided that by the time they got through gutting her, taking off all of her superstructure...did you see the pictures of what she looked like, starting with what she looked like by the time they cut the superstructure off?

SPEAKER: Yes.

MR. GREENSTONE: I'll tell you what. She was a natural for an aircraft carrier. She would have been the beamiest and biggest aircraft carrier we would've had at that time. She was so screwed up.

INTERVIEWER: You're telling, I think, that we bought the ship from the French.

MR. GREENSTONE: Yes.

INTERVIEWER: One story that has been circulating for years is that the Vichy government...

MR. GREENSTONE: Those stories are one and the same, but I'll tell you what. The United States government paid France for that ship. I've got a copy of the transfer document that was sent to me. If only I could find it. There was a group that worked in *Normandie*. Do you remember the guy who came to our reunion, to which you came, and he spoke? He was the president of the

Normandie club. You were there. Remember, Jim, when we used your facility, and I think it was the first reunion we had in San Pedro. The guy came out and brought us the formal purchase agreement and transfer of the *Normandie* to the United States. It showed exactly what was paid for it. What you are saying is true in the fact that the money was never transferred or paid until the war ended.

MR. TOMSKY: Well, it was probably the French government in exile then. It was in Britain at the time.

MR. GREENSTONE: That is probably true, yeah. They just didn't pay for it until after the war was over.

MR. TOMSKY: I don't think they did business with Vichy.

SPEAKER: Well, it was probably the French government.

SPEAKER: It was in New York Harbor, and they were refitting it at the time?

MR. GREENSTONE: They were refitting it and planning to make a troop transport out of it.

INTERVIEWER: But it had sailed then in December, was it?

MR. GREENSTONE: She had sailed in December. I believe it was January 9th that she caught fire. It wasn't until the 15th of January that they were able to control the fire, and the ship rolled over. It might've been the 12th. I don't know.

INTERVIEWER: At that time, the ship was in the ownership of the U.S. Navy.

SPEAKER: Government.

MR. TOMSKY: I suspect so.

MR. GREENSTONE: I'm sorry. What was the comment, again?

INTERVIEWER: My understanding is that in December of 1942, it sailed in and was commandeered by the U.S. Government.

MR. GREENSTONE: That's right. It did not belong to them. They just took charge of it. They took control of it with the intent to use the vessel without buying it or paying for it until it caught fire. Then, they changed the name to the *Lafayette* and arranged to buy it from the French government.

MR. TOMSKY: But they were converting it.

MR. GREENSTONE: They were converting it at the time.

MR. TOMSKY: Bought it at the time U.S. Government had –

INTERVIEWER: It caught fire after the Navy started converting it.

MR. GREENSTONE: That was exactly what set it on fire, yeah. The Navy used to talk about the fact that the commercial company that was working on it was totally out of its realm of knowledge because they really messed up everything on that ship. The fire got started because they had very poor security.

SPEAKER: Well, it was an accident.

MR. GREENSTONE: Huh?

SPEAKER: It was an accident.

MR. GREENSTONE: Merritt, Chapman and Scott, even though they continued on and had a very major part in the salvage of the *Normandie*, there were a lot of people in the Navy, and I have to say this on tape so that I won't be sued, talking about how the problem was developed by them. They caused the problem. They had lousy security. The people who were working on the ship were people they brought in from anywhere and everywhere, and they didn't know who the heck they were. As a matter of fact, the hoses that they had on the ship, the hoses they brought on in case of a fire, wouldn't fit the fittings on the ship. They couldn't even connect the hoses to put the fire out. That was a lousy group in administrative authority.

MR. TOMSKY: But there's not a ship that goes through a major overhaul --. Well, of course, you know that it's going to happen, so you worry about damage control.

MR. GREENSTONE: That's right, and they didn't have it. That was the problem.

MR. TOMSKY: Having a fire was not unusual in the facilities to put the fire out.

MR. GREENSTONE: Bless your heart, Jack.

MR. TOMSKY: Their screw up was the fact that there was no way to put the fire out.

MR. GREENSTONE: They lost control.

MR. TOMSKY: You know the whole story. Even in the shipyard, you've got a guy standing there if you're going to burn the thing out. The guy has to stand there with a CO₂ container.

SPEAKER: Back up some. Was the ship just floating at sea when they went out there and commandeered the thing?

MR. GREENSTONE: No, no, no. It came into the harbor.

MR. TOMSKY: It steamed into the harbor.

SPEAKER: It came into the harbor.

MR. GREENSTONE: You bet. It came into the harbor. The crowd met it. Then, she pulled in there and they tied up her up. It was a great, great thing for the city of New York.

INTERVIEWER: All the passengers got off to these tumultuous crowds.

SPEAKER: Yes.

SPEAKER: Yes. It was a liner.

MR. TOMSKY: It happened, but I don't know if that is the history that you're looking for.

MR. GREENSTONE: Yes, but I think we were going off track. Let's get on to the diving program that came from it, I hope.

MR. TOMSKY: The diving program that came from it, right.

MR. GREENSTONE: I think the thing that was important is the fact that there was so much structural work done on that ship. If it had been done before, I wasn't aware of it. I was only a kid, anyway. But I later read and learned that there wasn't much of it. The kinds of bulkheads that were built to divide the ship, to compartmentalize the ship, were really somewhat unusual. They used the massive timbers with two by four interlocking timbers and created a bulkhead by establishing a steel frame and putting this one major piece of timber on top. Then, divers would take two by fours, simple two by fours, and bring them down and put them up into the groove. Then, two divers would dive down with another piece, move it under that, move it up and lock it. But you have to remember that this sounds like a very simple thing to do. They were taking a piece of eight by twelve timber and could not see the other diver or what he was doing. He could only adjust where that timber was going by his feel. Too often, there was one guy down and the other guy got all the slivers in him, that piece of timber took off for the top. They had to control that.

SPEAKER: Were they using weights or something?

MR. GREENSTONE: They were using just their bodies and shifting their weight. You dump your weights and send the weight down by your weight.

MR. TOMSKY: They needed to focus on the salvage of the *Normandie*. At that time, it was probably the greatest capsized ship in history, and they were able to right it and float it.

MR. GREENSTONE: There were a lot of people who said it would never happen.

MR. TOMSKY: Well, be that as it may, it happened. It was probably the most successful marine salvage operation ever.

SPEAKER: Is there anything that comes to your mind? I mean something that is well known or techniques.

MR. TOMSKY: No, no. The things were designed to fit the particular problem.

MR. GREENSTONE: You're on an excellent point. There's a comment in this book I read that caused me to laugh because I had to put my mind back to what the heck they were talking about. The ship was up in September. "Greenstone stood in awe, looking at the patches he put on the vessel." Do you remember that bit I was telling you about? It was an unusual situation because of the 300 or 350 patches that were put on the vessel, there were something between six and eight locations in the forward part of the mid-ship of that vessel. That was because of the damage inside the vessel, along with the fact they used to have a walkway that ran alongside the vessel when they were in the process of converting it. When the vessel capsized, that walkway got all busted up. Some of the timbers of the walkway went into the portholes. The guys inside, not being able to totally get to it, had to send divers to the outside to go into the mud to put those things in. The tooker patch was designed to go from inside the vessel to outside, with the strong back and wing nuts, close against the outside of the vessel. Now, you can't do that. What you had to do was go down, and some of the portholes were beyond sinking depth. Sinking depth ran anywhere from six to eight feet in mud and then depressed. If you wanted to go further than that, you had to wash yourself in there. You washed yourself down to the porthole. Then, the first thing you did so you that you didn't screw up was lock in a device that let you know where that porthole was so that you didn't have to spend a lot of time finding the thing again. Then, went go back the next time, you felt around and tried to find out about that port hole, which opened up on the inside of the vessel. That had to be done away with. You had to get it out of there because you were going to put the patch on from the outside. You had to use tools, pneumatic tools, to chop off the hinges and junk from the inside and stuff the junk in, take a saw and cut the timbers off, shove the timbers in to pull timbers away, and then, take the tooker patch and put it inside. You didn't have much of a lift on some parts of the inside of that opening, where you could adjust this patch when you put the strong

back on. The rubber was going to be able to lock from the inside. Then, you locked them down. I was telling Jack earlier of one of the experiences that was probably the most existing of all to me. One of the dumbest things that made me laugh while I was in the mud was that I was holding one of the wing nuts and the patch, trying to put the other one on, and I dropped the ring nut. In the water, you did not go reaching for it. You got your hand out of the way and went down below to where you thought it was, in approximation, and started shaking the mud. The ring nut would come down through the mud in your hand. Then, you took it and put it on again. But when you got it done and got the ring nut on, you stopped. But you were a kid, and that happened. You were a mechanic. You happened to be a mechanic anyway. You couldn't help but laugh because you had never ever touched, witnessed, or involved yourself in a thing like that before.

MR. TOMSKY: For your edification ----.

MR. TOMSKY: No, but if you think about it, you know what a boiler is.

SPEAKER: Yes.

MR. TOMSKY: You know what the manhole plate in the boiler is?

SPEAKER: Yes.

MR. TOMSKY: You put the manhole plate inside. Then, there's a bar that goes across.

SPEAKER: Yes.

SPEAKER: Well, that's what --.

MR. TOMSKY: That's exactly right.

INTERVIEWER: Captain Tucker was on the *Normandie*. Was he brought in because of his mechanical background?

MR. GREENSTONE: With Scott for 22 years.

MR. TOMSKY: Yes.

MR. GREENSTONE: He was a full-fledged mechanic. He wasn't a jerk. Let me tell you something. He was a full-fledged diver, you know. Being a mechanic and a diver, as he was, which was what Jack was explaining, was an unusual thing in the diving industry at that time. They were trying to take us mechanics and teach us to become divers. Contrary to the Navy's previous activities, you took divers and taught them to become mechanics. They were taking mechanics and trying to teach them to become divers.

MR. TOMSKY: Let me give you an analogy about welding in the oil patch. We found that to take a diver and teach him how to weld just didn't work. But we could take a welder and teach him how to dive.

MR. GREENSTONE: You bet.

MR. TOMSKY: It worked.

MR. GREENSTONE: Yes.

MR. TOMSKY: It was same thing with a mechanic.

SPEAKER: It was same thing with a mechanic.

MR. GREENSTONE: You're exactly right. When you talk about the bulkheads that they had to build --.

INTERVIEWER: We worked the other way around. We trained Ken Conda to be a researcher.

MR. TOMSKY: Ken Conda was an exception. He was a good man.

MR. GREENSTONE: Let me tell you something. You know something?

MR. TOMSKY: I was saddened by his death.

MR. GREENSTONE: I'll tell you, it sits in my heart. He was one of my dearest, dearest friends.

INTERVIEWER: Hardly...

MR. TOMSKY: Kenny Conda was a heck of a guy.

MR. GREENSTONE: I don't even know that you really know how great a guy he was.

MR. TOMSKY: Oh, I knew him well.

MR. GREENSTONE: I'm sure you did, but I had a very, very close relationship with Kenny.

MR. TOMSKY: Was that after he left the Navy?

MR. GREENSTONE: It was when he worked for Art, as a matter of fact. I knew Ken before that.

I met him at Art's, and our attraction, boy...

MR. TOMSKY: I spent four hours with that silly guy.

MR. GREENSTONE: Please don't say that.

MR. TOMSKY: Don't you go to work for these people. You've only got 18 years in the Navy.

MR. GREENSTONE: You believe that...

MR. TOMSKY: Now, you have two more years until you retire.

MR. GREENSTONE: Yes.

MR. TOMSKY: I think he had 18 years then. Stay here and retire.

SPEAKER: But he loved...

MR. TOMSKY: I'll make sure you're a chief when you retire. He wouldn't do it. He's going to Art and the program. He was a heck of a guy, a good man. I wanted to keep him in the worst way.

INTERVIEWER: We were really close friends.

MR. GREENSTONE: Yeah, I know you were.

INTERVIEWER: I wanted to keep him in the worst way, but people get their minds set --.

MR. GREENSTONE: When they started drawing in all the water, and I think it was in late July or early August when they were getting ready, they sent divers down. They were giving directions for what they were supposed to be looking for and all that kind of stuff. The book says that to get on the *Normandie*, it took about 58-foot cracks. That was not really true, you know. In a 40, 50 or 58-

foot area, there were some cracks. There were no cracks 58 feet long. That was why they took some of the cracks and used a newly designed kind of a tooker patch to go in there. It didn't work, by the way. They put it in there and it helped a little bit, but not a lot. The real asset, of course, was going in there and jamming bags of rags in, which they did. I guess for the next five or six days, they were in there on an almost continuous basis, night and day, jamming rags in the cracks. Of course, they were also taking down bags of sawdust that they could dump off. I don't know if you understand how it functions, but sawdust, when you dump it off, wherever the water is traveling, it is supposed to follow. Then, when it gets in there, it expands. But the divers couldn't see what they were doing. They dumped the bags. Three quarters of the sawdust was on the surface, going where it was not supposed to go. That's not a fair thing to say because some of it got in there.

SPEAKER: It just didn't work.

MR. TOMSKY: How did they right the *Normandie*?

MR. GREENSTONE: Well, they ultimately righted it by filling it with concrete. They probably put in almost 300 yards of concrete, 80 in, 80 in. They kept filling the double bottom. They kept filling the vessel with concrete, which was the thing that ultimately slowed down the seepage.

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UNDERSEA & HYPERBARIC MEDICAL SOCIETY

ORAL HISTORY INTERVIEW

CAPTAIN JOHN HUNTLY BOYD, JR., USN (Ret)

Washington, D.C.

Monday, November 24, 2003

PROCEEDINGS

INTERVIEWER: Captain Boyd, when were you born?

CAPT. BOYD: I was born in 1931.

INTERVIEWER: Where did you go to school?

CAPT. BOYD: Well, I grew up in Trenton, Michigan, and went to Trenton High School. Then, I went to the Naval Academy and graduated in 1953.

INTERVIEWER: What influenced you into coming into the Navy?

CAPT. BOYD: Well, I grew up close to the Detroit River right at the head of Lake Erie, so I was on the river the lake all the time. It just seemed like the natural thing to do.

INTERVIEWER: How did you first get involved or get interested in diving?

CAPT. BOYD: When I graduated from the Naval Academy, I served on two destroyers and went to submarine school. They decided I was colorblind, so they punished me by making me an engineering duty officer and sending me to the Massachusetts Institute of Technology (MIT) for a graduate degree in naval architecture and marine engineering. There were 16 naval officers in the class. About a third went to the nuclear program and went right to work for Rickover. Another third went into submarines. They got their basic submarine training and served in the submarines for a year before their first engineering duty tours, and the rest of us were all sent to diving school. There was no choice, but I was delighted with it.

INTERVIEWER: You've been affiliated with Navy diving over the years. Can you, from diving school on, talk about your Navy diving career, its past, present, and future?

CAPT. BOYD: Since I was an Engineering Duty Officer (ED), the EDs wanted to have a sprinkling of diving-qualified officers who would be sprinkled around the world with some basic salvage training and would be available for any needs that might come up. After I got out of diving

school, I went to Long Beach Naval Shipyard. Although I was the shipyard diving officer, it didn't place any demands on me.

I went from there to Guam, again as a diving officer and an assistant repair officer. When I was there about a year they had a typhoon, Typhoon Karen, that caused havoc in the harbor at Guam. Eleven ships and craft were sunk or stranded and I got started really quickly in salvage.

The Seventh Fleet sent their salvage officer, Commander Tom Blockwick, down after we had already gotten started in getting some of the more valuable assets re-floated, in particular a floating crane, and they sent in two salvage ships, ARSs.

But Blockwick had an ulterior motive. He let me do everything. He watched over my shoulder. His ulterior motive was that he had been over toured as a Seventh Fleet salvage officer. Tom was really the last of the World War II trained ED salvors who was not too senior to participate in diving and salvage or hadn't already retired. They couldn't find a relief for him. He saw this young lieutenant commander, who was nine years junior to him. He was doing well at salvage and seemed to like it. He had, in the back of his mind, "There's my relief."

About six months later, they had another typhoon. It wasn't as bad as Typhoon Karen. Typhoon Karen, incidentally, was a big typhoon. It had 150-knot steady winds with 180-knot gusts. That was 207-mile per hour winds. It was quite an experience. The new typhoon blew only a hundred knots or so, but it just sat on top of the island for a long time and six more ships and craft were sunk, including one up in Saipan. That time, Blockwick didn't even come down. He just said, "You've got a qualified guy there. Go ahead and do it."

They sent another ARS to help us. Of course, we had the advantage of having a ship repair facility there with the industrial facilities and everything. I had a diving locker of about five guys, but it was great to have a Navy salvage ship with a good store of knowledge, equipment and divers.

Well, as time went on, I did relieve Blockwick. We were stationed on a repair ship, the USS *Ajax*, which was home-ported in Sasebo, Japan, and I relieved him in April of 1964.

In May of 1964, the USNS *Card*, a small carrier that used to ferry aircraft to Vietnam, was mined alongside the pier in Saigon, so off I went to Saigon. It turned out that when it happened, Blockwick was absolutely incommunicado on a train between Sasebo and Tokyo, so he was just unavailable to be brought back. I was on my own.

We patched up the *Card*, pumped it out and towed it out. It took about three weeks. I remember that the day we took it out was Ho Chi Minh's birthday. It was in May of 1964. There was betting in the bars in Saigon that we would never get it out of the river. As a matter of fact, we ran aground at one place, under tow, of course, at one sharp corner in the turn in the river. Fortunately, the tide was rising and we got it off, continued on and took the ship to Subic Bay, Phillipines.

Not long after, of course, Tonkin Gulf occurred. We were actually on another salvage job in the Phillipines at the time, and for the rest of my tour there, I was on the go all the time. They were activating all kinds of ships. The crews weren't too experienced. The skippers and the chief mates were okay but they had a total dearth of qualified second mates. Second mates were the guys who did the navigating because they had the morning and evening watches. Those were the guys who were running the ships aground. I did three or four commercial ships that ran aground in the South China Sea or in Vietnam. They all happened when the second mate had the deck.

During that time, the destroyer USS *Frank Knox* ran aground on Pratas Reef. It's a small, uninhabited atoll in the South China Sea. That was the first time we ever used cast-in-place foam on a ship. It was five weeks and we rode out three near misses from typhoons and again, that was exciting. The ship was bouncing around and the typhoon was approaching. The waves were

knocking the heck out of the ship. I remember we had to be careful to not go step out on the open bridge, because the radar antennas above looked like they were going to be shaken right off the mast. Service Group 3/CTF-73 was the logistics manager for the Seventh Fleet. I was their salvage officer. I was the Seventh Fleet salvage officer.

From there, I went to service force commander in Norfolk, Virginia. Again, the service force was a logistics agent for the Atlantic Fleet and as such, I was the Atlantic Fleet salvage officer. I did three significant salvage jobs there. At that point, I had done thirty salvage jobs. Incidentally, I loved to dive and was a good diver, but diving, to me, was the entree into salvage, which is the really fun part and the reason for being. Divers have to do something. There has to be some reason for them. In my case, it was salvage. I had done thirty salvage jobs and only one of them was unsuccessful. That was the USS *Bache*, a destroyer, which had been blown aground during a storm in Rhodes, Greece. They dragged anchor. They were doing some machinery repairs and dragged anchor. They didn't have steam up. One of those siroccos, those strong winds in the Mediterranean, came up. It was predicted. There was no surprise, but they either couldn't or didn't think about steaming to their anchor, and the anchors dragged. They ended up on the beach right at the entrance of the Old Harbor of Rhodes.

If you've ever been to Rhodes, you'd recognize the harbor is manmade with a very narrow entrance. That was where the Colossus of Rhodes was. It was a lighthouse that strode across this narrow entrance of the Old Harbor. One of the wags we had over there at the time said they had just made a startling discovery. The Colossus of Rhodes had big, gray feet, and one of them, the left foot, was the former USS *Bache*. Another storm came along and just wiped the bottom out of the ship. We were unable to get aboard it for several days. When we got back aboard it, you heard a lot of creaking and groaning. You looked down in the fire room and the boiler was moving around.

Somebody said, "Look at this. What's going on here?" I said, "the boiler is not moving around. It's the ship moving around. The boiler is stationary." In fact, that was one of many cases in which my diving experience and ability proved valuable to my salvage officer duties. I did inspect it myself and found that the entire bottom of the ship, through the entire engineering section, was totally separated from the rest of the ship. Salvaging it was out of the question and a Navy contractor ultimately broke up the ship.

After the CINCLANTFLT salvage job, I went to the Experimental Diving Unit (EDU) in Washington, D.C. It was in Washington in those days. The thrust in those days was saturation diving. We were very, very busy doing saturation diving tables. We were doing 1,000-foot, 30-day long dives routinely as they developed the saturation tables. That was interesting.

I was made the project officer for the acceptance of the first deep diving system, the Mark I deep diving system, and we did our trials off San Clemente Island in California from a contract salvage ship. It was a civilian-manned Navy salvage ship that was under contract to the Supervisor of Salvage (SUPSALV). We did, in fact, complete the series of dives. The requirement was only to go to 850 feet and that was what we did, although the system was good for 1,000 feet.

From EDU, I went to the Bureau of Navy Personnel (BUPERS). I was the detailer for the engineering duty officers. I always said that at least two of the jobs that I got as a commander were way ahead of time for my seniority because of the diving and salvage capability.

On the Seventh Fleet job, as I said, I relieved a fellow who was nine years senior to me, and when I went to SERFLANT, I relieved a fellow who was about seven years senior to me. The salvage side of my assignment always got the notoriety, but I still considered myself a mainline Engineering Duty Officer. Although I could have gone to the Supervisor of Salvage's Office, I was interested in breaking the chain to demonstrate that I was interested in doing something else.

When the BUPERS job came along, I accepted that and of course, there was nothing to do with salvage and diving in that job except detailing some of the guys and some of the ED divers. When it came time to leave there, I had myself slated to go to the Boston Naval Shipyard as one of the second tier officers, a planning officer or production officer.

Another fellow who was a couple of years senior to me came to me and said, “Huntly, I’ve thrown my hat in for the SUPSALV job and I wanted you to know.” He did that, I think, because he knew that had I wanted it, I could have had it because of all my experience. He had much less experience. He had had the Seventh Fleet salvage job and had done a couple of salvage jobs, but nobody around had the amount of experience I had. I said, “Oh, fine. I’m going to a shipyard.” Well, this fellow was a very fine guy and a great friend. It turned out that some captain, who was a design-type guy in the engineering duty community, retired early, unexpectedly, and this other gent who was looking for the SUPSALV job turned out to be the only person who had the background and qualifications to take the design job. The powers that be said, “Well, the only person we can send over to SUPSALV is Boyd.” I always characterize it as, ‘Don’t throw me in the briar patch.’

When I was SUPSALV, one of the interesting and challenging things that went on was the transfer of the EDU from the Washington Navy Yard to Panama City, Florida. There were a lot of politically sensitive issues about it. In a nutshell, the folks in Panama City, at the laboratory, had convinced the Navy, through their favorite Congressman, to build an ‘ocean simulator,’ as they called it. It was just a massive hyperbaric facility in a spectacular place.

In the meantime, the existing Experimental Diving Unit was getting down at the heels. It was built in 1938 or 1939 and although the chambers were suitable for 1,000 foot dives, that was all. They were also relatively small. Here was this great, big beautiful place down in Panama City that was just beckoning a bunch of divers. The laboratory had the place built with military

construction funds but didn't have anything in the budget for people to man it. In my view, they figured, "Well, the way we're going to man this outfit is by making a run on the Experimental Diving Unit and get the EDU to come here and they'll work for us and man the ocean simulator."

Well, that ended up in a political tug of war between SUPSALV and the laboratory in Panama City as to who was going to be in charge of the Experimental Diving Unit. The Naval Sea Systems Command (NAVSEA) was sending the divers, the technique and the technical expertise. The laboratory thought, "They're just coming down to run our facility." You can just see the problem there. They sent a guy named Jack Ringleberg to be the Assistant Officer in Charge of the Experimental Diving Unit. He ran the operation in Panama City and got it going.

The commanding officer of the Experimental Diving Unit remained in Washington because they were still doing work there. Jack, I'm sure, has told you or will tell you all the travails that he had, that he had a terrific job of being the diplomat between the divers and the laboratory people. It was also complicated because the construction of the system supporting the hyperbaric facility was not documented properly, so much of the mechanical system and all the air and gas systems instrumentation had to be redone because proper documentation was not maintained. At the moment, I can't remember who paid for it. It seems to me that NAVSEA paid for it, but that was another thorn between the laboratory and NAVSEA. At any rate, the Experimental Diving Unit did ultimately get transferred and abandoned the old Washington Navy Yard facility, which was shared by the Navy Diving School, both of which are gone now. It's a parking lot.

Somewhat later, incidentally, the diving school also moved to Panama City. As an anecdote on that, I think it was in the winter of 1981 when the Air Florida plane crashed on takeoff from National Airport into the 14th Street Bridge. There were a hundred or so people on board. It was going to Florida. There were a lot of survivors and a lot of people were rescued. But after the

immediate rescue, there were many, many more people who drowned. Many of them were still in the wreckage. Others were floating down the river. They mobilized divers to do this operation.. It wasn't a rescue. It was a body recovery, actually. It wasn't a fun job.

The weather was terrible. It was in the low unit numbers, zero degrees Fahrenheit. Remember, I said that the diving school had moved down to Panama City, where the water was nice, clear and not too cold. It didn't have the opaque water of the Washington Navy Yard and the bottom mud in which to dive. I was convinced that the Navy divers, who had been trained at Panama City, would quit as soon as they got to Washington and tried to make their first dive in the Potomac River, which was full of ice and zero degree temperatures. To their credit, though, I understand not a single one quit, so I was wrong on that one.

Anyway, let me get back to SUPSALV. The big thing at SUPSALV for me was the Suez Canal clearance. We also did a number of aircraft search and recoveries that were successful. One of them was for an F-14 that fell off a carrier up in the North Sea. We found that and recovered it. In about 1994, there was a C-5A coming out of Saigon, full of orphans, and the rear door fell off or blew out. I think they lost a few of the orphans. Most of them were okay. The plane flew back to Saigon, but they needed to get this rear door ramp to see what happened, what went wrong, so our guys went out, found that and recovered it.

The most lasting achievement while I was at SUPSALV was probably the real development and expansion of the underwater search and recovery capabilities. While I was there, we built the first deep drone, which was fairly cheap. It wasn't very good for searching because it wasn't very mobile, but it was a good inspection and minor work platform. They're still using the deep drone. Probably the only thing left on it is one bolt from the original one because they could fund its upgrading from one pot of money, not new procurement money. They've managed to keep the deep

drone in existence by continued upgrades for 30 years. They could probably find one bolt or one nut left on the current one that was on the original.

But as I started to say, the big thing while I was SUPSALV was the Suez Canal clearance. In 1968, the Israeli-Egyptian War took place and the Israelis were coming so quickly across the Sinai that the Egyptians were afraid they would overrun the Suez Canal, so the Egyptians scuttled ten ships, tugs and dredges in the canal, to prevent their use. The war ended fairly quickly, with the Israelis and the Egyptians facing each other across the canal, which had a bunch of wrecks in the middle of it. In the 1973 war, the Egyptians did pretty well for the first time. They regained their pride. They beat the Israelis badly in the beginning, but as time went on, the Israelis got their act together and crossed the canal before a truce was established.

In January or February 1974, I got a call from our Navy salvage contractor, Peter Barraca of Murphy Pacific. They had been nosing around Cairo, trying to get a contract to clear the canal. All of the tealeaves said that the contract was already settled with a Dutch consortium led by Smit. Barraca wasn't getting much attention until he happened to mention that they had access to the Navy heavy lift ships, which were the former German heavy lift ships that had been used in the 1956 clearance of the canal. That got the attention of the people in Suez.

I have no way of knowing, but you can just guess that the Egyptians probably started thinking, "Well, these guys are real. They can get these wonderful salvage ships," which were indispensable in the 1956 clearance. They probably thought, "If it's a United States contractor who happens to be the U.S. Navy's contractor, maybe we'll get the U.S. to somehow fund this operation." They finally responded to Barraca and said, "Yes, let's talk." Late on a Friday afternoon, probably around 4:30, Barraca called me and said, "I have to have an answer. Can we lease the heavy lift ships from you?" I said, "This is a pretty politically charged decision. I can't

make it at my pay level, so I'll call you back." I ran up to the commander of NAVSEA, Vice Admiral Bob Gooding, who was a great guy, and we sat down and talked about it. I had pictures of the heavy lift ships and told him what was happening. It was, as I said, probably late in the afternoon on a Friday. It was probably 5:30 by that time. There was nobody around. He said, "We'll both probably go to jail for this, but I like it. Go ahead, on my authority. Tell Barraca he can lease the lift ships for terms to be determined."

Things were quiet for a while even though Bob Barraca told us that they pretty much had the contract in hand. I believe this was because the Egyptians began to fear unexploded ordnance. Around April, if you remember, Mr. Kissinger was tromping around the Middle East and doing a good job of mending fences between the Israelis and Egyptians. He was, no doubt, making all kinds of offers and promises to the Egyptians, that the U.S. will help rebuild your economy, your infrastructure or whatever. Sometime in April, a message came the U.S. interests office. There was no ambassador, but they had an ambassador-level guy there. He said that the Egyptians had asked for the assistance of the United States in clearing mines from the waterways and on land and a number of other things, like training their people and things like that. Tucked in at the very bottom was, "and to assist us and to fund for the clearing of the Suez Canal." Well, that got attention at the Pentagon. I had to get on my horse to go tell people what it meant, how it happened, and that no, I didn't make it happen.

I remember that Admiral Zumwalt wrote a note on something and said, "I understand there are low-level people from NAVSEA who are making commitments to the Egyptians to clear the Suez Canal." Fortunately, Admiral Kidd who was the Chief of Naval Material (CNM), at the time, was a great sponsor of mine. He loved divers and loved me. He had been counseling me all along that if anything happened and it looked like they were going to get involved, to go over and see

Vice Admiral Cousins. He was the plans and program guy and the political-type guy on the OPNAV staff. When those things started happening, I went to see Admiral Kidd. He was on travel. Remembering Admiral Cousins, I went over to see Admiral Cousins with my deputy, Captain Bob Moss, and a big picture of the two lift ships working in the Saigon River.

INTERVIEWER: Was that the Mekong River?

CAPT. BOYD: It was the Mekong River, right. I quickly got through the outer office to Admiral Cousins. He said, "Well, this is interesting." He supported me and went in to see Admiral Zumwalt, who was the Chief of Naval Operations (CNO). From there, things were quiet for a few days. Anyway, I had been sending memos and copies of messages over to OPNAV all along, but apparently, nobody was paying attention to them. It shouldn't have been a surprise that we also got asked to fund the Suez Canal clearance.

A few days later, I got a call from the Assistant Secretary of the Navy for Installation and Logistics to come over to his Crystal City office and tell them about the Suez Canal clearance. I went over to see him, and he soon looked at his watch, saying, "I've got to go over and see Navy Secretary Bill Middendorf. Well, why don't you come along with me?" he said. We went over to the Pentagon and he went in to see Secretary Middendorf with my picture of the lift craft. I was waiting in the outer office. It wasn't two minutes before the secretary came out and said, "Come on in." He had run aground immediately, so I had to explain to Middendorf what was going on. It went on for a few minutes. Middendorf was a businessperson. He checked the Dunn & Bradstreet on Murphy Pacific, running a couple of numbers, and decided, "Yes, they're a small company, but they can probably do it."

At that time, it still seemed as though we might have to fund the operation and loan the lift ships through Murphy Pacific. Middendorf looked at his watch and said, "Oh, we've got to go and

see Bill Clements.” who was the Deputy Secretary of Defense. Mr. Clements came out of the offshore oil industry and heavy construction work, so he knew what was going on. He knew heavy equipment. He said, “Well, you had better come along, Captain.” so I tagged along and they raced over to Secretary Clements' office. Again, I was waiting on the outside. Two minutes later, I was called in. Clements was very skeptical. I was explaining what was going on, what could be done, and how much it might cost. The reason he was skeptical was because Murphy Pacific was planning on subcontracting to a German firm for two salvage cranes, 500-ton cranes, which could actually pick up 1,000 tons each in one mode. Clements was familiar with heavy cranes and their costs. In those days, 1974, one of the big, heavy cranes that they used in the offshore oil industry that had a 500 or 600-ton capacity probably cost \$25,000 a day and the German heavy lift cranes were going to cost about \$8,000 each a day. That was one of the reasons he was skeptical. He just couldn't understand how we could do that. That was all going on and at one point in time, Clements looked up and there was his aide, Captain Kenny Carr, who later became a Vice Admiral and COMSUBLANT, who was his naval aide and was looking over the table where we were all huddled. We had a map that showed generally where and what the wrecks were. He looked up and there were a lot of people around the table. Secretary looked around and said, “What are all you people doing here?” Carr said, “Mr. Secretary, this is the most interesting thing that's gone on here in a month!”

Anyway, I heard later that Clements said it was going to be a technical and financial disaster, but he couldn't turn it off. Sometime later, maybe two or three days later, I was called back over to OPNAV and was asked how could we do it. Well, the Navy could do it using the same equipment and contractors or with fleet resource. Of course, we could also just pour in money. That's a bad idea, to just pour money into the project. I always described it as a three-cornered hat.

Murphy Pacific would be doing the work. They would be whispering all the time to the Egyptians, “We can do this more quickly” or “We can do it more safely if we get more facilities and more equipment and more people.” Of course, the Egyptians would agree. The price would be going up and up and there would be the poor Navy, paying the bill for these two, each whose motivation would be to make it more and more expensive.

I remember I was called over to OPNAV on a Saturday. I went to the morning briefing of the Secretary of Defense and the Deputy Secretary and all of the chiefs of the services. They called it the ‘tank.’ I wasn't taken into the tank. I stood on the outside. They finally came out and said, “Huntly, there is no decision yet on whether we’re going to do it totally with Navy resources or using contractors.”

A couple of days later, I was called back again and told sit down. It was after lunch. I would say that it was maybe two in the afternoon. They said to me, “You have the rest of the day, before close of business, to prepare two plans. Come up with one plan to clear the canal using naval resources and one to do it with civilian resources, or Navy contractors. Oh, incidentally, whichever way it goes, you're going to be in charge.” I had no axes to grind. I was going to do it. Of course, it was the Holy Grail for a Supervisor of Salvage to do something like that.

I prepared two plans. It turned out we would have had to make a significant draw on both the Atlantic and Pacific salvage resources, ships and people, and, of course, it would have cost us less money. On the other hand, we could have done it with commercial resources. We had an estimate that said it was going to cost \$8.6 million. That was sight unseen. Nobody had been to the canal and done it in six months.

I told everybody that we could do it for \$10 million in six months. Again, that is even before my meeting with Bill Clements. We had those numbers and that was why he thought it was

outrageous and impossible. We were going to do this for eight or ten million dollars, using two cranes that cost only \$8,000 a day each. It was incredible. But in fact, it was fairly easy to estimate. You knew what resources you were going to start with and the daily cost of the resources. It was just figuring out how long it was going to take and you had a number.

Incidentally, as it turned out, we spent \$12.3 million, I think, which included a lot of Egyptian pounds. We bought a lot of our resources, food and stuff like that in the Suez, using Egyptian pounds. The U.S. owned them. They were not convertible. They weren't good for anything in the U.S. but were good for local use. All told, it cost \$12 million and took us six and a half months. No, it took seven and a half months.

At any rate, after the next meeting of the 'Elephants', I was told, "No, we're going to have the contractors do it." Remember, though, it was May of 1974. We were just getting out of Vietnam. Adamson said that the boss, meaning the CNO, did not want to get a bunch of Navy personnel in the Suez Canal, between the Egyptians and the Israelis, and get all shot up. He said that we were just getting out of Vietnam, so we were going to do it with the contractors.

That was how it came about. Then, we tasked the contractor, Murphy Pacific, to prepare the detailed plans, which I reviewed all the time, of course, and to go with their subcontractors. I was ready to go. It was in May. It was about the middle of May. There was one flight a week from New York that went all the way to Cairo and I had my tickets.

Admiral Kidd was also, as usual, very interested in all of this. There were certain financial restrictions, although the operation was going to be paid by the State Department, the Agency for International Development, and we had a strict prohibition against doing anything or spending a penny until we had the money in hand from the State Department. The Friday morning that I was supposed to get on the airplane to go up to New York and then fly to Cairo, we still didn't have the

money from the State Department. I told Admiral Gooding, "Hey, I can't go." In the meantime, Admiral Kidd had been telling all his four-star buddies, "My salvage officer is going over there and we're going to clear the Suez Canal." Oh, incidentally, I overlooked one thing. The operation to clear the mines and the land operation was all done under the joint command, under COMSIXFLT and CINCUSNAVEUR; and the Office of Secretary of Defense (OSD) route.

Since Mr. Clements was so convinced there was going to be a financial and technical disaster, he didn't want us to be a part of the joint command. He said, "You guys do it at NAVSEA." In other words, we would divorce ourselves from the financial and technical disaster that was going to happen. I was going to be separate from the operation that was already going on over there. They had an admiral over there who was in charge of all the other parts of it and it already started probably a week before what I'm talking about. I was ready to go over on that Friday morning. Admiral Kidd was off somewhere and called his aide and of course, they talked several times a day. Admiral Kidd is a great guy. I love him, but he was a controversial person. He was also sort of mercurial.

His aide was Captain Pete Dejarnette. Pete called me up and said, "I just talked to Admiral Kidd. He's getting on an airplane and wanted to make sure you're en route today to head over to Suez." I told him, "We haven't gotten the money yet, so I can't go." He said, "Oh, that doesn't sound very good. I'll call you back." He got Admiral Kidd before the admiral got on his airplane. Pete called back a few minutes later and said, "Huntly, put on your asbestos earmuffs. I quote Admiral Kidd: 'If you don't have your ass on that plane this afternoon, you can meet me at Andrews Air Force Base when I return this afternoon with your resignation and tell me how dumb you are why I shouldn't reactivate Bill Searle, a former SUPSALV, to go over there and take this

job.” I went up to see Admiral Gooding. He said, “Well, we might go to jail together, but can you go?” I said sure. I still had my tickets. He said, “Well, go!” so off I went.

We had the two heavy lift ships manned with all former Navy people, most of whom had served on them in Vietnam with Harbor Clearance Unit One. The contractor brought in first one and ultimately, two heavy lift cranes from Germany. We had a very small Navy cadre. I had three or four officers with me. When the operation got going, we had operations in the northern and southern ends of the canal, as well as the center, and I had an officer in each of those places. We had a supply officer and a SUPSALV civil servant, who did logistics stuff. We had one enlisted man, as I recall. He was a SEAL. A key man was Jim Bladh, retired lieutenant commander and diver. He worked for SUPSALV. He was our advance man and Cairo liason.

These officers rotated, so in all, probably six or seven diving and salvage officers were involved in the Suez Canal beside myself. We also brought a lot of people over for visits for a week each and paid for them with the Egyptian pounds. We bought their tickets in Cairo using Egyptian pounds, so we didn't use any U.S. dollars. The U.S. owned the money. It was useless to the U.S., except in Egypt.

The operation went pretty much according to Hoyle. There weren't many surprises. There are always little surprises when doing salvage work, but it went pretty well. Again, as I said, we originally estimated that it would take six months. It took seven and a half months from the time anybody got there.

Of course, when I got over there, there weren't any resources. There were a couple of weeks before the resources really got there; the people and the equipment. With this small group, we did this job. There were never more than about 120 contractor civilians on the job at any one

time, so the cost went along just as we had expected it would. That pretty much completes my SUPSALV time and my diving and salvage experience in the Navy.

INTERVIEWER: What about after SUPSALV? What was your involvement in diving after you retired from the Navy?

CAPT. BOYD: Oh, let me say one other thing. After SUPSALV, I went to the Norfolk Naval Shipyard as a planning officer and to the Puget Sound Naval Shipyard as a shipyard commander. One thing that I thought was important for my career was to keep my credibility and experience up to date in the more mainstream area that could support a full career after I finished diving and salvage.

I'm sorry to say that too many people get involved in diving and salvage and are so enthralled with it that they don't want to do anything else. Then, they come to get to be a commander and they ask, "Well, what can I do?" There's one ED captain job, and there are only a couple in the unrestricted line or the 1140 community, I think it's called - at least it used to be called that. They don't have much of a career path. In fact, the 1140 community, the diving and salvage officers, have been gobbled by the Explosive Ordnance Disposal (EOD) community.

I don't know that there's a single captain billet designated for a diver. There are billets that can be filled by a number of different specialties, but I don't know that there's a single diving and salvage guy who is a captain in the unrestricted line, in that kind of business, unless he has gone on to something else. The point is that in my case, and I tried to keep this going all the time, I had to make sure that I had my feet in two different career paths and when one dried up, I wasn't dead.

INTERVIEWER: Huntly, when you were at Puget or even Norfolk, you were, to some extent, still the senior ED salvor on active duty. During that time, were you consulted on various occasions by

the incumbent SUPSALV or used as a sounding board, or was it more like 'the king is dead. Long live the king?'

CAPT. BOYD: No. I think it was 'the king is dead, long live the king.' Oh, incidentally, I have a little bit of pride here. I was awarded the Distinguished Service Medal for the Suez Canal operation. Also, when I got over there, because of the difference between my chain of command and all the rest of the people, who were in the joint chain of command, I sent off my own SITREPS. I sent my SITREPS on Sundays, Tuesdays, and Thursdays, so they would be received in the U.S. Monday morning, Wednesday morning, and Friday morning, and things didn't happen that fast so as to require daily SITREPS. If anything really happened, of course, I could send off a message if I had to.

The overall commander of the operation was Task Force CTF-65. They made me the Task Group Commander. I was 65.7 and I'm probably the only ED who was ever Task Group Commander as an ED. When the operation was over, thanks again to my different chain of command, all the task group commanders were recommended for Legions of Merit and were all knocked down to commendation medals. COMSIXFLT, I'm told, had some heartburn about the operation over there. Somebody told me not to worry. Admiral Kidd was going to take care of me. In fact, he did. I was awarded the Distinguished Service Medal. I think I'm the only ED captain who ever got it while still on active duty. I was able to wear the Distinguished Service Medal for the last six years of my Naval career.

INTERVIEWER: You've gotten some other awards. I remember that you received the American Society of Naval Engineers Award for salvage engineering.

CAPT. BOYD: In 1966, I had come back from Service Group 3, CTF-73, as a Seventh Fleet salvage officer. I was selected by the American Society of Naval Engineers as the gold medal

winner for the year 1966. I was still a lieutenant commander at the time still. The selecting committee told me that they had quite a fight. All the previous gold medal winners had been scientists and very senior people. I don't know who the other candidates were, but they selected me. I was the first person who was selected for the gold medal whose background was an operational type. As a result, they changed the rules and they established a second top award in the society. One of them is unrestricted, like the gold medal, and the other one was really for technical lifetime achievement.

INTERVIEWER: Well, you've certainly had a distinguished career in salvage and also in the balance of the Navy. You served as an Engineering Duty Officer. By my recollection, you probably hold the record since World War II for the most salvage jobs done by any salvage officer, maybe (even more than) Chuck Bartholomew, but I'm only sitting in around at fifteen.

CAPT. BOYD: You're probably right. Including Suez, there are ten wrecks there. I've had forty salvage jobs that I was on scene and in charge. Technically, I wasn't in charge in the Suez. The contractor was in charge, but you can be sure that I was in charge.

INTERVIEWER: I was there. I know you were in charge.

CAPT. BOYD: As I said, the really lucky part of it was that only one of them was not completed successfully. That was the *Bache*, which wiped its bottom out before we could refloat her.

INTERVIEWER: Everybody has a rabbi. You mentioned Ike Kidd, who has been good for our community. Who, singularly, did you admire the most?

CAPT. BOYD: Well, the person who I admired the most and who had the most influence on me was Bill Searle. Bill was eight years senior to me. I remember that when I showed up at the diving school after MIT, Bill was completing a tour there as the assistant program officer at the EDU. He was a lieutenant commander. He was a commander selectee, as I recall. He sat us down and told us

sea stories and how great everything was. I said okay. I didn't pay much attention to that, but when I went to Long Beach, I was a docking officer. There comes the USS *Providence*, a light cruiser, and Bill was the chief engineer. I got to know him a little bit more. After the *Providence*, Bill went to be the Pacific Fleet Salvage Officer, so when I ended up at Service Group 3/CTF-73, he was my salvage rabbi in the west Pacific. Bill then went to SUPSALV and was the one, I'm sure, who convinced COMSURFLANT to put a salvor in the job as its assistant maintenance officer. That was how I got there, again relieving somebody significantly senior to me.

When Bill retired as SUPSALV, I relieved Gene Mitchell at the EDU. Gene went to SUPSALV, but Bill was still around. Bill was the kind of guy who was pulling strings and being interesting all the time. You remember how you would say that Bill would meddle a lot? I remember a story. There was a great diver named Vic Evans, an LDO diver. He was a lieutenant commander over in OPNAV. Vic stuttered or stammered a little bit and was called 'Vapor Lock' because of that.

Vapor Lock Evans once told me this story. Bill Searle, when he was SUPSALV, had to get something done or wanted to do something and had to get some help in the Pentagon. He got Vic Evans to set up a couple of meetings with him. The way he was, Bill would just blow into an office and take over. Evans told me later that one of those admirals asked, after Bill's visit, "Who was that man? That's the most interesting presentation I've had in a month." Another admiral told him, "Don't ever let that man in my office again. I never want to see him again."

INTERVIEWER: That sounds like Bill.

CAPT. BOYD: That's Bill Searle.

INTERVIEWER: You mentioned earlier the 1140 and the ED communities and the lack of jobs at the top, if you will, and the fact that the salvage unrestricted line officers are being gobbled up by

the explosive ordnance disposal community, who basically do have the bigger jobs or the bigger positions. Being aware of the current fleet level of ships in salvage and the activity in salvage, do you see the law of diminishing returns here, in salvage, for the Navy, as far as capability short of the contractor assets that the supervisor has available?

CAPT. BOYD: Yes, of course. When I was in the Seventh Fleet and the Atlantic Fleet, we had eight ARSs in the Pacific and five in the Atlantic, thirteen salvage ships full of divers, with about twenty divers apiece.

We had a whole bunch of ATFs. Although they weren't my responsibility, we had six or eight submarine rescue ships, all of which had big stores of divers. They're all gone. The ATFs are all gone. There are only three ARSs, and who knows how long they're going to stay around? They get a lot of publicity finding lost airplanes and things like that, but that doesn't pay the bills. Without the submarine rescue ships, there's no need for deep diving. Saturation diving training has just about disappeared. The billets are not there for either enlisted or officers. You're going to get to the point that it is diminishing returns if you are not already there.

It's like the British. They really don't have an RN-uniformed salvage capability. Their divers are what they call 'clearance divers,' which are EOD divers. They have no salvage capability to speak of, other than just basic know-how. They're useful in salvage, but I don't think they're trained in salvage. They have a civilian-operated division in the Ministry of Defense that does their salvage, mostly using contractors. I'd hate to see that happen, but that may be what's going to happen to the U.S Navy.

INTERVIEWER: You and I both recently attended the National Salvage Conference here in Washington, D.C., and you could have taken from that that there will be new regulations coming that could be a shot in the arm for the salvage industry, in terms of more exercise play, and retainer.

Second, the bulk of the salvors today, other than Titan, probably have day jobs in towing and marine construction, et cetera. I'm leaping forward into the post-9/11 world, in which we theoretically think that we have this firehouse capability with these waterfront construction companies. I'm just thinking of some marine terrorist disaster for which my gut feeling is that even on the civilian side, we may not have the resources in the form of hands-on salvors. Certainly, the potential Navy addition of search to that would be somewhat minimal.

I'm just thinking that with this new scenario, recognizing that it's not a defensive issue, just a causal relationship, we're going to have another terrorist activity. It could be a marine one. It could be significant. What would be the capability of the country to respond, recognizing the existing commercial salvage and probably the minimal capability of the Navy at this time? I'm wondering if in the new makeup in NORTHCOM or whatever we have, there is a role there for these skill sets to be employed.

CAPT. BOYD: Are you talking about a military capability?

INTERVIEWER: We're talking about either military or a combination thereof. I'm going back to a marine board contribution you made some years ago. When the threat of 6,000 TEU container ships going adrift and the lack of availability of major towing assets up and down the coast, I think we were looking at station ships or some capability like that, at that time. Incidentally, that is what's done in the U.K. If we had gone forward with that, then I think we would be better prepared. One can think of the fire ship that was sent into the battle in ancient times.

What if someone had the equivalent of a fire ship coming toward any of our major ports or something like that, and we had no snap-on and pull-away capability with tugs of any appreciable horsepower? I'm just posing this to you because I don't want to say you're the last of the salvors, but

you're probably the last of a breed. I don't think the opportunities are going to be there for our people to get experience, but I don't have a good idea on what the fix is.

CAPT. BOYD: Well, it's a very difficult question. Unless the country wants to invest the money, and I don't think it will, the Navy capability will peter away. But if the government wants to invest in standby Navy salvage capabilities, that could be done. After all, the standby aspect of the whole military is just that in normal times.

I don't think it's necessarily the all-plus because the people assigned and involved in that as if they were standing in the firehouse when there's no work to be done, they'll tend to atrophy. Their experience levels will deteriorate, their interests will deteriorate, and they'll get fat. That happened in Europe. Some countries paid for standby salvage capabilities and didn't use them. That happened to the U.S. Navy. In my time, we had three commercially operated former Navy salvage ships under contract and they were allowed to do commercial work. But Navy work, if it came, took priority over commercial work. During my time, those ships weren't impressive in their capabilities. They managed to keep a few old timers on board who were really good men, but the capability that had been there to start with atrophied because of less and less work, and it cost more and more money. There is a downside to paying for standby capability.

Also, a standby Navy capability is going to compete against commercial activity and capabilities, so it's a very thorny thing. We see right now that there's an issue up in the Puget Sound, and I don't know who paid for it. I think the Coast Guard paid for a lot of it. There was a standby tug in Port Angelis, I think, or someplace in the entrance to the Puget Sound. It came time to renew the contract and there was a big question about who was going to pay for it and how much money it was going to take. I think it's been resolved favorably, but you can see if there's no action

to remind people why they're there, it's going to disappear. The sources of the funding will just let it slide away.

INTERVIEWER: Looking ahead a little, you've been around a while. You've been able to observe things both commercially and in the Navy. We're making moves in the technology area, I think, on the heavy lift salvage side. It is 'use a bigger hammer or more hydraulics,' et cetera. But there seems to be a lot of focus on underwater vehicles and the standard diver threat to the vehicle, et cetera, but the vehicles can clearly go deeper than divers can. Are you encouraged with this kind of ocean activity? Forget about our mutual salvage interest, but consider the way we're going forward in the ocean now, compared to where we've been?

CAPT. BOYD: Well, as you know, the commercial diving industry has surpassed the U.S. Navy in its deep diving capabilities. Why? Because they had the need to do it. They have better training facilities. They no longer have to rely on former Navy divers, as they used to, and they're way ahead.

Even so, even in the commercial area, where they have tremendous deep diving, 1,000-foot capability, 1500-foot capabilities, the move is toward doing the job without a diver. If you have to have a diver, a man on-site, the move is toward doing it in a one-atmosphere capability, a one-atmosphere suit or one-atmosphere observation submersible. That's the way it's going commercially, as well. You saw the salvage of the *Kursk*. It was a marvelous job. They used very few divers. The only thing they used divers for, I think, was cutting the holes to put in these big 'flowerpots' to lift the ship. The sawing of the ship in half was done without divers. Except for actually cutting the holes and attaching a messenger, I think all of the connections for lifting it were done remotely.

We have the Navy lifting of the *Ehime Maru* in 9,000 feet of water. That was all done remotely. If there's a need to do something deep, it can be done. It's going to cost a lot of money, but it can be done. You don't have to have divers. As to the second part of your question, the facilities are getting better and better. When we did the Suez, those 500-ton sheer leg cranes were state of the art. Now, there are whirly cranes that are 5000 or 6,000 tons, and maybe bigger than that. Of course, they're terribly expensive. They are big enough to lift the whole oil production platform off of a barge and stick it on the jackets.

INTERVIEWER: While we're talking about technology, what do you think has been, based maybe on our narrow field, the most significant advance in technology in diving or salvage in the last fifty years?

CAPT. BOYD: Well, it was saturation diving, of course, and improved decompression tables. Mixed gas diving has come in the last sixty years or so. SCUBA and closed-circuit SCUBA were very important. In the traditional salvage area, the hydraulic cable puller is a tremendous advance. Instead of having complicated falls of four-part sheaves to pull on a wire, cable pullers are much safer, much faster, and much more convenient.

We already mentioned heavy lift cranes, which were a really significant advance, although not so much in the U.S., high-horsepower tugs. When I was doing it, our 3,000-horsepower ARSs were the best there were. Now, you've got harbor tugs that are more powerful than that and driven, perhaps, because of the mammoth growth in size of ships, but mostly overseas tankers. You have tugs that are 15,000, 20,000, and I think 25,000 horsepower. They're certainly significant to the salvage capability where they happen to be. The biggest salvage organization in the world is Smit, and they've got several big tugs but will take any job that they can. When one of those tugs is towing an oilrig from Singapore to Alaska, it's not available for salvage.

Again, as you say, even the biggest has to have a day job to keep paying the bills. But the bigger companies have a better opportunity to employ salvors and keep them employed, so you can get them to the job when you need it. The philosophy now is to use a fly-away. Don't worry where the tug is. You can get people to a site pretty quickly and make do with tugs of convenience.

Another tremendous advance over the past thirty years is the underwater positioning and locating and precision navigation capabilities. We couldn't do many of the marvelous things that they now do without those capabilities. They've all come in just in the last 30 to 35 years.

INTERVIEWER: This interview is supposed to reflect the last hundred years of Navy diving.

You've managed to plug into the middle of that, if you will, and maybe more so in the back half of the last fifty years, but in your early days, there were probably some, as you mentioned, World War II experienced salvors who did a few neat tricks and survived. But looking back over a hundred years and the history of Navy diving, if you will, do you have any general statement or comment, going back to this past, present, and future idea? In other words, theoretically, we learn from our past, but sometimes, we get a lot of this history repeating itself, as I think you mentioned. Bill Searle and I think that during the beginning of Vietnam, we found ourselves on somewhat of a short leash for resources and things with which to go to work. You've probably seen that cycle more than once or twice in your career, but surely in the last hundred years?

CAPT. BOYD: Well, the divers in 1920 always amazed me. The submarine that sank off the entrance to Honolulu, Pearl Harbor, is in 304 feet of water. I think it was the F-4. Divers dove on that ship using air and managed messengers and wires underneath the ship so that it could be actually lifted and dragged out. It was 304 feet under, and they were diving on air and doing hard work.

It was just amazing how those men could have done that. Even the USS *Squalus* was 248 feet down. They had a hard time, but they did it. Of course, they were just bringing in helium-oxygen mixed gas diving in those days, and I think this was the probably the first operational use of mixed-gas diving.

In fact, as I recall, I think they took divers from the EDU up to do the job. They did all the diving. The salvage ship, the USS *Falcon*, had divers who probably weren't trained and didn't have the equipment to do the helium-oxygen diving. It just seems that those Paul Bunyans of the past aren't around any more. Will we need them in the future? Sure. We need not only physically fit but smart people. Will we come to a time when we find that we suddenly need to significantly expand the traditional Navy diving community? I don't know. I just don't know. It's hard to maintain for a whole career, especially experienced officers. That's what you need, career divers and career salvors. It's hard to maintain them as an appendage to the Navy when they have limited funds and requirements for other things.

Like the fire department, they don't get the attention they need to keep them going until they want them. Then, they find out they're not there. Incidentally, speaking of the fire department, you ask, "Well, what's wrong with the fire departments in the U.S.? What's the analogy there?" Well, the analogy works because firemen get exercised all the time. They're in use all the time. If you go to the fire department in a small town made of brick houses, where they don't have fires, they have volunteer fire departments. Even if they had a full-time, professional, fire department, they would atrophy just like a standby salvage ship would if it didn't have things to do.

If we came to a need tomorrow and had to vastly expand our diving capability, I wouldn't be surprised that the route would be to recruit trained, experienced divers from the commercial sector. Even in our day, if you needed to do underwater welding, the Navy diver was trained to do it. He

didn't do it very well because he didn't do it very often. If you wanted a professional welding job done underwater, you get a professional. The way the commercial people do it is they take a welder who's a good welder and they train him to dive, not the other way around.

INTERVIEWER: That leads to this, and I think you alluded to it earlier. You were a salvage officer, salvage engineer, salvage master, and a diver, and a lot of people think that diving is your job. As you understand it, as I glean from your remarks, you really have to have a reason to dive. It's a tool to use to do what you want to do, be it explosive ordnance disposal or maybe more of a uniquely commercial diver, but he'd better be a skilled artificer. I think that some people lose sight of that, that it's just a tool in your sea bag. You mentioned in your earlier remarks how it was a valuable capability to you. You've been there, done it, gotten the t-shirt, and were able to, on occasion, get in, get down there, and get a first-hand look at the situation before you drew any conclusions or started any analyses. My sense is that in the Navy diving world, some of these guys are still thinking they're divers when they really should think that they're salvors, EODs or SEALs. I think you mentioned picking up airplanes, which now seems to be the only work we've got because ships don't seem to be going aground. But if you do not have the other skill sets, being a diver, in and of itself, isn't all that much unless you're going down to Cancun or something.

CAPT. BOYD: That's right. We don't train divers to put on their flippers and SCUBA gear and swim along a pretty reef. That may be rewarding, personally, but we're not going to pay people to do that.

INTERVIEWER: Well, Captain Boyd, this more or less concludes the interview. I appreciate your time. I think that was a great summary of the Suez Canal. In fact, I, having been a student of the Suez Canal, picked up a few more points that I didn't know.

CAPT. BOYD: I have one more little story in which you would be interested. When we salvaged the *Card* in Saigon in 1964, we became very concerned about the Saigon River. It's fairly narrow in many places and a torturous trip to Saigon. It has a large tide. It is surprising how large the tide is all the way up into the city of Saigon. We were concerned that the river could be blocked easily. We used the *Card* incident as justification to form the first post-World War II harbor clearance unit. But we also needed heavy lift ships. The last of the U.S. Navy ARSDs had just recently been decommissioned, and they had been sold. They just weren't going to be coming back. Bill Searle, who was the Supervisor of Salvage at the time, was interested in the British lift craft. The British had some heavy lift ships, some of which were in Singapore. He was wondering about leasing the heavy lift ships from the Brits. In the meantime, the Philippine navy flagship, the *Raja Solomon*, a former U.S. Navy DE, was sunk alongside the pier in a shipyard in Marvellis. That's in Luzon, forty or fifty miles south of Subic Bay. The ship was down for boiler repairs and moored alongside the pier. A typhoon was coming. It was expected to peter out as it crossed the island. It didn't. If they had known, they would have taken the ship out and put it to a buoy. But it was alongside the pier and the power failed, of course, and the ship beat against the pier. As they always do, it capsized toward the pier. What happened was the ship beat away the fendering and pretty soon, there was nothing but big bolts and brackets and stuff like that. They punched a lot of little holes and maybe some big holes, too, in the side of the ship, so it capsized toward the pier.

We heard about it and Gene Mitchell, then the PACFLEET salvage officer, Bill Searle and I went to Singapore. En route, we stopped to see the *Raja Solomon* and the Philippine navy was making a desultory effort to salvage the ship. You could see they weren't going to get anywhere. We saw there was an opportunity to demonstrate the use of lift ships and to establish a precedent of leasing these ships from the Brits. We told the Filipinos that in terms of the lease of the ship, once

in excess of your need, it returned to the U.S. Navy. That was, of course, to keep them from selling it to a third country or something like that. Basically, we told them, “If you can't salvage the ship, you have to say to the U.S. Navy, ‘the *Raja Solomon* is excess of our needs. Come and get your ship.’” They did that. We built the story that we needed the lift ships to salvage the *Raja Solomon* and the easiest way to do that was to lease them from the RN in Singapore. We got them and used them to raise the *Raja Solomon*, first to parbuckle it and get it upright, then to get it to more shallow water, where we could pump it up and re-float it.

In fact, we never needed the ships. Lift ships are most useful when there is a significant tide. There is only a two-or three-foot tide in Marvellis. You'd use up the tide just stretching the wires to do the lifting. Nonetheless, we proved that we needed and could use the heavy lift ships. That led to leasing more heavy lift ships for use in Vietnam and ultimately buying the two German heavy lift ships, which were twice the capacity of the biggest British ones. Actually, they were three times the capacity of the ones we used in Marvellis. But the U.S. Navy did lease, I think, four of the British heavy lift ships for Vietnam, operated by Harbor Clearance Unit One, and ultimately the two big German ones, which were renamed after two former Navy divers, *Crilley* and *Crandal*.

(Whereupon, the PROCEEDINGS were adjourned.)

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UNDERSEA & HYPERBARIC MEDICAL SOCIETY

INTERVIEW OF ADMIRAL IRISH FLYNN

Wednesday, March 17, 2004

PROCEEDINGS

INTERVIEWER: It's March 17, 2004, and this is an interview of Irish Flynn by Dick Vann.

ADM. FLYNN: Happy St. Patrick's Day.

INTERVIEWER: Well, Happy St. Patrick's Day to you, you old Irishman.

ADM. FLYNN: Well, let me give you just a synopsis of my time in the teams. I joined the United States Navy in 1960 and went through UDT training. I went through replacement training at Little Creek that same year, and I reported to UDT 11 in Coronado in October of 1960 as an ensign, USNR, and served in UDT 11 until 1963. I was in SEAL Team 1 from '63 to '65, staff duty in Washington from '65 to '67, and SEAL Team 1 and UDT 12 from '67 to '69. I then had various school and staff duties until I returned to Coronado as chief of staff of Group 1, in 1977. That lasted until 1979. Then, I had more duty in Washington, followed by command of Group 1 from '81 to '83. It was in those times that I was in the Naval Sea Systems Command in Code OOC from 1970 to 1972. At that time, I was involved in the acquisition of SDVs and the diving systems. When I got to the teams, I hadn't had diving training on the east coast. In those times, you went through UDT, reported to the team, and then the team sent their new people to Key West for diving training.

INTERVIEWER: Can you tell me when the underwater swim school was started?

ADM. FLYNN: Oh, it was long before then, long before 1960. I don't know what date that was because I never attended it.

INTERVIEWER: Oh, okay, fair enough. Sorry.

ADM. FLYNN: I came out to Coronado and was in the teams for some months before there was an underwater swimming course for team members. I did not do it with the trainees. On the west coast, SCUBA training was part of UDT training. When the people came to the teams, they had already had SCUBA training.

Well, not having had that, I was in a pretty small class with just a few people. It was run by the UDT section of the amphibious school, and Kevin Murphy was the principal instructor. Kevin, as you know, when he retired, went on to work for U.S. Divers. He's a very accomplished guy and knew his diving physics and diving medicine very well. Various corpsmen, and I could dare say the doctor, lectured in that course. What we learned to do was swim and dive with aqualungs. We did free ascents with a bell that was suspended from a Mark 6 LCM, which was used as a diving support by the UDT. It went out by the entrance of the bay out by Ballast Point. You free ascended from about 35 feet, rather than the 100 feet or so that east coasters probably did at New London.

INTERVIEWER: Do you recall who the medical officer was, the DMO, at the time?

ADM. FLYNN: The first one, I don't recall his name. There was a doctor there who nobody had very much confidence in because there had been an accident on the strand, and the guy was pulled out of the water. He died, and the doctor pronounced him dead, but the team members thought that not enough had been done to resuscitate this guy. I thought there was an awful lot of emotion in that, rather than science. Why would the doctor have said he was dead if there were any signs that he was still alive or capable of being resuscitated? Anyway, that was the knock on this doctor, and he wasn't there for very long before he left.

What was I trained in? We still had Pirellis in the team. That was not a circulation thing, but they were phased out. There were just a very few of them left.

INTERVIEWER: The Pirellis were a pendulum system?

ADM. FLYNN: They were a pendulum system. People used to call them the 'black death' because you could have a problem of just re-breathing, literally, the same air without it going through the canister and getting oxygen depletion combined with CO₂ build-up if people were working hard with them.

The Italians had used them principally for charioteers who were riding on, in effect, SDVs. The Americans used them while swimming horizontally with a very high work rate of underwater swimming. Maybe that was part of the problem with them. But all I recall is that there were a few of them still on the team. What I was trained in, in addition to the aqualung, was the original Draeger. I think that was the Mark 5 Draeger.

INTERVIEWER: Was there a Lund Draeger?

ADM. FLYNN: It was the Lund Draeger, and it was an excellent diving rig. I enjoyed swimming it because it was super for getting in and out of boats and things because it was lightweight. To my mind, there may have been a good reason for going away from it. The good reason was that they weren't able to get repair parts, particularly to repair the bags, which were inclined to leak because they didn't have clam shells over them, as the later Draeger has.

INTERVIEWER: Did the Lund have a circuit system or was it a pendulum?

ADM. FLYNN: It was circulatory.

INTERVIEWER: It was?

ADM. FLYNN: It was an excellent piece of gear. You were able to keep water out. Occasionally, if you weren't careful, you could get sea water around your mouth. Some of them had pin prick holes in the bags, too, because they were wearing out. You could get water in that way. When you did, you got a caustic wash into your mouth, but that only happened to me once or twice in a good bit of swimming, and I only got it into my mouth. I didn't get a good lung full of the stuff like some guys did.

INTERVIEWER: Can you compare the Lund with the new Draeger LAR-5?

ADM. FLYNN: Let's see. How does it go? The bottles, were they in the back? The oxygen bottles were, I think, in the back. In your front, you had your bag. Within that bag, fitted in through

the bottom, was the canister. Frankly, I'm not positive of that. The oxygen bottles may have been down below the canister. But it was very likely the Mark 5, with the exceptions of the clam-shell and the positioning of the oxygen bottles. The oxygen bottles on the Mark 5 were in front, and they were behind with the Lund and lightweight. It was made for combat swimming, but we did comparatively little swimming with it.

The swimming that we did with it was typically off the strand there in Coronado. You got a boat, loaded it through the surf, and were taken off 1500 yards or a mile and did swims in, with the target being the headlights of trucks on the beach. We also did that in the bay. Very occasionally, we would actually do attacks. We did do attacks with them out at sea off San Clemente. I remember doing that and doing a good deal of diving.

For example, when we did lock-outs from submarines, I don't recall ever using the oxygen rig. We used aqualungs and hooka rigs for that. We did hooka rig ascents and occasionally free ascents, buoy ascents. As I said, there were parts problems with them. Then, somebody got hurt with one somewhere. I think it was on the east coast. There was somebody killed on it, and people said that it was an unsatisfactory piece of gear, and NAVSEA designed something new to replace it, the Emerson.

INTERVIEWER: What year did the Emerson come along?

ADM. FLYNN: I'd say it was 1963 or so.

INTERVIEWER: Did you ever have one?

ADM. FLYNN: Yes. When I went to Vietnam in 1964, the CIA had bought many Emersons for the Vietnamese to use. They were pretty hopeless pieces of gear, but we trained the Vietnamese in the use of the full-scale Emerson. I must have gone through Emerson training perhaps as early as 1962, certainly by 1963.

INTERVIEWER: How did you find the Emerson in comparison with the Lund?

ADM. FLYNN: It was clunky and noisy. You had the clam shell in the back and bags in the front. From the swimmer's point of view, once you were in the water, it was okay. But it was an engineer's design, rather than a war fighter's design.

INTERVIEWER: That's a tactical disadvantage, isn't it?

ADM. FLYNN: Tactically, it was a bit of a mess. It looked like a mini Mark 6. Instead of being compact, like something that you could put into a kit bag, it was bigger and had the problems of noisiness and visibility. We came up to take a look with a Draeger. There was nothing particularly visible. Since it was very lightweight, you could go across a beach very handedly with it. You could turn off the oxygen supply, close the mouthpiece, and run around with it because it was so light.

The Emerson wasn't all that heavy, but it was a noisy bugger with that plastic thing. If you banged into anything, it didn't make a great deal of noise, but it made some noise that you didn't want to have. Also, even though it was painted black and things would scratch, it was a more reflective surface. Again, it was perfectly okay to swim it. At the same time, I was introduced to the Mark 5 mixed-gas rig and trained in that.

INTERVIEWER: Now, the Mark 5 was a predecessor to the Mark 6?

ADM. FLYNN: That's right. The Mark 6 is a better piece of equipment than the Mark 5.

INTERVIEWER: What were the differences?

ADM. FLYNN: Gosh, I don't recall. I think it was somewhat more complicated to set it up with the gas settings. As I recall the physics end, the calculation of your equivalent air depth, equivalent of the dive and repetitive dive tables, they were very, very similar. They may have had less flexibility in setting. I recall 60-40 as being a typical mix, and I think it may have been a little bit

bubblier than the Mark 6. You got a larger stream of bubbles from it. I think it was more cumbersome and heavy. But neither was a particularly good underwater combat swimmer thing. They just weren't particularly made for that. They could have been fairly decent in SDVs, but we didn't have an SDV worth anything at the time.

INTERVIEWER: I recall my experience swimming around pilings and harbors with the Emerson. It was so noisy.

ADM. FLYNN: Bong.

INTERVIEWER: Yes, whereas the Draeger was all in front of you, and you could protect it. It made a big difference.

ADM. FLYNN: Yes. That was the way that I found it, and it was a difference of approach. The difference of approach, if you want to know my understanding of it, was that we were never all that serious about going to war this way, because the United States didn't need it. The United States had a huge Navy with lots and lots of submarines armed with torpedoes and lots and lots of carriers with bomb-carrying planes. For example, if we screwed around with the Vietnamese, having them attack in North Vietnam, it was more a pin prick than a serious way of destroying the aircraft. But when the United States, after the Tonkin Gulf incident, really wanted to destroy them, they just bombed the heck out of them.

Now, the Italians, in the Second World War, needed to have something pretty slick to get at the British targets in the Mediterranean. They had the underwater swimmers and the establishment at La Spezia in order to do that. When I, along with Gene Mitchell and Chuck Lemoyne, visited La Spezia in 1972, they were still very seriously into that because they didn't have the reach with their conventional Navy to get to Russians and others. They were thinking of Russian surrogates. Where

the targets were, I'm not all together sure, but perhaps they were in the Adriatic and maybe even going into the Black Sea. I'm not sure.

On the other hand, when I joined the teams, part of the notion was to use SCUBA for taking the World War II beach reconnaissance and doing it underwater. Teams put forth immense efforts, particularly with the Mark 6, into doing that on the east coast, where we had nice, clean, clear water and a good environment to do it in at St. Thomas.

INTERVIEWER: Can you summarize that effort, program and what difficulties led to it not being successful?

ADM. FLYNN: The underwater reconnaissance of beaches?

INTERVIEWER: Yes.

ADM. FLYNN: It was essentially an attempt to do underwater what was done on the surface. From the surface, the attempt was to do a 50-yard grid from the three and a half fathom line into the water line of taking soundings in depth and in the shallow gradient that was a very large area. Even in a medium gradient, it was a large area with a fair amount of surf breaking over it, with the surf effect reaching down to the bottom sometimes.

People were. to establish this grid, were using great long flutter boards with lengths of line many hundreds of yards, and swimming with compasses to lay out a base line. Then, people were swimming a base line parallel to the beach. People were also swimming vertically from that with compasses into the water line.

It involved an awful lot of swimmers, fairly problematic about whether they were actually doing things on an accurate grid. Those parallel lines into the beach perpendicular to the base line I dare say a lot of them crossed. But what you did get was a fairly good impression of what that beach area was. Were there any rocks, shells or really prominent sand bars in it? You could get

that from this evolution, but you could probably get as much useful information by just two or three guys doing it.

INTERVIEWER: Did they ever do a comparison between a conventional hydrographic reconnaissance to see how the charts compared?

ADM. FLYNN: Probably, yes. When they really had it going well, after lots and lots of practice, you could get pretty good at it. But it involved either a really strange thing by which you were going through all this effort to do this underwater, but you've been delivered by an LCPR or an LCPL that's on the surface, so you have to say, "Huh?" We could approach this beach in a boat, and nobody was going to do anything about it, or it involved doing it from a submarine.

In most places, the gradient was such that for a submarine to have enough water under it to do the lock-on, there was only a very limited number of boats that could bottom. You were out there in fairly deep water when you were locking out, which meant a long haul to the beach.

Typically, people would lock-on through a standard escape trunk. It would be two, three or a maximum of four at a time, and they would breathe air from bottles that were tied along the deck of the submarine, until everybody was out. On a signal, they'd then take off. It was a complicated business because people had a lot of gear, their buoyancy could be off a bit, and we lost a really good sailor who was swimming with Bob Valentine off San Clemente. They came off the beach. We were going to swim from the submarine into northwest harbor someplace, where there's a beach, and do this evolution. They had all this gear with them. The guy was holding this gear and getting ready, having just come off the deck of the submarine, and he went into the screws of the submarine.

INTERVIEWER: Oh, gosh.

ADM. FLYNN: He was last seen going down into very considerable depth. Valentine followed him for some depth, but it was probably, oh, a couple of hundred fathoms there, so there was a limit to how far he could go. That man died. He probably was using an air SCUBA because the description of it was that the manifold was broken by the screw, and all these bubbles were coming out. Mercifully, one hopes that he was hit in the head by the screw and killed by it, but we don't know.

It had those disadvantages. What you had to do when you had a submarine that could not bottom, the submarine was doing an approach while you were doing this. Then, when it was at the closest point to the beach, and you knew the course would be from your drop-off point, they would flash a light in the escape trunk. That was your indication that you were at the drop point. This guy would give a signal and everybody would roll off the deck of the submarine and go to it.

Well, if they had the currents right, if the submarine could come in during the first instance and gauge what those currents were, well, maybe you could make it to the right flank of the beach. But you were starting to build up errors along the way, and the compasses were notoriously unreliable, as were the depth gauges.

The depth gauges that we had on the tack boards were not all that great, and you'd tap them to make sure that you weren't exceeding depth. But that usually wasn't the problem because people swam fairly close to the surface, and it could be done using the extended duration that the Mark 6 gave you.

But from the point of view of going to war against the Russians, would you really want to have a submarine screwing around in that shallow an environment, that close to the shore, with a fair amount of bubbling coming to the surface, a fair amount of underwater noise from all of this? Among other things, you used to rendezvous with the submarine. You lined up on the line and

snagged the periscope, so they had to have a periscope up, which was not a healthy thing to do that close in. You would also do everything from banging on pipes to signaling with an underwater sound generator, an acoustic signal, and none of that were healthy things to be doing in a defended area.

But, lo and behold, we did much of it in Vietnam, but on the coast. An awful lot of the coast of South Vietnam was surveyed and surveyed again and again by units that were supported by a submarine such as USS *Tunney* and also by detachments that were out on LPDs, the USS *Cook* and *Dyshenko*. The way of doing those beach surveys wasn't an awful lot different when it was done from the submarine, because it was done from the surface with IBSs out. The swimmer would swim into the beach with a line, with the swimmers coming off one or more IBSs as bunting came up on 25-yard intervals or 50-yard intervals. You'd start at one flank and just go down with the IBS. A guy would walk along in shallow water at the inboard end and take soundings as it went along, guesstimating the lateral distance along the beach as we were doing it.

We got a fairly accurate reconnaissance of beaches that already had been reconnoitered three times by then. That really didn't change an awful lot. During the monsoon season, you got some shifting of sand bars but not enough to make a difference as to whether an amphibious landing could take place on them.

INTERVIEWER: This was really an operational use of the underwater hydrographic reconnaissance?

ADM. FLYNN: No. What we did was on the surface. All those swimmers were on the surface.

INTERVIEWER: It was all done on the surface?

ADM. FLYNN: It was all done on the surface, whether by night from the submarine or in broad daylight from the APDs. There has got to be a better way of doing this underwater thing. One way

to do it is with a lot of the components of the swimmer support system, the need for a long-range, bubble-free, mixed gas rig leading to a very good piece of gear designed by Westinghouse. For complicated reasons, we went away from that to the General Electric mixed-gas rig, which was really big and cumbersome.

INTERVIEWER: Was that the forerunner of the Mark 15?

ADM. FLYNN: It was the Mark 15.

INTERVIEWER: It was the Mark 15?

ADM. FLYNN: Yes. It was the forerunner of the Mark 15; it became the mark 15.

INTERVIEWER: Well, what was the Westinghouse rig that you had liked?

ADM. FLYNN: Only about two or three prototypes were made, and when I was in NAVSEA, I bought the argument that we ought to have a common rig, that we were going to use this General Electric rig for both deep diving excursions for saturated divers and also for our purposes. I think that what really went on is that General Electric had undo influence with some of the guys who worked for Gene Mitchell.

INTERVIEWER: Interesting. What year was that?

ADM. FLYNN: That was 1970, because when I was in the Pentagon, in 1965 to 1967, we launched the operational requirements documents for the swimmer weapon system and the swimmer support system.

INTERVIEWER: My gosh. It really takes a long time for those things to mature, doesn't it?

ADM. FLYNN: Oh, God, yes. But what we were looking for was an SDV, a large people carrier and a smaller one, and one that we hoped would be stable and operate effectively in shallow water, and that became the Mark 9, the flat boat with twins.

We were also looking for a very low acoustic signature, a bubble free, mixed-gas rig. Then, we were looking for a way of doing that underwater reconnaissance by incorporating inertial systems into an underwater system and acoustic triangulation on it by putting out buoys as closely as possible to the known distance. We were trying to triangulate from that when swimming in what was called the 'swimmer navigation reconnaissance system,' I think.

We worked on that a good deal to try to get it to work. I think eventually, long after I was the Commodore in Coronado, and that was up until 1983, that came to pass. In the meantime, we got involved in mine hunting, using the Mark 6 and then the Mark 15. The Mark 15 was a little bit dangerous because what we really needed was the EOD version, the Mark 16, to screw around with mines. But the idea of landings on the coast of the Warsaw Pact did actually say, we're going to encounter mines on that, or if we have to go into North Korea, we're going to encounter mines, and those mines in many instances are going to be scoured. They're going to be covered by sand.

The way we were graded in mine countermeasures exercises was people would put in mines. They would fairly promptly scour under the sand. At any rate, they were going to be pretty darn difficult to find unless you actually swam right up to them. We were fortunate enough to do that, and these things were sprinkled along Coronado Beach, for example.

Then, you got graded on your ability. If there were twenty mines put in there, and you only found two, well then you were a bunch of bums. I argued, unsuccessfully, saying, "Hey, we found two mines." We had to say they probably just didn't fall off something. It was an indication that there was a mine field there. That was already a great accomplishment. What we had to do was go back by other means, concentrate overhead collection using water-penetrating optics or lasers in order to do it, blue, green lasers and the like. We had to do that in order to be able to take a really

good look at that bottom, take away the clutter and see whether there were any anomalies on that bottom indicative of the presence of mines.

Further, we should ask ourselves, “What's the beach lane doctrine of our opponents?” If you find two or three mines, as we did, what can you assume about where the others should be laid out? Can we then use that to go back and look for the others on a separate mission if we do have to send swimmers back?

INTERVIEWER: Would you clarify the mission with regard to shallow water mine hunting and the teams in those days, particularly as compared to EOD missions?

ADM. FLYNN: EOD would be used, I think, to render these things safe. As in the Second World War, the frogmen were looking for beach obstacles, some of them with small mines attached to them. That became our job. Now, what we were saying in the late 1970s and early 1980s was that the fact there were no obstacles along the beaches did not mean that they were not defended. They were probably defended by a lot of mines, cylindrical mines. Then there were plate mines, and there were various kinds of them developed by Warsaw Pact nations. These things would have very seriously complicated and led to the defeat of any amphibious landing craft.

The Navy was going at it through several approaches. One, they had to find out if the mines were there. That was the UDT job. They thought of a number of ways of having to deal with the mines. The problem was getting rid of the mines way ahead of time. Well, you might be in peace. That was not a good time to be letting off explosives off the coast of another nation. If, on the other hand, you wanted to get rid of them and leave such a short interval between the clearance and the actual landing that the enemy wouldn't be expecting the landing, and defeat it by other means or leave them with enough time to replace the mines, what you had to do was have some way of getting rid of the mines practically instantaneously before the landing or in the course of the

landing by using line charges and other things to clear lanes. It was a big problem then. I don't think that the Navy really solved that until the Cold War was over.

By 1982, the UDTs had been re-designated as SEAL teams but with the combined missions that formerly belonged separately to SEAL teams and UDTs. They were to go in, in a way that they would not be discovered, so again, it involved operations from a submarine. We did these practice things with swimmers. The real way to do it was with an SDV and to figure out in an operations analysis how many discrete cross sections of a beach would you need to take and not find mines, in order to determine that the entire beach was not mined. You couldn't go over every square yard of the thing underwater. We needed courageous operations analysis to be able to say, "If you do this, this and this and you don't find a mine, then the probability of that beach being mined is 0.01 percent."

INTERVIEWER: That was a statistical problem, wasn't it?

ADM. FLYNN: You had to know doctrine. It was a statistical problem, and you had to know the enemy's doctrine about how he was going to put mines in there. If there were only one or two mines in there, and say you're invading Russia or the coastline of one of the Warsaw Pact nations or North Korea. You expect to have some losses. If you mess around, trying to find every single mine in there, what will happen is you'll be discovered doing it. The enemy is going to know that that's where the landing is going to be. They had to trade off those things. Now that was the reconnaissance mission. The other mission was the attack mission. Initially, we started building capability without really figuring out what we were going to attack and why underwater attack by swimmers was going to be the preferred means of attacking.

For example, if you had to have a submarine deliver you most of the way to get into an SDV and go put a limpet mine on a ship, why was it not better for that same submarine just to lay

some mines at the entrance of that harbor so that you were going to go through all the excruciating difficulty of getting the limpet onto it? When that ship came out, it would be destroyed by the mines or at least give the Russians a sense of having to deal with the mines before their ships could come out of that port. There was a lack of adequate strategic thinking about it, and part of that was because we didn't have sufficiently senior people at the time. Our senior people were captains, and we were given fairly respectful hearings on those. We started to get SEALS like Bob Mabry and Bruce Dyer, for example, onto the 7th Fleet staff. Similar efforts were made on the east coast to get people on the 6th Fleet staff.

There were commanders and lieutenant commanders on the staffs of the fleets, with views of looking at things in an integrated way and determining in what circumstances it is best to risk putting people into the water to attack things. One of them was to go after a nest of mine sweepers in a port at the southern end of the Kamchatka Peninsula at the La Perouse Strait. The whole idea was to mine the La Perouse Strait to keep Soviet ships from coming out into the northwest Pacific. But you also wanted submarines or aircraft that would be laying the mines to get the mine sweepers.

There you were, in a pretty tough place up there at the southern end of Kamchatka or Sakhalin. Anyway, the water was cold. I don't know what acoustic conditions were like. You were going to be using an SDV, coming out from a dry deck shelter. That was a long evolution with the submarine going slowly at shallow water, a dangerous place for a submarine to be in a hot war.

Again, it depended very much on how accurate the navigation of the SDV was. We had put into them acoustic Doppler sonar navigators, with which you bounced signals, preferably off the bottom. By measuring the shift of the return, you would know where you were going at all times.

INTERVIEWER: What year was that?

ADM. FLYNN: We started developing and had the prototypes of those systems in as early as 1972. Working on attacking these things was into the early 1980s. I was working on it when I was with Group ONE, in 1981 to 1983. You know that the LAM was the Limpet Assembly Modular?

INTERVIEWER: Yes.

ADM. FLYNN: It was fifty or a hundred pounds each of those beer keg-like components. You could put several of them together with one firing train, and they were neutrally buoyant but still not all that easy to handle in and out of an SDV. There were a fair amount of explosives in a submarine, so there was a lot of effort to make these things sub safe but still have assurance that they would detonate. You didn't want to go through all of that, a very tough evolution of taking the SDV into a Russian port during a hot war. In order to be able to rendezvous with the submarine, to be able to deal with the succession of depths, you needed to be able to ultimately end up on oxygen for the last several hundred meters of the evolution and you were operating under the target. That led to the requirements for tables and being able to do the diving with a combination of several breathing media, mixed gas with the Mark 15, perhaps some of it done on air and then some of it on oxygen. You also had to be able to switch breathing media underwater. That was the kind of work that you were doing, Dick.

INTERVIEWER: Yes. That suggests to me how important it is to get the operational community together with the research community so that the researchers will have a perception of the operational limitations and requirements. I think that's missed so often in research that there's a tendency for researchers to go off in a direction that has a devil in the details.

ADM. FLYNN: They can come up with something that's physiologically sound and engineering-wise works but isn't the way that you have to use it in the mission.

INTERVIEWER: I'm sure that still goes on.

ADM. FLYNN: Well, I hope that they're breaking through on that. For one thing, the operators have to be explicit about what they want to do. Can you attack with aircraft-dropped delivered torpedoes? Can you attack the Italian fleet? Well, the British did that at Toronto, but one of the things they found was that Toronto had shallow water, and the bloody torpedoes would just stick into the bottom on the initial drop, so they had to modify the torpedoes and their procedures. All of these things are very sensitive to what it is you want to do. There are two things with the SEALs and the special warfare community. Now, they have admirals and all of that, but they still need to be talking to the theater commanders and chiefs to the war-fighting four stars and their staff saying, "We think we can do this. Is it of value to you? It looks like it's of value to us, and here are the circumstances in which we can do it."

Well, then you need to go get very fine grained about your operations analysis, of what do you need to do in order to accomplish this mission. Then, you say, "Oops, we've got to go to 500 feet on this." It's most unlikely, but let's say that. You need to go talk to the Dick Vann's of the world and say, "Okay, we've got an excursion to 500 feet in this. How do we do that? Okay, we need new tables, and by the way, the gear you have won't do it." But they're very much needed. The British are very good at that, getting what they call the 'boffins,' or the researchers, the scientist engineers and the physiologists, into the operational planning.

INTERVIEWER: Right. That makes very good sense, and from recent projects, I still think that on this side of the pond, it's not always done.

ADM. FLYNN: What can happen if you don't know what it is that you ultimately want to do? You can build a whole lot of capabilities that remain unused in search of a mission. You build a capability and then you feel there's got to be a mission for it. Well, not necessarily. It can be a huge waste of time and a waste of lives, by the way. For example, as you know, in the SDV work,

the men doing that were unintentionally put into very severe physiological stress. Some of them have died from it, from hypothermia, in missions. A young man at Keyport went into irreversible hypothermia. You know all the problems of dropping blood pressure from fluid loss and everything in those operations. I don't know if we are ultimately going to solve those things or if we're going to rely on tough guys.

Some of these guys, like Fletcher and some of the really good SDV guys, I talked to them later and said, "How did you prepare for these things? Would you build up your carbs beforehand?" The guy said I'd be so busy getting that damn boat ready that I'd have a can of Coke and a Twinkie before I got in it to do the mission.

INTERVIEWER: I know the scenario.

ADM. FLYNN: Or I would have a good cup of coffee. But they were brave, adept, absolutely unbothered by all of the darkness and cold and everything underwater and were enormously assisted by the kind of work that you were doing.

Ultimately, the Cold War ended, and I don't know what kind of missions people are thinking of for ASDS, the miniature submarine that is going to attach to a parent submarine. But it seems to me enormously important, again, that the research community knows what's involved in that. How deep do they intend to lock out from that ASDS? If it's very shallow water work, then you might have problems with embolism, because you're in an environment in which the pressure changes rapidly as you ascend between fifty feet and the surface. You've got to watch what you're doing from that point of view, but you don't have problems with the build-up of gases. But you need to understand that because damned if I know what they're going to do with that thing.

INTERVIEWER: Yes, sure. Well, let's touch on one point here as much as you can. That is the actual operational use of combat swimmers in either an attack or in reconnaissance, with breathing

apparatuses. In my understanding, that has not happened very often within the U.S. Navy. I think the one that I'm familiar with was the hit on Noriega's patrol boats. I think the one down in Cuba was actually done by Cuban swimmers, but we assisted. There was also the one that you mentioned about going into North Vietnam with the LDMN's.

ADM. FLYNN: Yes. In North Vietnam, we were training people, and they were really quite good. We were training them around Da Nang and in the Da Nang River. They could swim fairly prodigious distances.

INTERVIEWER: Were they using Mark 6's or Emersons?

ADM. FLYNN: They were using full-scale Emersons, and they were pretty good at it. But when they actually went to attack, they got caught and inevitably would be looking back on it. What it involved was going from Da Nang, in a swift boat, 150 miles or more to some place, like Dong Ha. That was not the smoothest ride in the world.

Then, you got into a rubber boat from that and went in the rivers of Vietnam, which are typically silted and have bars where they meet the sea. You needed to get around that and then launch the swimmers, and to do that, we tried to show them in maps and otherwise what they were facing. God knows we didn't realize what the currents were. This particular pier was tucked around a corner, and it was a fairly considerable swim to get in there with these limpets, attach them, and get away. We put them to the test by taking them up one of the local rivers and doing a full mission profile, a full simulation of it, and they did pretty well. But they were actually pretty gutsy guys who, when they found that they couldn't make progress in the water or whatever, just went ashore and walked along the shoreline to get to it. We didn't know that until after they actually went on the live mission.

INTERVIEWER: This was in the simulation that they went onshore?

ADM. FLYNN: The guys wanted to do it. They were good fellows, and by the way, that's something to watch out with the frogmen, too. Did you succeed in doing the mission? Yes. Now, tell me exactly how you did it. They may have done something that they could get away with at Little Creek or off the Silver Strand but aren't going to get away with off North Vietnam. That, in effect, was what happened. Those guys got captured, and the North Vietnamese held show trials with them. They were put into North Vietnamese jails, and I don't know what ultimately happened to them, whether they are still in jail or whether they've been released.

INTERVIEWER: About how many swimmers were involved?

ADM. FLYNN: There were four. The limpets were CIA limpets. Probably, the fusing on them was okay, but they were pretty small charges, with perhaps a kilo of explosives in them, but it was enough to blow a substantial hole in a patrol craft. Again, the United States was trying to create the appearance of a North Vietnamese resistance force, a North Vietnamese Maquis. It indicated to them that we were in the position to increase the support and recruitment of that. They were going to have just as large a problem with the resistance in the north as we were having with the Viet Cong in the south.

INTERVIEWER: I see.

ADM. FLYNN: It was utter malarkey. There wasn't a prayer of bringing that on because they never actually recruited anybody in the north. It was all the attacks from the south that were staged in ways to make it look like we were sabotaged by people in the north, which complicated all the mission planning because it wasn't straight forward 'let's-sock-them.'

Finally, we got away from that and just shelled them from the sea, which led to the Tonkin Gulf activity and other those things that were not good. But you're right. The only time when we actually launched was against Noriega's patrol boat down in Panama, and the guys who did it were

fine. They were doing their mission, and they did it well. Whether that mission needed to be done is highly dubious. Whether we ought to have been doing it in a way that was going to kill Panamanians was even more so. Why? We had been training with those guys days before. The United States Navy had a considerable presence. We had an Admiral down there who was training their navy, and it was not stopped. Aspects of it are Pearl Harbor-like, with us on the bad side.

INTERVIEWER: That's interesting. I've talked to a couple of the swimmers who were there, and it sounded like a really well executed mission just on the operational level. There was a lot of interest from the point of view of the swimmers, and that's what you would expect.

ADM. FLYNN: Norm Curley, I think, was the Commanding Officer of the team. He was one of the best operational guys. He fought operationally and lived operationally, and he had Team Six experience, too, which was highly operationally oriented. That command atmosphere probably beneficially affected everybody, including the guys in the water.

INTERVIEWER: Oh, sure.

ADM. FLYNN: Again, I want to distinguish two things here. I don't imply any criticism. On the contrary, there's only praise for the guys who did the mission because they were given that mission to do. But from the point of view of coming up a few echelons in command, I think it was a dubious mission.

INTERVIEWER: I see.

ADM. FLYNN: The other mission, using SDVs, was the one on which Spence was killed.

INTERVIEWER: Oh, yes. Now, that was, I thought, just a decoy for a prisoner raid?

ADM. FLYNN: People were escaping from the prison camp and coming down the river. "Mokey" Martin, who lives here in town, was on that mission.

INTERVIEWER: Oh, yes.

ADM. FLYNN: Lt. Philip Martin.

INTERVIEWER: Yes. I know Mokey. Well, that's very interesting. There was a book written about that. Had you read that book?

ADM. FLYNN: No. I haven't.

INTERVIEWER: It's called *Operational Thunderbolt* or *Thunderball* or something like that. I've always wondered how accurate it was.

ADM. FLYNN: Then Maynard came over while I was in command of UDT Twelve in Subic. That was in 1968. He came over during the time Al Todd and others were doing something with SDVs and the USS *Greyback* and a fast surface boat. You ought to interview Maynard about what the heck that was all about, because they were going to do something in Vietnam, I think. Possibly, they were going all the way out to Korea to do it, but I think it was a Vietnam operation. But it was very tightly held, and I didn't ask Maynard what he was doing, but he came over to have a role in that.

INTERVIEWER: Why don't you, if you could, review the history of the development of SDVs?

ADM. FLYNN: All right. There was a number of Italian or foreign boats, such as the Trass boat. We had also SPUs, or swimmer propulsion units. Swimmers lay on them and steered them more or less by shifting the body. They had very limited range, and there was no protection for the swimmer. It was marginally better than swimming yourself, than relying on your leg power to get you through the water, but not very accurate with regard to navigation and the problem of what it did with this thing while you were in the objective.

INTERVIEWER: What year was this?

ADM. FLYNN: We had SPUs in the early 1960s. Then we had the Trass boat. Then, we had the Drut, which was built by a bunch of guys in Underwater Demolition Unit One in the diving shop.

Guys like Gionatti were involved with it. 'Drut' is 'turd' spelled backward. They actually built it with salvaged pieces of equipment and stuff. But they gained a fair amount of experience from it, and we thought that we needed better SDVs, and that was part of the swimmer support system. As I said, we wrote the OR for that in 1965, shortly after I got to the Pentagon. It included a six-man and then a two-man SDV.

INTERVIEWER: Let me read between the lines here and see if I understand this. The initial development was looking at boats and equipment that were out on the market and available by other people, other countries, and also some in-house development?

ADM. FLYNN: Yes. You could call it in-house development in the sense that there were engineers with blueprints. All of that was way above the actual level at which these guys did their best.

INTERVIEWER: I understand. Really, that laid the ground work for the formal plan?

ADM. FLYNN: Right.

INTERVIEWER: What was it called?

ADM. FLYNN: It was called 'Code 3802.'

ADM. FLYNN: Specific operational requirement, SOR, 3802, swimmer support system. It had in it navigation, SCUBA, the mixed-gas SCUBA, underwater communications, and the SDVs.

INTERVIEWER: That was the program that led to the successful development of the Mk-7, which was really the first practical U.S. Navy underwater vehicle?

ADM. FLYNN: No. The Mk-7 was before that. We started 3802, and it was a fairly long, cumbersome thing of doing research and development with a contract with Aerojet. It had to go through budgetary hoops and everything.

In the meantime, a Warrant Officer who was part of Underwater Demolition Unit One, said, "We really need to rebuild some Trass boats, and we need money for that." Because the Vietnam

War was on, I got him the money. It was no big deal, but I was in Washington and got the money for this, put it through NAVSEA, and the money went to Convair. The Mk-7's were officially rebuilds and rehabilitations of Trass boats.

INTERVIEWER: Oh, so this was done then shortly before the 3802?

ADM. FLYNN: Yes. Well, it was done in parallel with it and much faster, so they built the Mk-7's very, very quickly.

INTERVIEWER: What year was that was occurring?

ADM. FLYNN: 1966.

INTERVIEWER: Then, 3802 came along and was looking a little beyond that.

ADM. FLYNN: The 3802 project was looking far beyond that to much longer range: 36 miles, 6 hours, 6 knots. You were going to need to have the advance SCUBA, the life support system, the heating systems. All of that was part of 3802.

In the meantime, Convair built a boat that was typical of all the boats we've had since, with a rigid aluminum frame with fiberglass sheeting over it, a hard tank and a soft tank around the midpoint, and fairly rudimentary controls.

INTERVIEWER: I recall that when I was in UDT Twelve, my view of SDV operations was that they were pretty kamikaze.

ADM. FLYNN: Well, here's the deal on those. There were two boats, the Seahorse and the Trass. In 1965, when I was going back to Washington, I went to see a fellow named Ken and said, "Tell me about these SDVs and stuff." He gave me a ride in the Seahorse. He would put a pinger out way ahead some place, and we would track in on the pinger. That was reasonably accurate, You'd know where you were, so you could put a stream of fingers behind you and steer a course 180 degrees away from them.

Well, that was pretty tricky on the way in, because your signal was weakening as you went away from it. How were you going to fix it? You were going to drop these pingers off on some sort of anchoring system. We really hadn't figured out all of that. But Ken said we had to have something to improve on that, and that was obvious. They built the Convair Mk-7's over there at the Convair plant in San Diego. We just built five of them initially, and we got those things going and then they proliferated. Other people came in and said, "We need to have more of these things."

Well, it wasn't worthwhile having very many of the Mk-7's. They weren't quite Kitty Hawks, but they certainly weren't DC-3s. I mean, it was much closer to Kitty Hawk than a DC-3, and much closer to Kitty Hawk than a P-51. We weren't even up to a World War I Spad in the evolution of where we needed to go.

INTERVIEWER: But your thinking was, "Well, let's get a faster program up and running while we're waiting for 3802 to come along?"

ADM. FLYNN: Yes. We wanted to get something going and parallel with them. I thought five of those things were plenty. By the way, I also thought that you needed very few automatic mixed-gas systems. When I was in NAVSEA, I was thinking of buying dozens of them. Dan Hendricks came in after me and decided that every swimmer had to have one. He brought hundreds of them.

INTERVIEWER: Oh, my gosh. That was an expensive buy.

ADM. FLYNN: It was an expensive buy, and it overwhelmed the teams. The logistics of maintaining those things was way over their heads. No one was giving sufficient number of hours in the water to be really proficient with them.

What you really had to do was concentrate and do that only. Instead, they were doing all kinds of things. Well, first they had to do PT. They had to do small arms, and then they had to do

land combat and all that stuff. People would get into the water with those things once a month, maybe, and that was no way to really understand how the gear worked.

A lot of gear would get knocked as being no good, but people just weren't familiar with it. They weren't given the chance to get comfortable with it. By the way, you would need to bend down full length because a lot of people didn't have the patience and endurance, absence of claustrophobia and all that, even in a group of SEALs, to handle that stuff. You'll probably find in doing your research that it's the same group of guys that show up again and again on those things because they're self-selecting.

INTERVIEWER: That's certainly true, and that's always a problem. Then, the Mk-7 seemed like such a good idea, but you wanted to make it a little better?

ADM. FLYNN: Well, no. We knew even when we were doing the Mk-7, we had already written the requirements for 3802, it had to go through a huge bureaucratic process. That was why Ken said, "Just give me the money to repair these things, these Trasses or Seahorses." He didn't repair them. With that amount of money, they built the first five Mk-7's.

INTERVIEWER: Then the Mk-7's got to be more loved than you had anticipated?

ADM. FLYNN: Right. Everybody had to have a lot of them, and you know how we navigated with those things - with dead reckoning. You had no idea what the currents were doing. You could do some missions since because were in very familiar waters, like San Diego or Subic. Probably, there were east coast equivalents where people knew what the bottom gradient looked like and everything like that. We were using them. "Gator" Parks was involved in that thing with Maynard. They were taking Tunney and going to do something in Vietnam. I suggest you talk to Maynard about what all of that was.

INTERVIEWER: Yes.

ADM. FLYNN: But little Al Todd of UDT Twelve had the SDV platoon. Those guys put in a lot of time in Subic Bay, just dead reckoning around and doing occasional stuff with simulated limpets and so on. We didn't have real ones. They did attacks and delivered scout swimmers and the like. It was pretty easy to do that there because you didn't have to wear a lot of rubber, and when you went ashore, you could go ashore naked.

Later, when we started using the boats off Korea, where you had to have a lot of clothing, if you were going to be inserted onto a shore, you had a whole lot of clothing to take with you. It was a real problem, because the clothing had a lot of entrapped air in it, and consequently, it was buoyant. I remember once when the crew was trying to submerge a Mark 8 SDV and being unable to do it because the clothing of the team that was going to be inserted onto the shore wouldn't sink. We weren't able to extract the air from it. Had they been able to power dive it down, that would have compressed the air and, all of a sudden, they would have had to compensate for a considerable loss of buoyancy quickly if they were in deep water. Then, when they were coming to the surface to put these guys off instead of being able to do it in a measured way, this air in the clothing would expand and they would be popped up to the surface faster than they wanted to be. By the way, that sort of stuff needs to be worked out with the ASDS, or they're going to have guys popping to the surface when they don't want to.

INTERVIEWER: Well, now, was the Mark 8 a 3802 product?

ADM. FLYNN: That was a 3802 product.

INTERVIEWER: That was really using the Mk-7 as a starting point in making it better?

ADM. FLYNN: Right. Now, we went initially to Aerojet, and Aerojet, instead of using the aluminum frame, wanted to put the strength in the structure. Part of the reason was that we gave them unrealistic weight requirements.

INTERVIEWER: I thought the aluminum frame was also a gas storage cylinder. Am I mistaken there?

ADM. FLYNN: You're right. You did carry air in those gas cylinders.

INTERVIEWER: You'd have to have cylinders in addition? You no longer had the frame?

ADM. FLYNN: Well, yes, but the whole idea was that you were going to be using a mixed-gas rig. Anyway, that got way overcomplicated, and it wasn't all Aerojet's problem at any rate. Ultimately, it was going nowhere, and I terminated the work with Aerojet and scooped up the remaining money, and Ken went up to China Lake and built the Mk-8 and 9 as we know them.

INTERVIEWER: That was no longer an Aerojet project. It was an in-house project?

ADM. FLYNN: That was done in-house at China Lake. We had the first runs of them done in Lake Isabella and a true Skunk Works. I doubt that there were a dozen people working on it. It was probably more like eight or ten whom Ken handpicked, like Frank Gorlic, Gator Parks, guys like that, guys who really knew how to do things. Some of them were still sailors.

INTERVIEWER: Frank Gorlic was one of my instructors.

ADM. FLYNN: He was a good guy, wasn't he?

INTERVIEWER: Oh, yes.

ADM. FLYNN: He was my leading PO in the fourth platoon in UDT Eleven. I could have gone home and just left him to run the platoon. He probably wished I had. But you're starting to get a lot of capability into it. For one thing, you've got the forward-looking sonar, which, by the way, we had started to use in the Mk-7, retrofitting an obstacle avoidant sonar. The obstacle avoidant sonar allows you to pick up underwater topography, particularly in San Diego. It shows very clearly the side of the dredged channel. It shows up remarkably, so you can follow the side of the dredged channel all the way into the carrier pier or down to 32nd Street. I think if you were ever going to

do a real operation on it, you'd have to do some probes first and figure out what the underwater landmarks are.

(Whereupon, the PROCEEDINGS were adjourned.)

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IN ON UNDER AND ABOVE THE WORLD'S OCEANS

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THE OCEANOGRAPHER AND THE NAVY

Rear Admiral J. Edward Snyder, Jr., USN (ret)

September 2003

INTERVIEWER: I would like to focus first on your term in the Office of the Assistant Secretary of the Navy (ASN). Were you his aide or his assistant?

ADMIRAL SNYDER: Well, let's go back to 1963. I was still a commander when I reported to that office, right after the USS *Thresher* disaster. At first, I was the special assistant for surface, but I held other titles later as the secretaries changed. Dr. Jim Wakelin hired me because the aide and executive assistant to another assistant secretary was a former commanding officer.

Although he had given me an almost unsatisfactory fitness report when I was his executive officer, he recommended me when Dr. Wakelin said he wanted an iconoclast, someone he could trust to tell it to him like it was. When I first came to the office, I told the assistant secretary that I really didn't want the job because I had been selected for command of a guided missile destroyer. I was coming from the command of a World War II destroyer. I was also concerned because during my research and development experience within the nuclear weapons program, I had not had the necessary two years at sea in command. I needed another three months. I think that the *Thresher* went down in April and my two years would have been up that June. Dr. Wakelin agreed to do something that was probably quasi-legal. He said okay, "I will have BUPERS order you here on temporary additional duty from your destroyer to the chief of the bureau of supplies and accounts. But you will work in my office." That worked because my ship has just gone into the Philadelphia Naval Shipyard for a FRAM, which was a two-year program. It was not a real problem. That was how I got started up there.

INTERVIEWER: The record I have reads that Dr. Wakelin had been the Assistant Secretary of the Navy since June 1959.¹

ADMIRAL SNYDER: My memory is that he took on the title of ASN for research and

development probably the year before I arrived, in 1962. Maybe they changed the title while he was in the office. The previous title had been 'Assistant Secretary of the Navy for Air.' Theodore Roosevelt had been the Navy's assistant secretary before he became president. He must have had a low opinion of aviators because he is recorded as saying that the Navy should buy one airplane and let the damn aviators take turns flying it. Franklin Roosevelt was also an Assistant Secretary of the Navy from 1913 to 1920 in the Wilson Administration and during World War I. Admiral Moorer had, at some point, been the executive assistant to the ASN. When he was the chief of naval operations (CNO), he used to kid with me that my boss was senior to him. I would always take the CNO's flag with me when we would go on a trip. If the CNO were there, I would insist they fly his flag. He, in turn, would always tell me to take his flag down and put up the secretary's flag, so I would carry out his orders. But it was interesting because that was how I learned that Admiral Moorer had been in the circuit.

INTERVIEWER: If Dr. Wakelin was appointed in 1959, Eisenhower appointed him. You arrived in the Kennedy administration and he was still the assistant secretary at that time. What was his background?

ADMIRAL SNYDER: We could verify that with a call to Steve Anastasion, who was the guy I relieved. I'm 99% sure that I'm right because we didn't have research and development (R&D) in the military then. Steve became special assistant for surface when that office was set up. They created the DDR&E position, or Defense Department Director of Research and Engineering, simultaneously with establishing the assistant secretaries for R&D within each service. Dr. Herbert York, a guy with whom I worked at Lawrence Livermore Lab, became DDR&E when that office was first established. The first couple of guys all came from Los Alamos at one time

or another, and that was when the DDR&E was number two in the Department of Defense (DOD). That is, there was a secretary of defense, and right under him was the DDR&E. I don't know how that all happened because I'm not a good historian. I never really looked into why. Congress must have done it because you can't shift titles like that at the DOD level just because you want to do it.²

That was interesting because they did not increase the number of presidential appointees in the service departments, the Army, Navy or Air Force. They substituted, at least in the Navy. Dr. Wakelin's title may have previously been 'Assistant Secretary for Air.' It was President Eisenhower who had the Navy form the first equivalent of the Interagency Committee on Oceanography. I don't think there's ever been a history of the Office of the Assistant Secretary for R&D. I knew nothing about the Pentagon when I arrived. It was my first time in that establishment. Dr. Wakelin had agreed that I could first go back to my ship before reporting in. When I did report a couple of days later, he greeted me with a 'publication,' which was something I had never seen before, called "The Seahawk Destroyer - Technical Development Plan (TDP)." He said, "Eddie," and he was the only person to do so, but he always called me 'Eddie,' "Take this home tonight and tell me tomorrow what you think of it." I always knew when he was on the phone because no one had ever called me that, including my own father. I came in the next morning and had written with big, black crayon pencil, "TDP = Trash Developed Profusely." He laughed and said, "Well, you're certainly living up to your reputation." Wakelin was quite a gentleman. His first name was James. Everybody in the E Ring except for me, who always called him 'Mr. Secretary,' called him 'Jim.' He had a relatively good sense of humor but was truly a gentleman. His only real objection to me was a repeated and consistent

admonition: "Eddie, you have to calm your mouth down. The words that come out of it are not really CC." I always replied, "Well, Mr. Secretary, what do you expect in Disneyland East?" That was before Disney built their place in Florida. I had written a paper at the war college called "The Five-Sided No-Sayer." I have unfortunately misplaced it. I was looking for it the other day. But I'm getting off track. You're going to have to keep me going.

INTERVIEWER: You said your background was nuclear. Is that in nuclear weapons, not in propulsion?

ADMIRAL SNYDER: That's correct. I was never in propulsion. I had been aware of propulsion. In fact, in approximately 1950, during the early part of the Korean War, before I went to the Massachusetts Institute of Technology (MIT), I was stationed at Los Alamos and had put in a request for assignment to the first nuclear powered surface ship. I had a specified assignment in or about 19xx, something or other, by which time I would have made lieutenant commander or commander. That was in my service record when Admiral Rickover interviewed me for possible command of the nuclear destroyer USS *Bainbridge* or for executive officer (XO) of the cruiser USS *Long Beach*. He rejected me for those jobs. He brought it up by saying, "Who on earth did you think you were that you knew so much that we were going to have one in this time frame?" I had been very respectful. He was only the third flag officer I'd ever met in my life, but that's another issue. I do remember that the last question, after he'd gone through all the items from his standard Rickover treatment, usually was, "What did you do, spend all your life in bed, because you have five children?" But I only had two children. His comment to me was, "Why do you need a Ph.D.? Why did you want to go to MIT? I don't have a Ph.D. I go to Los Alamos any time I want to." I said, "Well, sir, I'm not an admiral and I'm not really the father of nuclear power. As

a kid, I had always wanted a Ph.D. in nuclear physics." I could tell the interview was coming to an end and he looked at me straight in the eye and said, "Who do you think you are, Jesus Christ?" I said, "No, sir," and was dismissed. I walked back to the house of my first classman Reuben Woodall, where I was staying overnight, and he told me, "Ed, if you had said, 'there can't be three of us, Admiral,' you'd have been in like Flynn." I always remembered that and it kept me in the Navy. I was ready to go back to BUPERS and quit, resign. All my life I had wanted to do this. I really felt that nuclear power would be important in the Navy.

INTERVIEWER: For the record, you're the son of a pastor?

ADMIRAL SNYDER: Yes, I am the son of a Methodist minister. I never did get my Ph.D. from MIT. I stayed there only two years. I was accepted by MIT for a Ph.D. in nuclear physics. I had written part of my dissertation and they accepted the topic. But the Navy wouldn't let me stay. There were three or four of us going there at the time and we all had to come back into the Navy. One of us, Reddie Cobb, who was a little bit younger than I was, went back about four years later. I don't know whether he had had to change to specialist restricted line or what, but he came back and finished his Ph.D. MIT took my paper as a thesis, didn't make me go any further, and granted me a Master of Science degree in physics.

I was bitter about that, but I also realized that I was in trouble. I was a lieutenant at that time and I think the thing that saved me was that the professor of naval science at MIT turned up as a Navy captain on my selection board. I thought I would be passed over because I had spent too much time in school, meaning a year and a half at that time. When the captain came back, he told me what had happened. He said that the Navy had to have people in graduate training. He didn't happen to have a graduate degree but was watching what was happening to his Navy

officer graduate students at MIT. He thought that the Navy ought to look at their records and not worry about whether they were spending too much time getting educated unless they thought they were not proper naval officers. He said, "You made it, but boy, it was a by the skin of your teeth sort of thing." That taught me a lesson. I also wanted to get out of Los Alamos because of that. But you didn't realize the importance of it to the Navy. I had always thought that the Navy liked graduate education. They had set up the Office of Naval Research. I thought they would support education. But it turned out that the unrestricted line in the Navy had not been very receptive. I'm probably very close to being unique, as someone who has commanded three or four ships and also been in charge of significant R&D programs.

INTERVIEWER: Your later career points out that you were aware that there are communities in the Navy, officer communities, that get lost, isolated, and forgotten, but I'll come back to that later. Did you make lieutenant commander on time?

ADMIRAL SNYDER: No. I could not because of lack of sea duty. I got back pay when I did. When I left MIT, I reported to Doug Plate, who is still alive, I am sure, who was a commander and skipper of the destroyer USS *Edward F. Larson*. I was his XO. But he absolutely resented the fact that one, he had a lieutenant for XO when everybody else had a lieutenant commander and two, I was an egghead coming from MIT. I used that as a pretext, when he was sailing to the west coast, to get transferred as XO to another east coast destroyer. After I had gotten in my time at sea, I got the rank of lieutenant commander and considerable back pay. Since I had retained the same date of rank as those on the earlier promotion list, when I did put on the gold leaf, I got enough back pay to buy a 1957 T-Bird, which got Mary Louise uptight.

INTERVIEWER: Tell me about coming to the Pentagon and Dr. Wakelin's office. You said it

was right after the loss of the *Thresher*. Wasn't it true that the loss of the *Thresher* made possible a lot of what people had been hoping to accomplish and triggered the foundation for the very successful Navy ocean program whose inception dates from about that time?

ADMIRAL SNYDER: I would have to agree with you. I would have to say, to go even further, that we wouldn't have had oceanography anywhere other than in the Office of Naval Research or the Naval Research Lab had it not been for Dr. Wakelin. His background was Ryan Aviation, I think. He was a Ph.D. and academically inclined but also a great gentleman. It was probably the best thing that could have happened. There, you had somebody coming into the Pentagon after the establishment of DDR&E. You had a separate line appropriation for research and development and a Navy assistant secretary who was skilled in that area. I knew absolutely nothing about research and development from that standpoint. I knew how to manage programs but not how you did it in a bureaucracy. I had just finished writing this paper about how there were so many admirals in the Pentagon and that they were all no-sayers. You could never get anything through and that was why the title of the paper was "The Five Sided No-Sayer." Dr. Wakelin was impressed by my "Trash Developed Profusely," although TDPs were part of the new McNamara system on how you did paperwork. Nobody cared about whether you had a destroyer, but you had to prove in the paper work that it was cost effective. We were off to a good start in that sense, except for my language, which he continually criticized. My office was, by the way, closer to his office his executive assistant's office. I was right outside his door and the executive assistant was in a little cubicle behind it.

INTERVIEWER: The executive assistant was uniformed?

ADMIRAL SNYDER: Yes. He was a captain. In those days, one of the fascinating things, which

I can go into later, was that the Navy, though I can't speak for the other services, refused to have deputy secretaries, deputy under secretaries or deputy assistant secretaries. They had naval aides and executive assistants. They were four-strippers. All of them were four-strippers and the people who controlled the calendar. In fact, the CNO and vice chief didn't have civil servants to help them. They each had an executive assistant and a naval aide. When Admiral Kidd was a captain, he was naval aide to Admiral Moorer. Dr. Wakelin, the Assistant Secretary for Research and Development, for some reason or another, of which I do not know the real origin, absolutely felt compelled to do something about oceanography. It was Dr. Wakelin who put money in the budget to create all these new oceanographic institutions. I don't remember how many we had in 1962, but I think there were Woods Hole, Scripps, Texas, and Columbia. Columbia was the one that did bottom contour mapping with Iselin or somebody who was very famous, up on the east coast. By the time I left, the office had something like 15 new programs in academic oceanography outside of the military. We had no oceanography within the Navy until after I left. When I came back, I found that the oceanographer was in charge of the oceanographic program at the postgraduate school in Monterey and of supplying ships and faculty for the program in oceanography at the Naval Academy. That was Dr. Wakelin's definition of oceanography.

INTERVIEWER: That was initiated after you left the office?

ADMIRAL SNYDER: It was in the process of being done. I was trying to get it done. I was there for almost five years and thought it was absolutely ridiculous that you had the Assistant Secretary of the Navy running the Naval Academy. Those are my words. I would have thought the CNO would be involved. Up until that time, we had never had anybody who was interested in research and development. We might have had past Navy admirals or captains who were

interested. In fact, you're aware of many of them who were. However, there was no formalized Navy structure for research and development. As a matter of fact, since I had no knowledge of how you did things within the bureaucracy of the Navy, I decided that I would learn. I asked the secretary if I could have his authority to write a pamphlet called the RDT&E Management Guide, or in other words, the "Research, Development, Test, and Evaluation Management Guide." He said, "Fine, Eddie, go do it." I called people. By that time, I had been introduced to civil servants in all the bureaus and to all the flag officers in the Pentagon. I had learned because of my own negative experience with flag officers that you did not get them involved with anything. I called over to various bureaus, the Office of Naval Research and the Naval Research Lab and arranged for designated GS-15s or above to come on over and sit in my office so that we could talk about what it was they had to do. To make a long story short, we wrote the manual. You have to realize that at that time, none of the uniformed Navy or even the civilians really understood formal research, development, test, and evaluation because it was only a little more than a year old. I wrote in the first edition that the Assistant Secretary of the Navy for Research and Development was the program sponsor and appropriation sponsor for the expenditure of RDT&E funds. When I left the Pentagon, the chief of naval operations still believed that the Assistant Secretary for Research and Development actually decided where that money came from, who got it, and where it was going. Nobody questioned that while I was there. DDR&E didn't question it. It was actually not true. Nobody in Congress ever even said anything about an appropriations sponsor. That indirectly gave him and his two successors immense power, if you stop and analyze it. I remember Dr. Wakelin saying, "Eddie, we don't have enough good officers being sent to these Navy labs. As long as we're going to have Navy captains running these

laboratories with one top civilian, don't you think we ought to find people who really qualify?" I said, "Absolutely," so he told me to go find some. I found some and he had me call the Bureau of Naval Personnel. I said, "The Secretary wants Captain so and so sent over to Dahlgren," and they did it. Dr. Wakelin's executive assistant at that time was Captain Moran, who was later as a vice admiral in charge of OP-07, the research and development office. I remember that because Wakelin was on a trip with Moran after I had mentioned I had worked with Captain Hassler, an ordnance specialist. Command of the Dahlgren lab was coming open, so I was told to call Captain Hassler. He remembered me, so I said, "Sir, would you be willing to take on Dahlgren and see if we can get it in good shape?" He said, "Let me think about it," but called me back in about thirty minutes and said yes. I had them cut a set of orders for him. When Wakelin came back from his trip he said, "That was great, Eddie." Of course, the aide who was a naval aviator got really uptight that we had put a non-unrestricted line officer in an ordnance laboratory. Those kinds of things were not being done.

INTERVIEWER: Was he a restricted line ordnance specialist?

ADMIRAL SNYDER: Yes, he was assigned to ordnance engineering duty. He came to mind mainly because I knew what he had done in the Polaris program and how competent he was. Now, that was an unfair thing to do. I should probably have looked at every one available. But the first thing I wanted to do was to be sure we had a specialist there, an ordnance duty only, and there weren't really that many qualified four-strippers. I knew quite a few of the ordnance specialists because they had been working in the Polaris program under Admiral Raborn. In fact, that was where Hassler came from. Anyhow, that allowed the Assistant Secretary for Research and Development to appoint the commanding officers of Navy laboratories, in fact. It allowed

him to create the title 'Director of Navy Laboratories.' It allowed him to do a lot of things because nobody understood what was going on, but Secretary Wakelin was not a power grabber. He was a real gentleman. I say that was important at that time because there were a lot of feuds and fights going on. Secretary Wakelin never got excited about that. He'd go over and smooth over the waters. He'd even get Admiral Ramage, the head of submarines, to calm down. They had been together previously at some point. He had warned me. Ramage was the only admiral that I wasn't told to go visit when I reported aboard, Red Ramage, Medal of Honor recipient, head of submarines.

I don't know why, but Dr. Wakelin just told me you don't get involved with him, period. It turned up later when we created the thing in which I'm sure you're interested. Admiral Ramage felt that when a ship went down, when a submarine went down, that was a grave! Don't touch it. He really got ticked off when we went to look for the *Thresher*. The first thing I was ordered to do was to get involved immediately with the Deep Submergence Systems Review Group (DSSRG). It was actually a SECNAV technical advisory group looking into the background of the *Thresher* disaster. It was not the board of inquiry that asked why the *Thresher* went down. It was a group that he formed to find out what we should do so that it did not happen again and suggest a technical plan. That was the Stephan committee.

INTERVIEWER: Where was the new Director of Navy Laboratories assigned?

ADMIRAL SNYDER: He was over in the materiel side, initially. He later came over into our office, the secretary's office, but he was originally established in the materiel side of the house. At that time, the secretary of the Navy ran the materiel side of the Navy. A lot of people don't know that but at that particular time, the Secretary of the Navy was legally in charge of the

materiel establishment. In fact, I had been involved with establishing the office of Chief of Naval Material. It took many months to get the piece of paper written that established the Chief of Naval Material as a four-star admiral. The Navy didn't like that idea. The final compromise, at least as I saw it, and remember that I was a pretty junior commander, was that if the Chief of Naval Material was an unrestricted line officer competent and qualified in program management. That would keep the blue suit Navy in the Pentagon relatively happy. You've got to remember that if you put four stars over there, you were taking them away from somewhere else.

INTERVIEWER: NAVMAT came under OPNAV?

ADMIRAL SNYDER: No. At that time, NAVMAT reported directly to the Secretary of the Navy, legally. There were lots of innuendoes, but legally, we had just established the Chief of Naval Material under the Secretary of the Navy. Under the Chief of Naval Material came all the old bureaus that were to become the SYSCOMS. One exception was the Office of Naval Research. In accordance with a nice, little title ten code, the Secretary of the Navy could appoint the Chief of Naval Research from any person in the Navy or Naval Reserve, commander or above. When appointed, that officer would be a rear admiral upper half with two stars while serving. The CNR reported to the Secretary of the Navy. But the Secretary didn't want that, so he said, "Since I've got this new Assistant Secretary for Research and Development, report to him." That was wonderful because the Office of Naval Research had a comptroller. ASN(R&D) had its own comptroller. The RDT&E management book then stated that the comptroller for the appropriation RDT&E Navy reported to the Assistant Secretary of the Navy for Research and Development. You wired all that together and that was how you were able to get billets.

I don't know how this happened. Maybe you can find out. We had had trouble in the

1950s getting good civilians to come work for the Department of Defense. A new law called Public Law 313 permitted the secretary of the services, and in those days we weren't really that joint, to pick those who had the academic background in certain subjects such as physics, chemistry, mathematics and the hard sciences, and automatically appoint them as PL-313s. That paid them at the top of the pay scale. It was not the old GS-16, 17, and 18 system but a new establishment called 'PL-313.' That was their code. They weren't 16s but they were paid as 16s. In fact, I was shocked. I found out when I looked into it, in trying to get everything organized, Dr. Wakelin was getting \$20,000 a year, GS-18s were getting \$20,000 a year, and PL-313s were getting \$20,000 a year. I thought, "Boy, there's something wrong with this system." The CNO was getting \$20,000 a year. Of course, the CNO had certain perks and at that time, the assistant secretary had a few perks also, such as a car and driver. It was all tied to how much a congressman was getting. I don't remember the formula, but that formula hasn't changed, to my knowledge, in fifty years. What I mean is the formula as to who can get paid compared to whom.

That isn't strictly true. I remember very clearly a stunt we pulled in Hawaii. When we wanted the University of Hawaii to get into oceanography, John Craven was willing to go there when he was ready to retire from the Navy. The law in Hawaii was that you had to be a resident of the State of Hawaii for ten years before you could be a part of the University of Hawaii. We managed to get around that in the case of Dr. Craven. I am not sure that John Craven will agree with me on that, but I remember. What we did was establish, as had been done out in Texas, a separate institute that was not part of the university but parallel to it. That way, it didn't come under the same law. That was the reason we had lawyers. You remember that we had lawyers in the Office of the Oceanographer. I remember telling our own lawyer, "Don't tell me what I can't

do. You're only paid for one thing. Tell me how I will have to do it to get it done.” That was what we did in the E Ring. If a law was an obstacle, you tried to figure out how to bypass it. That was important to get things done, as long as you had a gentleman and an honest man as the assistant secretary. In fact, Dr. Wakelin put much emphasis on Admiral Stephan's group and on oceanography. He had me define oceanography. Not knowing anything about it except what I had learned in the Polaris program, I just defined it as all the research, development, test, evaluation, and operations necessary for the Navy to operate in, on, under or above the world's oceans. That was a broad cotton picking thing, and it got somebody mad. I think you know who first got mad, the Supervisor of Salvage. The secretary was basically saying that anything that goes on in the ocean was part of the Navy's mission and was oceanography. It really wasn't, of course, but it took us two assistant secretaries before we actually got Secretary Nitze to sign the instruction that made it so.

The big holdout was the submarine force. It was Buck Dietzen, a classmate of mine, who was running submarines by that time, out of OP-03 or 31 or whatever, and he resented the fact that he was going to be the Assistant Oceanographer for Ocean Operations. I think with your background, you can understand the animosity that a nuclear submarine officer had toward that kind of stuff. Whether it was because of Admiral Rickover, I don't know. I don't the inner details. The only way I got involved was when I had been about three years into my job and the Office of Naval Research put something on the E Ring wall, right outside Secretary Nitze's office. It was put there by Admiral Claude Ricketts, the vice-chief, who later died of a heart attack in his doctor's office in the Bethesda Naval Hospital. It gave ONR and a couple of Navy

scientists (Philip Abelson³) the credit for being the fathers of Navy nuclear power. I remember that Admiral Rickover sent for me and wanted me to get rid of that. I think the same problem showed up in diving over the question of whether ONR was really running anything. One has to recognize that, under the rules that were set up, the Office of Naval Research had no authority to run any part of the operational Navy. The only time they did get that was when they reported as the Assistant Oceanographer for Ocean Science. The Oceanographer, as an unrestricted line officer working also with his CNO hat (Assistant Oceanographer for Operations), could direct them to do something.

INTERVIEWER: There were some problems with SeaLabs I and II?

ADMIRAL SNYDER: Well, there were problems with all of that, but I'll go back to Wakelin because I call him the 'Father of Naval Oceanography.' When he was a lieutenant or lieutenant commander in World War II, he was one of a group working in naval research. I don't know that he understood it scientifically, but he realized that the ocean was important to the Navy and that we better understand it. We better be able to have our capability, he realized. The Stephan group (DSSRG) began to show the kinds of things that needed to be done in order to give us that capability, including diving, which was not an insignificant thing. You've got to realize that Wakelin liked diving but I don't know why. Before Dr. Wakelin came to the Navy, he ran a research group in the National Geographic magazine hierarchy. I can't remember the exact title. National Geographic had given Cousteau a sum of money, possibly \$25,000, to purchase an ex-French navy vessel that he then named the *Calypso*. It wasn't Navy money. It was National Geographic money from the Wakelin office, before he became assistant secretary. Dr. Wakelin showed an interest in oceanography when he was with the National Geographic, before he came

to the Pentagon as ASN(R&D).

Dr. Wakelin told me to get in touch with Captain Cousteau, as he wanted to have lunch with him. I can remember that for one particular reason that Captain Cousteau probably didn't understand. He brought Mrs. Cousteau with him. At that time, I don't think he went anywhere without her. She was keeping him under control, in my personal opinion. Anyhow, she showed up and that tore the E Ring apart, of course. There had never been a woman guest in the Secretary of the Navy's mess. All of a sudden, we had a formal luncheon at which the guests of honor were Captain and Madame Cousteau, with Wakelin hosting. The Secretary of the Navy was also there. I was there. Cousteau made a proposal in front of the Secretary of the Navy and whoever else. He said that we needed to get involved in man's exploration of the ocean and the ocean's power. Captain Cousteau was going to help us.

INTERVIEWER: What date was that, approximately?

ADMIRAL SNYDER: Well, it had to be before Kennedy died, because Wakelin left after that. I was at the White House the day Kennedy was assassinated and I remember that less than X number of days later, we were told by the White House aide that Wakelin was out of a job. When President Johnson became President of the United States, he chose to get rid of all appointments within the Defense Department, with the exception of McNamara. The Republican President Dwight Eisenhower had appointed Dr. Wakelin. Kennedy was in office from January 1961 to November 1963, The Thousand Days, two and a half years, almost three years. I don't know whether I had been at the Pentagon for a year. Wakelin had a background with Ryan Aeronautics, so it made sense that a Ph.D. with an aeronautics background would be the assistant secretary in the office previously known as ASN for Air. Eisenhower appointed him in 1959.

His title may have been changed from Assistant Secretary for Air to Assistant Secretary for Research and Development. I'm not certain when that occurred because it was before I arrived. Steve Anastasion or Bob Abel should know something about that, as I inherited both of their jobs.

INTERVIEWER: The departure date of 30 June 1964 may have been just the day before Dr. Morse arrived on 1 July 1964. Could there have been a gap with no incumbent?

ADMIRAL SNYDER: There was a hiatus at that time and the reason for it was unforgivable.

We all knew that a Republican had appointed Wakelin. Kennedy had decided that even though a Republican appointed him, Dr. Wakelin could stay on if he was doing a good job in research and development. Kennedy put his poker-playing buddy in as the Undersecretary of the Navy. I remember that really clearly because he had a playmate of the year. Red Fahey from San Francisco played poker with the President of the United States one day a week. The Navy let him alone. He certainly had no other capability whatsoever that I could see, and I knew him very well. Those were the days when the secretary had a lot more power than today. Without the secretary, or without McNamara, you couldn't get any money. Let's put it that way. You had to kowtow to them a little bit.

INTERVIEWER: One of the things that is of interest to the diving community is George Bond and the SeaLab, and that happened before Wakelin left. I remember you telling me that you were the one who wanted to get a briefing for Dr. Wakelin about the Navy Medicine program in diving. As I recall, you said that the Surgeon General then sent Captain Bond to do that briefing. Do you remember anything about that?

ADMIRAL SNYDER: Well, yes and no. It was absolutely true because Wakelin had Captain

Cousteau over to get involved with diving. It had nothing to do with what you and I would have considered scientific oceanography at the time. He wanted to have an 'inner space program,' as we called it. It was Senator Warren Magnuson who led the crusade, if I can remember.

Magnuson was as crude as I was and always drunk. I can remember that he said, "We know less about the ocean's bottom than we do about the moon's behind." Wakelin and Magnuson were very close friends. One of my jobs at parties was to keep Magnuson happy, but not drunk. That was an impossible task in those days. I didn't know the word 'alcoholic,' but maybe he was an alcoholic. He sure liked to imbibe. Let's put it that way. He drank a heck of a lot. I always went as the aide when we had an ocean function because the naval aviator would handle all the other things. But Dr. and Mrs. Wakelin always wanted me to come along because I was their Special Assistant for the Ocean's Bottom. Although my title was for surface, I spent at least 45 hours a week on oceanography, which included diving at that time. That was why he had Captain Cousteau over. Wakelin had in the back of his mind, as we have discussed, the need to have a program that would be, and these are my words, a poor man's space program. The assistant secretary indirectly sponsored the Bureau of Medicine and Surgery, and we were also trying to convince someone to do surgery underwater in pressurized chambers. We were doing this also through the Interagency Committee on Oceanography (ICO), which at that time included a rear admiral upper half from the Public Health Service as a member. Abel would know more about that and when it was formed, because I just inherited the responsibility. It also included the Bureau of Commercial Fisheries and all these other ocean agencies. When the Bureau of Commercial Fisheries reported to the ICO that they were having money troubles and would have to get rid of all their ships, Wakelin said, "I can help. The Navy needs to get some information

about the oceans. Eddie, you go get some money and transfer it over to the Bureau of Commercial Fisheries so that they can operate their ships.” Now, if you try to do that in today's world, or even when I came back as the oceanographer, you will be court-martialed. But we did have the authority to do that back then. We had the 6.1 money and could move it around.

Bob Abel was the executive secretary for the ICO as a civil servant. He was also the guy who directed the National Oceanic and Atmospheric Administration's (NOAA) Sea Grant Program, and was recently the president of the Marine Technology Society (MTS). I haven't seen anything from MTS. I'm trying to get rid of all my stuff. I did see that pin or something they gave me for being an honorary something or other for their technology society.

INTERVIEWER: Did Senator Magnuson have a specific interest in diving or just give general support?

ADMIRAL SNYDER: He had an interest in understanding the ocean. My comment always was that you could not understand the ocean unless you were able to put men down there to look at it and put equipment down there to work in it. Magnuson fully supported that. It may have originally been based on the commercial fishing interests in Oregon, but it never came to my attention as such. He was a big sponsor of oceanography with that statement about the moon's behind and was a pretty powerful guy in the United States Senate. He was leading the charge then. It was not Senator Russell. Russell was a powerful man also. Russell was head of appropriations full committee, as I remember it, and was head of the armed services subcommittee, which gave him one devil of a lot of power over the Navy. The guy who relieved him was Senator Stennis, and I remember that Senator Stennis was the last person to ever hold both of those jobs. After that, I think the Senate began to realize that those positions were a little

bit more powerful than they should have been. Let's put it that way. I don't really know, because I wasn't in the Senate's inner circle. A lot of people respected Senator Magnuson. Also, at that particular time, you had Senator Hollings. Now, you tell me why Senator Hollings would be interested in oceanography. But Senator Hollings was, in reality, our east coast supporter of oceanography.

We were looking for words to put the same kind of public emphasis on our inner space program that National Aeronautics and Space Administration (NASA) had for its outer space program. Do you do it remotely or do you do it with man? The Deep Submergence Systems Review Group had recommended both. Like all good scientists, we never had enough. We hadn't studied it enough, so we needed both Man in the Sea and remote sensors in the sea. Wakelin was looking specifically at the business of putting man in the sea, and somehow or other through the ICO or things like that, he was also aware of Ed Link's work. Ed Link had been acquainted with him in the past. Wakelin's background was in aviation, so they might have met through that or possibly through the connections they both had to the National Geographic. But Ed Link was involved. Dr. Wakelin put him on the DSSRG. We were trying to look at how we could get people excited about the oceans. One of the ways of getting them excited was, of course, through the Bureau of Commercial Fisheries' interest in feeding the world's population with fish. Everybody had his own ax to grind, but Wakelin decided that, irrespective of my recommendation to him and of the cost of putting man in space versus the remote, we would follow the space program and somehow or other we have a manned diving program. I don't remember who invented the word, but it would be called 'SeaLab.' The reason it was called 'SeaLab' was because we were doing this through the Office of Naval Research, as that was the

only legal way we could get a new program started. We had the concurrence of the Senate. We also had support from the House of Representatives. I can't remember the house members who were supporters of it, but it was in a subcommittee. Oh boy, my mind is boom, boom. I wish I could remember, because we took all of them on a flight to show them Scripps and all the other labs. From that, we got lots of supporters, including, I think, the congressman from Michigan, who may still be in the Congress. I remember riding in the plane with him and we were talking about its importance. To me, it was absolutely fabulous to realize that we had supporters from places like Michigan who maybe had a lake but didn't know what the word 'ocean' was. They were interested in Detroit and automobiles, but you had those gentlemen really believing that it was a great program, that the United States really needed to do something about it. We were trying to get something started in the manned side of the program. You know better than I do that we had a lot of those programs run by the Bureau of Medicine and the Supervisor of Salvage and so forth. But Wakelin had a broader concept and would say, "Eddie, we're going to do this like the space program. You go get Scott Carpenter. If we can put him in the SeaLab, then we're going to have a program that will get us some attention. We need attention to get more support from Congress so that we can get the program financially sound," or words that he would use. I don't remember what they were, but they basically meant you could not have a program without people and you could not have a program without money. The problem was getting the people and the money.

INTERVIEWER: Do you remember the invitation to George Bond to brief SECNAV? Did he brief Dr. Wakelin or the secretary?

ADMIRAL SNYDER: He briefed Dr. Wakelin. I don't remember whether the secretary was

there, but I seriously doubt it. We're talking hours of briefing, because Dr. Wakelin could get carried away, as you and I are getting carried away now, and talk for hours. The Secretary of the Navy can't do that. But that was Dr. Wakelin's personality. He was a gentleman, but we were going to get through the program and we were going to understand it. Those are my words. He was using Captain Cousteau, and nobody used Captain Cousteau. Captain Cousteau used other people. But Wakelin thought he was using Captain Cousteau to get the Man in the Sea program moving because the French had already done it and that was how Dr. Bond came in. I didn't know him personally. I had met him and was impressed by him, but I didn't know anything about medicine. These new subjects could easily impress me. My background was in hard physics. It wasn't biology. I couldn't understand what the medical problems were but knew that you had to have people. In those days, the people who really understood man's ability to survive in the ocean were, in fact, in the Navy under the Bureau of Medicine, and that was where Captain Bond came in.

INTERVIEWER: As a matter of protocol, the invitation went through the Office of the Surgeon General. Is that correct?

ADMIRAL SNYDER: Yes. Secretary Wakelin didn't own the Surgeon General, but he was, in my opinion, the SECNAV sponsor of the Bureau of Medicine. The Surgeon General was always responsive to us, and in general, his contact was through me to the Assistant Secretary for Research and Development. Again, you had the assistant secretary for R&D running what I call 'outhouses' that nobody else cared about, like the Naval Academy, the Postgraduate School, the Bureau of Medicine and Surgery, and he was also involved in the Bureau of Supplies and Accounts. That was because of me, trying to figure out how we could tie together logistics, spare

parts, and readiness, because his title was not just R&D. Dr. Wakelin's full title was Assistant Secretary for Research, Development, Test, and Evaluation. That meant that you had OPTEVFOR, or Operational Test and Evaluation Force, the group of people under the CNO who took a new program and checked it out at sea. Well, of course, when we didn't want to do that, like in the diving program, because we knew we'd run into all kinds of bureaucratic problems, we ran the operational programs through the Office of Naval Research. That really wasn't right, and may be why we had some problems with the Man in the Sea program. To copy the space program, we first called it the 'Man in the Sea program,' and that was where we were trying to use Captain Cousteau's influence to accentuate diving, along with using Ed Link, Perry and several other people. There was quite a bit of development going on long before I got in the program, led, I thought, by the French submersible development and by what other people called 'toys to play with in the ocean.' Wakelin's concept was that those were not toys. They were necessary for the Navy in order to ensure that its submarine force could be handled safely. Now, Admiral Ramage, who was head of the submarine force, was absolutely uptight as heck with Dr. Wakelin and me over the issue of going down to look at the *Thresher*, where we took the *Trieste*. Remember that we had the *Trieste*, so we weren't completely new at developing research vehicles. The bathysphere *Trieste* was, in fact, brought around to the east coast to look for the *Thresher*.

INTERVIEWER: Was Dr. Wakelin the SECNAV sponsor for the deep *Trieste* dive in the Mariana's Trench by Don Walsh and Jacques Piccard?

ADMIRAL SNYDER: I don't know. You'd have to ask Don. I don't know who sponsored it. I remember Dr. Wakelin saying he was amazed that it was President Eisenhower who had him

form the Interagency Committee on Oceanography. The President of the United States, Dwight D. Eisenhower, started it. Maybe Steve Anastasion knows. Things had been going on a lot before I even got there. Dr. Wakelin didn't stay there very long after I arrived. It was less than a year, wasn't it? He departed sometime after President Kennedy was killed. Possibly, he didn't actually leave until just before Dr. Morse took over. But as soon as Johnson became President of the United States, he was determined to get his own appointee into the office.

When I arrived at the Pentagon in 1963, Fred Korth was Secretary of the Navy. Kennedy initially made John Connally his SECNAV but Connally resigned after 12 months to run for Governor of Texas. Kennedy nominated Paul Nitze for the job, but Nitze's confirmation was held up for a long time in the Senate on the grounds that Nitze was a peacenik or something like that. Korth stayed until 1 November 1963 and then, Undersecretary Paul Faye fled up. Kennedy was assassinated on November 22. Once Johnson became President, things happened in the Navy Department that I remember well. The name of Kennedy's nominee for Secretary of the Navy, Paul Nitze, had been sitting in committee for a long time. President Johnson quickly cleared that up and Nitze came over as Secretary of the Navy from being Assistant Secretary of State for Disarmament or something like that. I'm trying to recall, because I remember clearly Captain Moran flying up to the Cape in New England to pick Wakelin up, bring him back and tell him the news that he was fired. Those are my words, but that was what happened. I thought it happened very soon after Johnson took over, but I don't remember. When it did happen, Morse was the guy who relieved Wakelin. I do remember taking a copy of the RDT&E management guide and giving it to Dr. Morse so that he'd know what he was stepping into.

INTERVIEWER: According to the Office of the Secretary of the Navy, that was the 1st of July,

1964.

ADMIRAL SNYDER: That could easily be correct. I don't remember how long after Kennedy died that the change took place. R&D was strictly on a technical basis. I do know there was a discussion in the White House about whether McNamara should remain the Secretary of Defense, because that was far more important than the Secretary of the Navy. Johnson also cleared the roadblock so that Nitze could become Secretary of the Navy, and Nitze stayed in that office for a long time. Kennedy had nominated Nitze to replace the nominee who died. Wasn't there a man who died before he could come to Washington to take the job? Undersecretary Red Faye was a politician and his nomination was a political payback. Faye was, in fact, one of the President's cronies. He played poker with the President of the United States, and that was a pretty powerful position. People in the outside world might not understand that, but in this town, that was a pretty powerful thing. He was out there, with no aides and nobody to keep track of what he was saying, and he was with the President of the United States and four or five buddies playing poker.

Let me go back a step. Connally was the guy who was riding in the car with Kennedy when Kennedy got shot. I remember one other thing. I remember Secretary Korth defending Assistant Secretary Wakelin at a hearing. Korth as Secretary of the Navy and Wakelin, his assistant secretary for R&D, were having a discussion in either the House or the Senate over the issue of the TFX airplane, which was the airplane for all three services. Secretary Korth got up, interrupted Wakelin's testimony, and said, "Jim, leave this room!" He turned to the chairman and said, "Don't call my people eggheads. These people are dedicated. They are trying to find out what the answers are."

I'm a young novice. In a Senate hearing, you were going to tell him to get his butt out of there? I didn't know Korth. That was the first time I had ever even to the Capitol. I remember we talked about him when John Craven, who was later the head of the Deep Submergence Systems Project and had been involved with the DSSRG, brought the report to me to show to Dr. Wakelin. I said, "Oh, well, we have to show this also to the Secretary of the Navy and, I hope, to the President of the United States." I shouldn't have been telling John anything, but by that time, I realized that nobody read these reports. I can remember telling John, "You've got to give me three pages for the Secretary of the Navy and a one-page only condensation of that so that I can underline three words in case I get it to the President of the United States." I can see John now, coming down the E Ring with his grocery cart and a stack two or three feet high and this little thing on the top for Dr. Wakelin, who is tickled to death, but he reads a little more than the Secretary. Nitze only read the short version. I can remember that clearly. During that time frame, before Kennedy was assassinated, we were doing an awful lot. In fact, we had finished our movie, *Science for Survival*. We were looking for gimmick titles. I remember I even kept a copy of that movie. It featured the Interagency Committee on Oceanography and we had pictures to show that the Navy wasn't running the world. It was very subtle. In fact, you probably remember that ocean research in those days was actually done by the Assistant Secretary for Research and Development through the Office of Naval Research and was later taken over by the Oceanographer. *Science for Survival* was the gimmick title for that first movie on the interagency business and the oceans. It showed diving and some other things. President Kennedy had agreed to, and did, introduce the movie. He also closed the film. He opened it and closed it. I was over at the White House in President Kennedy's movie room reviewing it with one of his

staff when the word came that he had been assassinated. President Kennedy was pretty pro-oceanography, including diving, and he was an ex-naval officer. I think our ocean programs would have gone a lot faster in the Navy if he had survived. It took us a long time to get President Johnson interested. We did get him interested, though. We got him to speak at an ESSA, or the Environmental Science Services Administration, as it was first called, ship commissioning. I can remember being criticized for writing words for the president's speech. I said, "Well, the President certainly doesn't write his own words for a speech about an oceanographic vessel. But those are side issues. It shows, though, that in that time frame, the Navy was not interested in taking charge. The Navy was interested in getting other agencies to help us understand more about the ocean so that we could get better weapon systems. We had figured out, for example, that if we could make a torpedo three times as effective, the cost savings would be unbelievable. In fact, destroyers could not carry enough torpedoes, so it became even more of a necessity to understand the ocean. Diving was part of our appeal and the Supervisor of Salvage had used diving for years as a doable function. I think the Man in the Sea program and SeaLab were things we were looking forward to for the future, or what we could do later. I didn't realize how dumb it was, since the electronics we had in the SeaLab program were not solid state but filament, the old vacuum tube. That helium gas wiped out the vacuum tubes and we lost communication. Stupid little things like that used to happen. I think that was because we were using people to run the program who shouldn't have been doing that, but we couldn't do it any other way. We couldn't get anybody outside of the Office of Naval Research because they were the only technical people that the assistant secretary actually controlled and owned. He didn't own the Bureau of Ships. Some of the people in BUORD could have helped a lot. They

did help some, but if you had put them in charge of the program, it would have never gotten done. We made a lot of mistakes because we had a lot of people, including yours truly, who didn't really understand anything.

INTERVIEWER: But what you're talking about is a given in engineering progress. You make a technical advance and then have to have a whole generation of engineers trained to use that advance, instead of basing their experience on vacuum tubes and nitrogen under pressure and so forth.

ADMIRAL SNYDER: That is absolutely correct. You remember I didn't know biology and certainly had no knowledge about medicine and still don't. Yet, in my opinion, I made the decision to keep the Bureau of Medicine strategically involved with it and made the decision to convince the secretary to enhance what was going on in Bethesda in the diving program. I didn't know if Bond was a politician. I really could have cared less. I knew that he was a good spokesman. I knew he could get the attention of the assistant secretary. I knew the assistant secretary would listen to him. I knew that the assistant secretary wanted to do something but wanted somebody to tell him what to do, and I wasn't going to tell him because I didn't know. One of the things that kept me alive for five years was that if I didn't know something, I called somebody who did. I would say, "I'm sorry, sir. I don't know. I'll find out and let you know." That was so unusual in the E Ring, or it was in the 1960s.

INTERVIEWER: What happened, politically, was Captain Bond and his ideas, his proposals, were being held at arms length by the surgeon general's BUMED staff. Then, when Dr. Wakelin asked for a briefing, Captain Bond was sent because he was the one who had the background in

the subject. He was, in effect, bypassing the BUMED staff that was trying to discourage him.

ADMIRAL SNYDER: That was characteristic of both the Wakelin and Ed Snyder approach to life. It didn't matter what the chain of command was. Go find the guy who knew the most about it. I should mention one other thing. We only had five people on our staff then. When I came back from Vietnam, there were 165. There were only five people before. I could get in to see the boss whenever I wanted. He was always receptive. When you have 165 people, you have a constipated bureaucracy. We didn't have a bureaucracy. We were all tearing our hair out. I had to have outside people help me. I didn't have a staff. I had a secretary, a wonderful secretary, but all she could do was answer the telephone and keep me guided.

INTERVIEWER: Tell me more about the DSSRG.

ADMIRAL SNYDER: The Deep Submergence Systems Review Group was Admiral Stephan's last job. He was chosen for the assignment, and he retired when it completed its work. When I came aboard, the oceanographer was a meteorologist or somebody. I can't remember. It was not Admiral Stephan. I know that because it was during Dr. Morse's time frame. When we lost the A-bomb, I got hold of Ocean Systems in New York to help us out. Admiral Stephan was the president of Ocean Systems, which was 60% owned by Union Carbide, 30% by General Precision, Ed Link's company, and 10% by Link, personally. I know Union Carbide was involved because I knew the guy there. That brings up another issue, the preparation of the pamphlet "Effective Use of the Sea,"⁴ a product of the Panel on Oceanography of the President's Science Advisory Committee. The chairman of the panel was Dr. Gordon J. F. MacDonald of the University of California in Los Angeles, who later became head of the Environmental Protection Agency under Nixon. The vice chairman was Herb York, who by then was at the University of

California in San Diego. The pamphlet was written during the time frame when the Weather Bureau was trying to become leader of civilian oceanography. That was supported by Wakelin, in a sense, and was certainly supported by him for years afterward. President Johnson signed "Effective Use of the Sea." It documented the Navy's first step forward to volunteer as the ocean engineer for the U.S. Seen by some people as a power grab by the Navy, the Navy looked at it reluctantly as something that Snyder must have been doing.

Dr. Frosch then replaced Dr. Morse. I left the office in 1967 as special assistant to Dr. Frosch. When I returned in 1971 as the oceanographer, Dr. Frosch was still there. He served until January 1973. He was there quite some time while I was the oceanographer. In fact, he was the one who wanted me to be the oceanographer. I'm rambling, but while I think of it, I can remember clearly what happened that day. I was a fresh caught admiral, or relatively fresh. Admiral Zumwalt was the CNO. I had been told to leave my job as the COMTRALANT, or Commander Training Force Atlantic Fleet, in Norfolk at least two days a week and take over as additional duty the job of running the Office of the Oceanographer. Admiral Behrens, who was then the oceanographer, had been sent by Admiral Zumwalt to work over at NOAA, where he established the billet of Naval Deputy to the Administrator of NOAA. I was standing in the hallway, having a friendly conversation with Dr. Frosch in the corridor outside his office when Admiral Zumwalt came down the hall and started to talk to him. Dr. Frosch called Zumwalt 'bud.' He said, "Bud, I want Ed to be the Oceanographer of the Navy." But Zumwalt responded, "I want him to at least try to be the Atomic Energy Commission (AEC) Director of Military Applications." The reason he sent Behrens to NOAA was his great interest in getting the Navy

involved with other federal agencies. The Director of Military Applications had never been a Navy job. He was the one who ran the weapons side of the Atomic Energy Commission, a very powerful position. Up until that time, this director was, by law, the only weapons tie between the Department of Defense and the Atomic Energy Commission, in order to be sure that the military couldn't make their own weapons. It has been changed since then. I was well aware of that. I think somebody had told Zumwalt that I was a flag officer who had served at Los Alamos and Livermore, and that might be the Navy's only chance to get the job. Frosch and Zumwalt were discussing this back and forth and at that same time, one of the cute gals from the undersecretary's office walked by. I stopped listening to both the CNO and the secretary and turned my back and say something to her. Dr. Frosch, and I can see him now, turned and looked at Zumwalt, smiled and said, "Now, you know why I want Ed Snyder. Is there anybody else who can do bottom contour mapping better than Ed?" Everybody started laughing. Zumwalt said, "Okay, but I get first shot at him with DMA. If he fails, then you've got him." I did fail, but that's a two-hour story. Jim Schlesinger was Chairman of the AEC then. Normally, there would be one individual from the Air Force, one from the Army and one from the Navy interviewed. Fifteen minutes were allowed for each. But I was first on the list and my interview with him lasted an hour and a half, and the other two were mad. There was a book about Japan, *Shogun*, which had recently come out. I had been given a copy by the vice president of one of the oil companies and had read it. You know me. I hardly ever read anything other than technical publications. But I was fascinated with that book. You know how these old men on the staff sit there and read through their aides. One of them could hardly see but turned toward me and asked, "Admiral, have you ever read the book *Shogun*?" I said, "Yes, sir." He was reading his

questions and asked, "What did you think of it?" I replied that it was the best book on leadership I had ever read. That woke Schlesinger up, because he must have read it, too. My reason was that it said you cut your head off with a sword and give it to your boss on a platter, if he asks for it. That's pretty good leadership if you can get away with that, in my opinion. Schlesinger picked up on that and we got in a tête-a-tête. At one point I said, summarizing, "Sir, if the CNO told me to shovel horse manure in Manhattan, then I would be the best shoveler of manure there was in New York City!" I think that was my reply to him saying, "You don't seem to really want this job, but I'd like to have you," or something like that. At that time, I knew probably more about how the system worked than most people. I had been at both Livermore and Los Alamos. I had actually been a field manager and AEC's representative there. When people asked, I would tell him them what was wrong with both Los Alamos and Livermore, and there was plenty wrong with them.

INTERVIEWER: But the appointment went to somebody else?

ADMIRAL SNYDER: It went to the Air Force, probably. I think Schlesinger felt that I didn't want the job. That's my guess. He had to be interested. You don't go beyond 15 minutes when you've got a tight schedule for the whole day and take that much time. We had a real, person to person conversation about what was wrong with Los Alamos, what we could do better and so forth. He was interested. Whether that had anything to do with his choice for the appointment, I really don't know. But I really didn't want the job. The predecessor had fixed it up so that when he retired, he could keep the responsibilities of the job as a civilian. The new guy coming in wouldn't do anything. That was no job at all. It had been a very tricky one, anyhow. In those days, you were dealing with the group that decided who got what weapon. That was after the

time when the Air Force had set up Dr. Teller at Livermore, thinking they could get their own atomic energy laboratory. Of course, the law and Congress and everybody else stepped in and said, "No. That belongs to the Atomic Energy Commission, period!" We had two competing laboratories, as opposed to the original concept. The Air Force denied it, but they wanted their own bomb makers. That's another subject that has nothing to do with oceanography but it is an interesting subject. The Air Force wanted to say that you could not build a military weapon system smaller than 54 inches in diameter. One reason for that, without being written down, was so we couldn't fly them off an aircraft carrier. Teller invented a 39-inch one with twice the yield, and that put the Navy back into the carrier business at Los Alamos. Those were the things that used to happen in the Washington arena. The outside world didn't realize that and few people really knew what the heck was going on. You had decisions being made sometimes without any technical knowledge to back them up. I may be exaggerating, but I think it certainly was true in the 1960s. Can you imagine another weapons system like Polaris, which was built under President Eisenhower? There was no way at all. I mean, the President had a meeting with Admiral Raborn, Dr. Teller and a couple of other people. They convinced him it was important. The President said to do it. It started immediately and was completed in three or four years. It was done on an unlimited budget and finished on time.

INTERVIEWER: Did they stay within their projection?

ADMIRAL SNYDER: No. The weapon was lower in yield and shorter in range because the people sitting at that meeting with the President each had a different version of what the word 'warhead' meant. To Teller, 'warhead' meant the plutonium, polonium, and uranium. To a weapons designer, it meant that plus the fusing and firing circuit. But to the military people it

also included the re-entry body. I can't remember the exact figures, but Dr. Teller said, "I will guarantee you one megaton within such and such a weight." In the end, we attained that weight, but it also included the re-entry vehicle and the fusing and firing, so that cut the range down. There was no definition of the term 'warhead.' When I went out to Los Alamos, it blew my mind that nobody was speaking the same language. You had the most brilliant man in the nuclear warhead business sitting with the President of the United States, and you had an admiral who was an aviator, not a physicist, and you had other people who were worried about Sandia Corporation, which hadn't been working on ballistic weapons. They had been working on fly-them-away weapons. There was a big difference and it caused a lot of problems, which we did solve, but that is a totally separate subject. That was three years of malarkey.

INTERVIEWER: Go back to the Stephan Committee.

ADMIRAL SNYDER: I think the Stephan Committee gave the Navy its ability to focus together all of its recommendations. Certainly, it got the Navy moving, but it would not have moved if it were not for Wakelin. He took that report and started to implement it. When Wakelin left, Dr. Morse came aboard. Dr. Morse implemented the engineering side even more than Wakelin because Morse really believed in it. When Frosch came aboard, you had not only a scientist but also an individual who had a tremendous background in underwater acoustics and had come from DARPA. He possessed knowledge that neither Morse nor Wakelin had. Both of them had to learn on the job. Wakelin had to learn how to make the office function. Morse had to learn how to deal with the bureaucracy. Frosch came from DARPA, which I have to call the bureaucracy. That was advanced research at DOD and he really knew what he was talking about. You saw things happening.

INTERVIEWER: Was the Office of the Oceanographer set up as a result of the Stephan Committee report?

ADMIRAL SNYDER: The simple answer to that is yes, but not directly. The Office of the Oceanographer was set up because yours truly realized that it was impossible to tie those things together as everybody wanted them unless you had somebody to tie them together. Although Admiral Stephan, if he is still alive, will tell you that he was the first Oceanographer of the Navy. He was not. He was the Hydrographer of the Navy. Wakelin was the first Oceanographer of the Navy.⁵ The next guy who was hired I didn't care for at all. When Dr. Morse came aboard, we had a discussion about needing to get rid of a bureaucracy that talks about meteorology and oceanography and diving, and really start bringing it together. Dr. Morse was given permission by the Vice Chief of Naval Operations to go pick his own oceanographer. We went on field trips and that was when we picked (RADM Odale) Muddy Waters. I was accused of picking Waters because his name matched that of the Chairman of the House Committee, Mendel Rivers. It was Chairman Rivers and Admiral Waters. I was with the boss when he made that decision. I don't know why he chose him. But he did choose him and make him the first oceanographer. Maybe the one before him was the first legal oceanographer. It's not clear because we didn't even have a designated oceanographic program until Secretary Nitze signed the instruction that established the Oceanographer of the Navy, the Assistant Oceanographer for Ocean Science, the Assistant Oceanographer for Ocean Engineering and Development and the Assistant Oceanographer for Operations. I can't remember whether that was signed during the tenure of Morse or Frosch. But it was signed before I left because I remember taking it up to the Secretary's office. When Secretary Nitze attended my going away party, he asked me, and I'm sure it was just out of

courtesy, “What did you accomplish in these five years?” I said nothing, and he said, “You must have done something.” I said, “Yes, sir. I got you to sign two pieces of paper.” He asked, “What were they?” I said, “Creating the Oceanographer of the Navy and Op 95.” He said, “That can't be true.” I said, “Well, let's put it this way, Mr. Secretary. All the mistakes I made would fill the largest hard drive you have in the computer and I couldn't even get my accomplishments on a little disk.” Op 95 was the creation of a czar for anti-submarine warfare (ASW). Congress pushed that on us. I can't remember which congressman pushed it on us but we were not doing well in anti-submarine warfare. There were big arguments that submarines could sink carriers and so on.

There were only five special assistants in the office at that time. There was one called ‘surface,’ another called ‘air,’ one for laboratories and another one called ‘technical assistant.’ I think there was one more, but I can't remember the title. At that time, I was surface. Dr. Morse made me submarines, also, because when Milt Shaw, who was the technical assistant and had come from Admiral Rickover's office, left to set up something in the Atomic Energy Commission, Admiral Rickover could not provide a uniformed qualified nuclear submarine officer as a replacement. Dr. Morse insisted that research and development had to include nuclear because diesels were dead, as far as the future was concerned. They were not dead in submersibles were concerned, but dead as far as the active submarine force was. That was when Morse assigned me as the Special Assistant for Submarines, and another officer who came aboard as the Special Assistant for Surface relieved me. When the executive assistant got sick and was in the hospital, Morse assigned me as his aide and executive assistant because he didn't like the guy who was in the hospital. That had nothing to do with oceanography. It just had to do

with Dr. Morse. When he left that office, he wanted to be president of a major university. The aide who controlled his schedule was always letting in the presidents of Grumman, Northrup, Lockheed and so forth, and that got Dr. Morse really uptight. When Dr. Morse did leave the Pentagon, it was to become the President of Case Western Reserve University in Cleveland. He was to put together the Case Institute of Technology and Western Reserve. About a year after he left, he called me on the phone and said he wanted me to retire, come up there and help him out. I said I didn't know anything about running a university. He replied, "Well I thought I did, but that's not what I am doing. My job here is to keep the 'Marine Corps' and the 'Army' together," meaning 'Western' and 'Case.' It was also to raise money, and he said, "You're pretty good at knocking heads. You come here and help me knock them." Then, he got fired. He won't tell you this, but he got fired over some issue in Cleveland. He was trying to be racially sensitive. Whoever ran the university didn't like what he was doing, I guess. It had nothing to do with education.

Paul Gaffney was my extraordinarily talented flag lieutenant in 1973, when I was Oceanographer. He had a brilliant Navy career and after serving as the Chief of Naval Research, was promoted to vice admiral and appointed as the President of the National Defense University at Fort McNair. Paul recently retired and has become the President of Monmouth University in New Jersey.

INTERVIEWER: During the period you were in the secretary's office, Lew Melson was in the Office of Naval Research (ONR). He came in about 1963 or 1964. He said that there was a proposal to set up an oceanographic office and it involved Admiral Leydon. What did they propose?

ADMIRAL SNYDER: Admiral Leydon was Chief of Naval Research. I was trying to write the oceanographer's charter. It started under Dr. Wakelin, who gave the order to emphasize oceanography in the Navy. One of my jobs was to sit down and, in effect, write a charter for the Oceanographer of the Navy. You can well imagine that was not exactly the easiest thing in the world to do. You were cutting into the knickers of people other than the Chief of Naval Research. Under procedure current at that time, and even later, when I was the oceanographer, the Assistant Secretary for Research and Development ran the Office of Naval Research. The Chief of Naval Research did not report to the CNO. He reported to the Secretary of the Navy. But the secretary had delegated that responsibility to his Assistant Secretary for Research and Development during the time I was there. The Office of Naval Research ran the secretary's budget since the ONR comptroller was the comptroller for ASN(R&D). I had written in the RDT&E Management Guide that ASN(R&D) was the sponsor for research funds appropriated by Congress. I didn't know any better that he really wasn't, but this statement gave him a lot of clout. That meant a lot of other things were involved with it, too. The other issue was naval development, and not just basic research but development, and that brought in the materiel establishments. They did not turn out to be a problem because it was going to be a loose confederation. Nobody was going to own anything, but they all had to report. The concept I had, which the secretary bought, was to have an Assistant Oceanographer for Research, Assistant Oceanographer for Development and Assistant Oceanographer for Operations. Well, the Oceanographer for Development would be on the materiel side and in those days, the Secretary of the Navy ran the materiel offices, not the CNO. That changed later. The only problem I had was with operations, because operations came under the CNO. It was probably a technical

mistake, but I chose the submarine community to be the Assistant Oceanographer of the Navy for Operations. That was in my mind, but it took two or three years to get it signed. In fact, I remember when Secretary Nitze came to my going away party. He was the Secretary of the Navy before he was made Deputy Secretary of Defense. He said, "Snyder, what have you accomplished?" I replied facetiously, as I always do, "Not a thing, Mr. Secretary." I didn't even know what I could say. I could fill an entire hard drive on a computer with all my mistakes. He looked at me and said, "Now, come off it." I said, "Well, I got you to sign two pieces of paper, Mr. Secretary." He laughed and asked me which they were, and I said, 'the charter for the Oceanographer of the Navy and the establishment of Op 95, or the Anti-Submarine Warfare Office. Everybody in the room laughed, of course, but it was a real accomplishment in those days to get a change.

That change was shoved down the throat of the submarine community. I would have had no problems had Admiral Eugene Wilkinson still been there, but he had been transferred to Japan. The Deputy Submariner was Buck Dietzen, a classmate of mine at the Naval Academy. He absolutely didn't want to work with anything except submarines. It did finally happen, but not until the end of Dr. Morse's term. It took years to get it approved. I think that the Chief of Naval Research was also somewhat to blame because ONR had the problem of 'Not Invented Here,' the National Institutes of Health approach. Strictly speaking, in the Navy ladder for research and development, ONR was supposed to do basic research and then pass the results on to one of the bureaus. But ONR did not want to pass anything on if it was good. They wanted to keep it and continue to work on it themselves. The Bureaus, in turn, didn't want to take anything from ONR because they wanted to be the guys who invented it. I'm exaggerating, but those are the kinds of

things that made it very difficult to get an agreement. In the materiel side of the house and at the Office of Naval Research, everybody either agreed or we forced it down their throats. I honestly don't know the difference, but from where I sat, they all seemed to cooperate. They would come over to my office and we'd sit down. I'd say, "Here's what I need to do. Let's work it out." They would be glad to work it out. That happened particularly well with the Man in the Sea program because, and you've got to realize that it was a mistake, we were having the ONR research people run the Man in the Sea program. The Supervisor of Salvage should have run it, in my opinion. I don't know whether you agree, but I'm talking about the operational side. Let the R&D start with ONR, but let them work together with the rest of the Navy. You didn't have anybody who was really pushing that part of the program. The Supervisor of Salvage was pushing diving, hard hat diving, but I don't think his office understood that if you really wanted to explore the ocean and exploit it, you needed man to be able to do the work, on occasion. Of course, that really showed up when the intelligence community started getting involved. I don't know what is classified now, but obviously, we occasionally sent submarines down in certain parts of the world with divers who then worked outside the submarine. I think that was published in the book *Blind Man's Bluff*.

At the time, Wakelin had given me two jobs that I didn't like. One of them was to answer all the kook letters sent to the president's office or to Congress. I remember one of them, in which we had to put a line item into the budget for the flying submersible aircraft carrier. Now, you figure that one out, a flying submersible aircraft carrier! I think we put fifty grand into that scheme, and it took me two years to get it terminated. Then, when I came back from Vietnam, it was back in the budget again. That was one of the jobs I didn't like. The other job was dealing

with the SI, or special intelligence, world. At that time, the R&D Assistant Secretary ran the SI programs. That changed while I was the oceanographer. When Dr. Potter moved from ASN to undersecretary, he took all of those programs with him. Potter ran them during the days of the submarine projects.

I'm getting off the subject, but how did you get somebody interested in Man in the Sea? We needed that as an alternative or backup. We didn't need to say that everything we were going to do is going to be manned. I think that became a big problem with NASA. They said, "We can't do it if it isn't manned." Well, as you know better than I do, we used to talk about how much more expensive it is to put man in the loop, physically. There are times, though, when I think it's absolutely essential. Other times, it's a lot cheaper, and just as efficient and cost effective, to do it with a remote sensor. I'm talking about in the ocean. I'm not that conversant with space. I think you would have recommended to me that I use a submersible-type of remote link of some sort before I put a man down there if we hadn't done it before, just to understand where we were going. In general, I think the Supervisor of Salvage was interested only in salvage.

INTERVIEWER: Well, it's interesting that Lew Melson was also an engineering duty officer and a colleague and friend of Bill Searle's, who is, I think, the Supervisor of Salvage you're talking about

ADMIRAL SNYDER: No, I'm talking about his predecessor. I don't remember his name. I never had a problem with Bill Searle.

INTERVIEWER: When Bill Searle came in, and he arrived about that same time, in 1964, Lew Melson wanted ONR to develop better tools and equipment for divers. It was an ONR program that Lew Melson tried to prosecute through the SeaLab experiments. He had many difficulties

that he will gladly tell you about. There were lots of people in the Navy department who were interested in advancing Man in the Sea.

ADMIRAL SNYDER: Yes, but I think Captain Melson was the only one who was actually trying to take charge and get something done at ONR, and only ONR was doing it. I kept telling them how important it was, in a classified sense, to have the capability of putting a man outside a submarine. It was obvious to me. I used to kid the boss. I would walk in his office and say, "Well, the forces of darkness got to me again today." He'd ask what I meant. I'd say that the submarine community had closed their doors again. I'd say, "I may need your help," and he'd say, "Okay, call me if you need me," or something like that. It became a joke in the office. But that was the time when Admiral Rickover was absolutely and totally in charge of nuclear submarines. He didn't really appear to dislike research and development, but he didn't like it. Then, he almost went down on his hands and knees to get my boss to agree to let him have the first nuclear research submersible, the *NR-1*. We had an interchange with R&D for not the first time. After that fiasco with the USS *Seawolf's* sodium reactor, Admiral Rickover just didn't trust anybody in ONR.

The assistant secretary talked the Secretary of the Navy into hosting a lunch with Captain Cousteau for the Man in the Sea program. Wakelin had been the director of National Geographic's research team, committee, or whatever they called it. He had been involved with the *Calypso* and with Captain Cousteau on other subjects. We were using Captain Cousteau on other things but needed somebody to get the secretariat up to speed on how important it might be to have manned capability. We weren't telling Captain Cousteau about the long-range view of using it in the classified sense, only about the ability to exploit the ocean. I think it worked. I

remember it only because Mrs. Cousteau was the first woman ever to have eaten in the Secretary of the Navy's mess.

INTERVIEWER: That dinner took place after you arrived because you were present at the dinner. I also think it was before George Bond briefed Dr. Wakelin about his SeaLab proposal. Is that right?

ADMIRAL SNYDER: Oh, yes. As a result of the DSSRG, that review group we were talking about, Dr. Wakelin wanted to support the Man in the Sea program. That was what we called it, 'Man in the Sea,' but we didn't have it all clear in our minds. We made a heck of a lot of mistakes. I remember the first absolutely stupid mistake was that we forgot that vacuum tubes were not solid state in those days. Helium wiped out a vacuum tube. There we were, trying to do research with cameras and stuff, using vacuum tubes in a helium atmosphere and all of a sudden, the gas wiped out the entire communication net. Those were the kinds of things with which ONR should have helped us. There was no reason in the world, in my mind, that the Assistant Secretary for Research and Development should have been running a technical program. Wakelin did not want to run a program. He just wanted to see that it got going and that he was kept aware of it.

INTERVIEWER: It was initially assigned to ONR?

ADMIRAL SNYDER: Absolutely it was, because Wakelin owned ONR. He owned it lock, stock and barrel. He had the authority to promote civilians and was always listening on the Navy uniform circuit for who could be the next Chief of Naval Research. Admiral Leydon, for example, never went before a selection board. Under the law, the Secretary of the Navy could appoint a commander or above, regular or Reserve, active duty or not, to be the Chief of Naval

Research, and that officer while so serving would be a rear admiral upper half. That was, to my knowledge, the only law we had in the Navy that permitted that.

INTERVIEWER: Could ONR command Navy units at sea?

ADMIRAL SNYDER: No. It absolutely could not. You said 'Navy units,' and Navy units by definition are commissioned units.

INTERVIEWER: Well, how about the SeaLab?

ADMIRAL SNYDER: That was not a Navy unit. That was a research unit, a research operation. In fact, that issue came up the day Admiral Moorer was sworn in as Chief of Naval Operations. The Chief of Naval Research had a merchant vessel up somewhere off of the Pacific coast for an experiment. They were going to blow it up and sink it. Well, it didn't sink, and all of a sudden, yours truly was told to get involved with the thing and find out what was going on. To make a long story short, the vice chief, who was Admiral Rivero, I think, gave me a lecture like never again. He said, "Snyder, never again do you ever let anybody in the Office of Naval Research command anything that is at sea."

INTERVIEWER: That was the ship *USS LeBaron Russell Briggs*?

ADMIRAL SNYDER: I can't remember. It was not manned, of course. It was full of explosives. Then, Admiral Moorer got involved with it. From then on, somebody woke up to the difference I just asked you about. Is it a naval vessel? For example, is an oceanographic vessel a naval vessel in today's Navy? It was then, but is it today? Technically, it is not, because it may not be a commissioned ship. It's USNS. But in reality, they are ships and under the command of the CNO. I found that out as an admiral, when the Turks crossed over Crete. They were going somewhere to attack somebody and saluted my oceanographic vessel sitting in port. The CNO

blew his stack. Every morning from then on I had to attend, or send a representative to attend, the CNO's morning operational briefing.

INTERVIEWER: That was while you were the oceanographer?

ADMIRAL SNYDER: Yes, but going back to what you were talking about, there was a lot of interest in research, but nobody was willing to put his money up. In that sense, you were forced to use ARPA, the Advanced Research Project Agency, which was basic research for DOD. In my opinion, it was not that good. But I have to be careful about that because Dr. Frosch was the director of ARPA before he became the Navy's assistant secretary. He certainly was a good assistant secretary.

Captain Lew Melson was a remarkable person in a lot of ways. I think he made a major contribution but never got credit for it. He never made a show of what he was doing. Melson was very quiet, very confident and very capable. I like guys like that. If he told you something, you could trust it. I didn't have to do further research. I could go in and tell the boss, "This is what it ought to be." You knew George Bond far better than I did. I think if Bond wanted to have access to the assistant secretary through me, he would have polished me up to attain it.

INTERVIEWER: As a result of the *Thresher* loss, did the SeaLab program get attention from the Office of the Secretary of the Navy? Did it get approved for execution and assigned to ONR for that purpose? Also, was the Deep Submergence Systems Project (DSSP), PM-11, set up as a consequence of the report DSSRG's report when it came out?

ADMIRAL SNYDER: That's correct. ONR had done SeaLabs I and II, but SeaLab III was transferred to John Craven at the DSSP to carry out. John Craven was, to my knowledge, the first civilian, or civil servant, chosen to run a major project within the Navy materiel establishment.

It was intended as a permanent selection but interestingly enough, within a month after I left ASN, all of a sudden there was a Navy captain running the DSSP.

INTERVIEWER: Why was there the change? It makes sense if Craven was just an interim tenant doing the job until they found the appropriate ED. Dr. Craven had a full-time job as the chief scientist of PM-1, the Polaris Project Office.

ADMIRAL SNYDER: No. They relieved him of that job when he became the program manager at the DSSP. He thought he was still their chief scientist. He may have been to Admiral Raborn and Admiral Levering Smith, but his official job was the PM-11 program manager and that was to be permanent. I don't care what anybody else says. That was permanent. The Assistant Secretary for Navy R&D did it. You've got to remember the Secretary of the Navy owned and controlled not just ONR, but the entire materiel setup. We established the Chief of Naval Material as a four star billet. The blue suit Navy didn't do that. They didn't want a four-star running something big outside their chain of control, pushing buttons and stuff like that. You know that. ASN controlled NAVMAT and PM-11 came under NAVMAT. We made a recommendation for the first Chief of Naval Material. Remember that it was four stars, and in those days, we didn't have many of them. It was not like the world today. You haven't got a room big enough to bring them all together. I'm being facetious, but it was important and meant that the Navy had to give up another four-star billet somewhere else in order to make the Chief of Naval Material four stars. We made a verbal requirement, not in writing but verbal, that no one would be promoted to that job unless he had previously demonstrated successful management of a major program. I forgot that it was another thing that I got Secretary Nitze to sign. Who did that leave you with in those days? Who was the most successful program manager in the 1960's?

It was Red Raborn, the head of the very successful Polaris development program.

INTERVIEWER: Was he the Chief of Naval Material?

ADMIRAL SNYDER: I thought he was, but maybe not. I thought he was the first one. Ike Kidd was the exception. Ike Kidd was in my first class at the Naval Academy, so I know him really well. He was not a technical man no matter what he tells you. He was a good, rough and ready sailor but became the Chief of Navy Material. I don't remember when that happened, but I was the oceanographer. I remember getting a telephone call from him. He was one of the two guys that called me 'Eddie.' I got this call and he said, "Eddie, are you on the squawk box?" I said, "No. Who's this?" He said, "You know who this is. This is Ike." I said, "Yes, sir," and he started chewing me out because he didn't have proper maps. He was then COMSIXFLT. I said, "Whatever you want, Admiral. I'll be sure to get it to you," and we hung up. But he knew me well enough to do that. I can remember clearly that when I was working for Wakelin, Kidd was the executive assistant to the CNO, Admiral Moorer. He and Zumwalt were specially selected early for rear admiral. Zumwalt got sent to Vietnam, where he could put his stars on. Admiral Moorer may disagree with me on this, but he kept Ike as his executive assistant until Admiral Moorer became Chairman of the Joint Chiefs of Staff (JCS), as I remember it. I can remember that I'd walk down the hall and there would come Captain Kidd. I was a commander or a captain and I'd back up against the bulkhead on the E Ring. He'd ask, "What are you doing that for, Eddie?" I said, "When you knife me, I want to see it coming." That was what I thought of Admiral Kidd. But he wasn't a technical man and in spite of how much I liked him, I was very upset that he was chosen to be the Chief of Navy Material when I came back. Then, I was out of the loop. The oceanographer was not in the loop of running things. I don't remember the exact

number of staff persons in the assistant secretary's office when I came back, but it was over a hundred. When I first went there, it was just five. That was a real difference. It was when bureaucracy took over. With five people, if I have to know something about medicine, I'd go outside the office to you, and you would help me write it. I might have changed the tone so that it would have fit the secretariat, but I didn't know what was going on in medicine. I didn't know what was going on in a lot of subjects. I'd have people come over and we'd sit down and they would help me. Admiral Wilkinson would let me walk into his room at any time because my title was changed from Executive Assistant to Special Assistant for Submarines. I was not wearing dolphins. I never wore dolphins. Admiral Wilkinson was Op 02 or Op 03 before he got fired and sent over to Japan. He was running submarines within the Op 03 system before the submarines had their own Op man. I think he was in Op 03, and the reason that I had contact with him was because of what we were talking about before, a submarine admiral was the Assistant Oceanographer for Ocean Operations.

INTERVIEWER: That was also true in the 1960s?

ADMIRAL SNYDER: It was true in the late 1960s, yes, just before I left. I left in December of 1967.

INTERVIEWER: Let's talk about the formation of the Office of the Oceanographer. The hydrographer's office was changed by the Secretary of the Navy. The title for the admiral in charge was changed from hydrographer to oceanographer?

ADMIRAL SNYDER: Well, we changed the title before we actually got the instruction. We just automatically said that the guy who relieves Admiral Stephan, the Hydrographer of the Navy, will be called the 'Oceanographer of the Navy.' Stephan was moved, or retired, and took over as

the head of the Deep Submergence Systems Review Group. Another admiral replaced him but the assistant secretary or his aide did not choose him. When it became time for him to leave, Dr. Morse was the assistant secretary, as he had relieved Wakelin. Morse said to me, "I want you to go down and talk to the vice chief and get a list of admirals that he and I can agree on to be the oceanographer. We were making the oceanographer a title before it was approved. We didn't get that piece of paper until later. But you've got to realize with Wakelin, it wasn't hydrography, nor was it meteorology. He had a concept of Navy oceanography. In fact, he did own the Naval Observatory. I had forgotten that. His whole concept was to bring all of it together, and it started back in the early 1960s. There would be a program called 'Navy oceanography,' which would include the environment of the ocean, above it, below it and on the bottom.

INTERVIEWER: Did the hydrographer's office report to the assistant secretary?

ADMIRAL SNYDER: No. It never did. The admiral himself was made to report when he was called the oceanographer. I call it a change. I call it a drastic change. I don't know to whom he reported before. It was just someplace in OPNAV. A lot of people reported to some place but did not know to where they reported and did not have godfathers. A lot of enlisted ratings were that way, too. To make a long story short, we picked an admiral called Waters. His last name was Waters, and it became a joke. Chairman Rivers was going to approve Admiral Waters, even though Congressman Rivers wasn't in the Senate, to be the Oceanographer of the Navy. Then, Admiral Waters took over as the Oceanographer of the Navy. He was the first one selected by the assistant secretary. Dr. Morse chose him. Admiral Waters told me later that he knew that he was being considered for some job when he saw me coming out with the assistant secretary. Because the ASN had no business at all talking to him in mine force, that was an operational

thing. Admiral Waters became the Oceanographer of the Navy when I was leaving for the USS *New Jersey*. He wanted me to come to be the Chief of Staff to the Oceanographer. By then, it was a legal title and they had been moved to a building on Route 1 in downtown Alexandria, before later moving to the Hoffman Building. The office was established. There was a staff and the oceanographer, in effect, reported to two people. He reported to the Assistant Secretary for Research and Development and to the Chief of Naval Operations for operational things because, remember, he had an Assistant Oceanographer for Operations. That was the first time you had somebody who spanned from basic research to what was going on in weapons systems at sea on the ships. Admiral Waters was the first one who really had that job. Admiral Stephan kept telling me he had had it, but Admiral Stephan didn't control operations. He did control oceanographic programs. Admiral Behrens relieved Admiral Waters, and I, in turn, relieved Admiral Behrens.

Admiral Zumwalt was the CNO and he wanted Navy people to work with the other federal agencies. Of course, by that time, we had set it up so that the Oceanographer of the Navy was the Naval Deputy to NOAA. It wasn't called NOAA then. It was called ESSA, the female of ESSO. That got resolved while I was in Vietnam. When I came back as the oceanographer, it was NOAA. This is an opinion. I don't even know if Barhens is still alive, but I think he saw this as an opportunity to get three stars. They moved him from being the oceanographer, with additional duty as naval deputy, to a full time assignment in NOAA as the naval deputy or some title. That gave him the ability to deal with a presidential appointee. That made him automatically eligible for three stars. He did get that promotion from Admiral Zumwalt. Dr. Frosch, who was then the Assistant Secretary for Research and Development, and for whom I had worked before I went to Vietnam, called me over and wanted me to be the oceanographer. It

wasn't until after Dr. Potter left that the office began to grow exponentially. But by the time I left active duty, the Office of the Assistant Secretary of the Navy for Research and Development still owned the Chief of Naval Research and the Office of Naval Research lock, stock and barrel.

Legally, it was the only thing he owned entirely.

INTERVIEWER: Both as the special assistant in SECNAV, and later as the oceanographer, you did a lot of work to bring separated programs of the Navy department together and make them work together in the Office of the Oceanographer.

ADMIRAL SNYDER: That was an attempt that was obviously a failure.

INTERVIEWER: There were lots of successes. You put the Oceanographic Center in Mississippi.

ADMIRAL SNYDER: Well, I'll leave it to you to judge successes. I just felt so frustrated all the time. I even got an advisory group set up that really had some really high level people on it, including the first Op 95 admiral. At that time, Mr. Middendorf was the Secretary of the Navy, and I don't know why he was interested in oceanography, but he truly was. He would take me with him on all kinds of trips and things. When he found out that the oceanographer was the Antarctic Projects Officer and ran the Navy's part of the Antarctic program, he said, "Snyder, I want to go down there." I explained that I would have to get the Director of the National Science Foundation to agree. When he told me that he was the Secretary of the Navy, I promised that I would take care of it. I went over and told the director, who said only, "Ed, do what you want to do, but try to keep Middendorf out of our hair, will you?" I said, "Sir, I intend to do that but I wanted to avoid having a bunch of Ph.Ds trying to tell Secretary Middendorf what he can and can't do." We flew him down to the Antarctic, and he enjoyed it. But suddenly, he thought that

he controlled it. Actually, the NSF controlled the technical part while the Navy only provided logistic support through the oceanographer. In fact, that's why there's a peninsula in Antarctica named for Snyder.

INTERVIEWER: Oh, there is? Where is it located?

ADMIRAL SNYDER: I don't know. I'd have to show it to you on the map that they gave me. It's in the bathroom there somewhere hidden under the sink. Then, the White House budget people decided they wanted the NSF to pay for the whole thing. The NSF became the sole owner of the Antarctic program, including the logistics. I retired when that happened, but the director used to have me come over and we'd have lunch together and talk about it. Lockheed and some other people could taste running the program because NSF wasn't about to really run the logistic part. It was very expensive. One of the things that OMB wanted to do was find out what it truly cost, but there was no way you could have found that out from the Navy. The reason was because we'd pull a P-3 here and take a crew there, and the oceanographer would send the plane down or a ship would go down. When the NSF had to do that, they had to pay for it, every dime. All of a sudden, they knew what it cost.

INTERVIEWER: The Air Force and the Army also supported the Antarctic logistic programs. When full responsibility was transferred to the NSF, and the Navy connection was severed, were their connections severed at the same time?

ADMIRAL SNYDER: Well, connections weren't severed, but the NSF was put in direct charge of it, which made all those things reimbursable, theoretically. Whether they were all truly repaid, I don't know. For instance, as the oceanographer, I dealt with a lot of reimbursable programs but sometimes never asked for payment. I remember looking for a gun in Lake Michigan at the

request of somebody, and it was legally a reimbursable program. I went to the divers and said, "This is over Christmas. This is purely voluntary. If you volunteer, I'll see that you get Navy per diem, but I want a hundred percent volunteers. I don't want anyone thinking the Old Man is telling you to do it." I got more volunteers than I needed. They went over there and they found it, I guess. I don't remember the details. I did not consider that the situation demanded reimbursement. On the other hand, when the Air Force lost its hydrogen bomb, I was working for the assistant secretary and that was a totally different story. Dr. Harold Brown was the Secretary of the Air Force then, and I can remember very clearly what he said when I handed him the bill. He said, "Snyder, can't you just call this your Navy training?" It was a pretty hefty sum. It wasn't just the contract work. I wrote in the charges for the *Mizar* and the *Trieste*, a pretty big bill in those days. It was a long time ago, but it was a pretty big expense to send the *Trieste* halfway around the world.

INTERVIEWER: That happened just before you went to the *New Jersey*?

ADMIRAL SNYDER: I don't remember. I didn't go to the *New Jersey* until December of 1967, and I think this was about two years before that. Was it in 1966? I don't remember the date but I do remember that Dr. Morse was still the assistant secretary, so it would have to be before Frosch came in. Dr. Morse was the Acting Secretary of the Navy, because Secretary Nitze was out of town on an official trip. I have a memorandum on the Assistant Secretary's white letterhead paper that reads, "Ed, take charge and find it," or something simple like that, "Signed, Bob Morse." I thought, "Oh, boy!" It was on a weekend and we were pulling in the whole Navy. We were even pulling the flagship of the Sixth Fleet over there for one purpose, communications. It wasn't just R&D. I think you would call it a really operational thing.

Basically, the Air Force was talking to me on the telephone. They had a one or two-star general assigned to the problem because it was their weapon and they did not want anybody to find out why it was lost. It was lost because some major from the general's staff suckered the pilot of the bomber to let him fly up for the refueling and didn't know what he was doing. In my opinion, he didn't know what he was doing. But that was when the explosion occurred. Nobody was killed. It was absolutely amazing. But it broke the back of the bomber and it just opened up and all the weapons just dropped out. I think there were four. One went into the water because only one deployed a parachute. The wind got its parachute and took it into the water. We were doing all that on the weekend, and I mean that we were really doing it. They even assigned me a place to sit in the CNO's ready room because we were really operational. It really wasn't research and development, but we were calling on R&D to use their cutting edge new technology equipment to find and retrieve the lost bomb.

INTERVIEWER: ONR was involved?

ADMIRAL SNYDER: Oh, yes. ONR sent the *Alvin*, and it was the *Alvin* that found it. The *Alvin* was owned by Woods Hole, which was owned by the Office of Naval Research, which was owned by the Assistant Secretary, who at that time was the Acting Secretary of the Navy. Anyhow, I put all of this junk that reported on what was happening on Secretary Nitze's desk. When he came back on Monday morning, he was floored. It had hit the newspapers. But it was an Air Force plane. I don't think the relationship of the Navy to the operation was clear to the secretary until he saw my report. Then, things really started to happen. The president got involved. It became the highest level thing because unbeknownst to me, certain presidents or directors in various European countries had given unofficial permission to the United States Air

Force to fly over their countries with a loaded hydrogen bomb. Well, they basically said, “If you don't find the bomb and straighten all this out, you've got to stop your flights.” Here is my good opinion, which has nothing to do with fact. I always call it the ‘Air Farce’ because if that had happened, you would have had only one major nuclear program, and that would have been Polaris. I don't know whether you're aware, but the Navy couldn't have cared less about Polaris. Again, that is my opinion, and many would deny it, but the Navy really never supported Polaris because it was eating them alive, financially. They did support it, but you know what I mean by that kind of support. The Air Force could only have seen the incident as a threat. Can you imagine not being able to fly over in those days, when you didn't have cruise missiles in the airplanes? You had to physically fly over the target and physically drop your bomb. It became a number one problem. The Vice President of the United States was put in charge of the oversight committee. I was going over there with whoever was representing DOD, who happened to be Navy, by the way. I think it was the undersecretary. It wasn't my boss. It may have been the undersecretary. I remember this clearly. I went over to the meetings in the White House. I stayed out of the day to day bolts and nuts, and the work done by our contractor, Admiral Stephan's Ocean Systems. But when I found out how deep the area was, for instance, I discovered our CURV, or Cable-controlled Underwater Recovery Vehicle, couldn't go that deep. I called the director of the Navy laboratory on the west coast and told him to modify its cable. I remember that he said, “Who's going to pay for this?” I said, “It's going to be your butt if you don't do it, so don't argue with me about reimbursement.”

That was a bureaucracy. We had the number one problem in the United States of America, and I was getting, “I'm not going to do it until you pay me?” Come off it. But that's the

way life is. You know me well enough to know that my tone was not exactly pleasant, nor was it official. I could not have necessarily backed it up, either. But we were going to do it, and we did. The Air Force was absolutely one hundred percent cooperative. I remember we also got involved somewhat with the land business, even though that was the Air Force's responsibility. They had to scrape acres of radiation-contaminated topsoil, and their general asked me if our SeaBees could help. He asked, "Can't we get them over there and start pulling this contaminated dirt together?" I said, "Yes, sir." I called the head of the SeaBees and the Commander, Naval Facilities Engineering Command, but they only had one used bulldozer. I called the general back and asked if he could buy six bulldozers and fly them over there. He bought brand new ones and flew them over for the SeaBees to operate. The Navy couldn't do that. We didn't have that kind of money. I had sailors from a heavy cruiser wading into the shallow water in swimsuits, walking to see if they could find it on the bottom. I had the Atomic Energy Commission totally disagreeing as to where it was. I talked to a Spanish fisherman, and you know a fisherman as well as I do, but when he told me where he thought it went into the water. I accepted his word. His location was sixty miles away from where the Atomic Energy Commission-Sandia had decided it was, but that was where we did find it.

INTERVIEWER: When did you say you were talking to the fisherman?

ADMIRAL SNYDER: The fisherman was on the telephone. The assistant secretary was, in fact, with the CNO, who was running the operation from the Pentagon. But because Morse had been the Acting Secretary of the Navy at the beginning, he had put me in charge. The CNO's office was perfectly willing to have a shared responsibility and assigned a two-star admiral to run the operational part of the program in the Pentagon. I can't remember his name. Everything was

taking place in Spain. We had ONR involved, plus contract teams, so how did you communicate? We put a heavy cruiser on the scene. Then, we said, "Well, gee whiz, can't we use some of their sailors to double check the shallow water?" Everybody was having a ball from that viewpoint. I remember it so clearly. While it was going on, Dr. Morse was called upon to testify before Congress, but he was in the hospital by then. The Chief of Navy Legislative Affairs came in and said, "Snyder, you do it." I said, "I can't do it, sir." He said, "You didn't hear me. Go do it." I went over there, representing the Navy department, and gave this testimony and slides as to how we had recovered this weapon. Congressman MCC, before the Appropriations Committee said, "Well, Commander, do you need more money for this kind of program? This is very important, isn't it?" I said, "Yes, sir. He said, "Do you need more money?" I said, "Yes, sir." He said, "Well, how about ten million dollars?" I said, "That's a start," or something like that. He threw it in the budget and the Senate approved it, and McNamara's staff went right through the ceiling because there was a Navy guy, putting money in the budget with a directed program. Of course, that was not the right thing to do, but I was pretty naive about that. I had been dealing in the technical sense all the time and nobody cared about. But all of a sudden, I was going before the Chairman of the House Appropriations Committee, Congressman MCC, a very brilliant, powerful and honest man. I had dealt with him before on technical matters, and that shook a few people up. But it was so important to find the bomb, and we did find it, as you know. It was so important that there were a lot of bureaucracies involved, but it got done. To this day, it would be hard to actually document how it got done because nobody would believe it. You and I worked together a long time. You know what I'm talking about. But it did get done. That was Man in the Sea, too, by the way, because we wanted to put a man down there when we thought

that it was in shallower water. It actually fell into shallow water, but the parachute stayed partially open so that the current pulled the bomb into a gully and made it three or four times deeper than it was when it first fell. That was when the *Alvin* saw it. The *Alvin* saw the parachute and followed it. Some of the few things I have ever saved were the slides that I made for my presentation, because they comprised a summary of my recollections as to how we did it, what the names were and so forth.

INTERVIEWER: I think the SeaLab divers may have been sent.

ADMIRAL SNYDER: We wanted divers because we started out thinking it was in shallow water. For the deeper search, the *Alvin* was the nearest thing available, on the east coast. It was at Woods Hole, next to Hyannis, and the Air Force said they could pick it up at Otis Air Force Base and fly it over, which they did. As I remember, they flew it over, because it got there in a hurry, comparatively speaking. The *Mizar* was sent over, too. It also belonged to the Office of Naval Research. The CURV vehicle was on call. At that time, the Navy was the leader in undersea technology. You didn't have all these civilian companies, and the early ones did work under Navy contracts. You had them involved somewhat. You had them involved in the shallow diving and in shallow recovery. But the lost bomb was very deep when it was finally found. I don't remember the exact depth. Also, you've got to realize our concern about charges that the Americans had irradiated Spain. The Soviets tried to exploit that. There were four H-bombs. The bombs came apart and irradiated Spanish fishing grounds and the waters around them. They irradiated the tomato patches. I remember recommending to Secretary Nitze that he tell the vice president and the secretary of state he would authorize the Navy to buy tomatoes from Palomares farmers and feed them to our crews. That would prove that they weren't contaminated. Of course,

we had already done the tests and knew they weren't contaminated. But the Russians would try to convince everyone that they were. They were watching us all the time. An AGI, or whatever you called the Soviet spy ships, was sitting there, pretending it was a fishing ship, but it was watching everything. That caused me to tell the secretary that if we didn't find the lost one, I had another one in my back pocket, fixed up to look exactly like the real thing, including dents. We could slip it in there and pull it up. He said, "That's a good idea, but keep it to yourself, because the Soviets are going to accuse you of just that when we do locate the real one."

I always looked at Man in the Sea as a function of the operational Navy, whereas most of the people on the materiel side looked at it as a toy, a Cousteau toy. We had a big tent down there and it was getting a lot of publicity. It was an inner space program and so forth. I was looking at it because I thought we would need to be able to use a man, on occasion, and not just a remote sensor. I didn't know. I wasn't smart enough to know what that occasion would be. But today, it has been proved true. In the intelligence world, it is absolutely true.

INTERVIEWER: Well, that is true even in the operational world. The SUPSALV gets calls all the time, not only from various agencies in the United States, but also from overseas. Could assistance be rendered in locating and retrieving something? I think that the retrieval of the bomb was a demonstration of the early success of the program that Dr. Wakelin had initiated.

ADMIRAL SNYDER: You're absolutely right, and I think we proved it to the world. But I don't think the Navy understood that. Except for what the contractors brought, all the gear that was out there, the diving suits, submersibles, the CURV and so forth, were all in-house Navy equipment. They weren't combat ships, but they were paid for and owned by the United States Navy. The equipment was designed and developed by the United States Navy or its university and

laboratory contractors. I mean, the *Alvin* was named for Alvin Vine at Woods Hole, but the Navy paid for it and the Navy stood over it.

INTERVIEWER: I remember that the SUPSALV recently gave a speech. It was when an airliner was lost off Los Angeles. He said, "We have put our resources to work. It may take a couple of weeks, but I am positive that we will find the flight recorder." Then, someone handed him a note and he read it out loud, "We found it an hour ago and it is being taken aboard our surface ship."

ADMIRAL SNYDER: I think that demonstrates what I was trying to do. But I didn't have that much luck with Supervisor of Salvage. I think the SUPSALV people always thought somebody was getting into their knickers. The Supervisor of Salvage has a unique function, authorized by Congress, which allows him to do a lot of things from an operational viewpoint that nobody else in the Navy can do. Working for the assistant secretary, or later as the oceanographer, I never saw that the oceanography program was in competition with them. We actually worked to be sure that the Supervisor of Salvage had the capability both in ships and in manpower for Man in the Sea. I use the term 'Man in the Sea' because that was the term I learned when we first started talking to Captain Cousteau. I do not think people understood that when the assistant secretary's staff was five people plus a naval aide, a Marine aide and a bunch of GS-13 to 15 secretaries. We weren't trying to take on any more responsibilities. We were trying to get rid of them. I don't know what kind of staffing is there now, but I guarantee you that it's a whole lot more than five people.

INTERVIEWER: When we talked last week, you said that the Navy had to grow into a new capability. Bill Searle's vision in the 1960s was to have a Director of Ocean Engineering over a Supervisor of Salvage and a Supervisor of Diving. Looking back, we can now see that they had

enough successes over the last forty years to breed a new outlook. They take great pride in their offices, accomplishments and parts in the Navy's current remarkable undersea capabilities.

ADMIRAL SNYDER: They're taking pride in doing something for people other than just those in the Navy. The resentment that I faced, working for the assistant secretary, was in promoting the concept that the Navy had an obligation, just as we have for the rescue of people at sea.

International law states that except when being shot at in time of war, a naval vessel must stop what it is doing and go to rescue a merchant ship. The Navy didn't like that. They didn't that the oceanographer was sending people to find a pistol in Lake Michigan or doing what you are

talking about. Now, what you're telling me is that they understand the value of this, because the Navy is not big enough to do its own job. In fact, there's a piece of paper over there on my desk.

In it, someone talks about how important I felt it was to have people help the Navy, because our job was otherwise impossible. I felt that way both while I was working for the assistant secretary and as the oceanographer. If you wanted to, you could spend the Navy's whole budget to

understand how to operate in, on, under and above the world's oceans. I used to be criticized for going down with the oil companies and giving them even unclassified information, but they were

helping us more than we were helping them because they had the money. They were going to find oil. That paid money. I think that when Bill Searle came, he began to see the ability of the

Supervisor of Salvage. He recognized that it wasn't a bad thing to help other people out because the Supervisor of Salvage does get reimbursed. It wasn't like the oceanographer. If I got paid, I

didn't care. The Supervisor of Salvage kept a real hard set of books with regard to what he did for other people. But I think the Supervisor of Salvage was, in a sense, and maybe Bill would

disagree, an independent agency and not part of the bureau.

INTERVIEWER: Yes. I agree with you completely. He had an office in New York and a source of funds, which you just indicated, that permitted him to do some expensive things. But he said, "Don't worry about the cost. We will budget for it next year. We are going to set a precedent and then, we can continue doing it." I think that Bill Searle was the first Supervisor of Salvage who, as I saw it, recognized the Navy's responsibility to people and to the world's oceans. He's a great man. We've been talking about the Office of the Oceanographer and the Navy's oceanographic program. They had a very important role over a long period of time in making this all come together. But could you catalog what was involved, the oceanography, Navy weather and all the things that were included?

ADMIRAL SNYDER: I saw the creation of the Oceanographer of the Navy before I myself became the Oceanographer of the Navy, and I never wanted that job, by the way. I wanted to go to sea and stay at sea. But it didn't turn out that way. As the office in the Navy that gave the Navy the ability to operate, technically, scientifically and operationally in, on, under and above the world's oceans, it has a big view. People would say, "Well, is that true?" My reply was, "If I can tell you how the Mark 48 torpedo is going to operate so that you can use one instead of four to hit the target, then I have proven it to you." But they weren't willing to pay for it. Even Admiral Bob Long, when he was head of submarines wasn't willing to pay for it. Even Admiral Wilkinson was perfectly willing to support me but wasn't always willing to pay for it. I remember having one discussion that basically said, do I think that what I'm asking for is competing with him getting a billion dollar submarine? I said, "Come off it." I understood the competition in the Navy for dollars. I did not expect to get completely what was needed to do this job, but I to be able to do as much as we could to help out. Toward the end, people stopped

criticizing me for being willing to support other agencies. By the time I became the oceanographer, though I can't remember the exact details, I was the special assistant to the director of the National Science Foundation. I was the special assistant to the Secretary of Commerce. I was the special assistant to the Vice Commandant of the Coast Guard. I was the special assistant to the Interior Department. I even let his oceanographic-type ships use our facilities. He didn't reimburse the Navy, but the government didn't have to hire a big expensive bureaucracy to get the work done. I can't remember all the others.

INTERVIEWER: Was that the work with the Geological Survey?

ADMIRAL SNYDER: Yes. That was who it was. There was an internal feud in the government over whether the Geological Survey from Interior would be more of an ocean-oriented thing or if NOAA would be a more ocean-oriented thing. NOAA was only a hydrographic group. It really wasn't anything else, but it got into it in a lot of ways. I'm pretty familiar with that because while I was working for the assistant secretary, I was assigned many times to work with Athelstan Spielhaus, the guy who was always drunk and wrote that comic strip. He was the one who started the Sea Grant program, politically. That was after Bob Abel got hired. In fact, I remember a call from the National Science Foundation Director. The Sea Grant program went to the NSF before it was given to NOAA. I can remember his call because he said, "Snyder, I need to talk to you privately. Get off the squawk box. I'm thinking of hiring Bob Abel to run the Sea Grant program. What do you think?" I said, "That's fine, but keep your line on him." He laughed and said, "Thanks for the tip." Bob Abel is very capable, but I think that you always had to be sure of who was running the program, generally. I don't mean the nuts and bolts. When they moved the program from the Science Foundation to NOAA, Bob continued there. We were very close

friends. Bob had been the executive director or secretary of the Interagency Committee on Oceanography, which was established by my boss back in the early 1960s. I got to know him really well. Even now, we see each other once or twice a year. But the Sea Grant program became a political thing, as I see it, in the eyes of certain members of Congress and certainly in the university's eyes. It was Uncle Sam passing out more money, wasn't it?

INTERVIEWER: I think it was deliberately seeded to universities scattered across the United States in order to build up its representation in Congress.

ADMIRAL SNYDER: Of course. They did it just like the Post Office and the Weather Bureau. The Weather Bureau saw to it that there was a representative of the United States Weather Bureau in every town that had a member of Congress in it, whether that town needed a weather station, for the same reason. I used to testify both when I was young and while I was the oceanographer along with Dr. Bob White or anybody else who wanted to talk about the oceans, oceanography, sea business, Man in the Sea or fishing and that kind of stuff. In those days, they liked to have a naval officer sitting beside them. I've even gone and done something quasi-legal by doing television promotions with members of Congress who are on those committees. The fine line says you can't deal with members of Congress unless they are your representatives or the Navy Office of Legislative Affairs has told you to that you can. But in many parts of the country, a guy enjoys having an admiral standing up beside him when he's making his speech.

INTERVIEWER: Did you know that in France, naval officers are forbidden to leave the country when a national election is going on?

ADMIRAL SNYDER: Oh, no. That's fascinating. The navies of South America are political but aren't generally involved in coups. It's usually the armies and air forces that is involved, while

the navies sit and pretend that they are above it all.

INTERVIEWER: I think this restriction applies to army and air force in France also, and to all military officers.

ADMIRAL SNYDER: I always thought it was very interesting. Here I am. I've been in the weapons system program. I've been at Los Alamos. I've been at Livermore. I've been at Sandia Base. I've been the program manager for the Polaris warhead and reentry body on-site. The only thing I had to do with oceanography in those days was to be sure that we knew where the FBM submarine was and whether it could launch a missile through the interface of the ocean into the air. Then, all of a sudden, I was the Oceanographer of the Navy. That started really because of my job in the assistant secretary's office. Yet, I don't think history will ever give Jim Wakelin true credit for the fact that we have a Navy oceanographic program only because of him. Morse followed through and indeed, did more in certain areas. Frosch did much more in other areas. But I'm talking about getting it started. We were dumping money in every small town and university that was willing to accept it from ONR in order to get involved in the ocean business. We suddenly woke up to the fact that in the Navy, certain programs, like anti-submarine warfare and submarine operations, needed to know a lot about the ocean. The Polaris program put us in the position of having to really understand something more about the ocean than most people recognize.

INTERVIEWER: Now, I see the direct connection between OP-95 anti-submarine warfare and ASN for R&D.

ADMIRAL SNYDER: When I walked into that Pentagon debate on the subject of anti-submarine warfare, I remember Secretary Wakelin saying to me, "You know, Eddie, the

Congress is really pushing us on anti-submarine warfare. They say we don't have any capability, and I tend to agree with them. I want to see what we should do. They want us to have a czar of anti-submarine warfare. The Navy does not want us to do that. The Navy doesn't want to push ASW in the same limelight as tailhooking, driving nuclear submarines and so forth." He got me involved with that. Congress really pushed us into anti-submarine warfare. I woke up walking in there, coming from command of a destroyer, not yet aware of the SQS-26 sonar, and all of a sudden, I was, in effect, advising the secretary as to how to do it, pay for it, train people and get people interested in it. I should have known a lot more about it than I did. I was running some ASW programs but was not up to date on all the new stuff.

INTERVIEWER: But I think the current ASW capability is another success story in the Navy's oceanographic scientific program.

ADMIRAL SNYDER: Well, I would say it is more to the scientific program than the oceanographic program because it occurred prior to the establishment of a valid oceanographic program. My personal opinion is that the kinds of things that we've done, plus what the oil companies were able to do later with it, really started at the Office of Naval Research. The big problem, as I saw it when I came in, was how we were to move it from ONR to new ships. In other words, the question was how we were to take it from the drawing board and the bread board model to something the Navy could use at sea. I was a sea driver, so I'm a unique individual. I don't think you'll see that again. I had command at sea of three ships and at other times, I managed three or four technical programs. Nowadays, you've got to make a decision to go one way or the other. But I was lucky in a sense and maybe unlucky in another, because I would rather have been an operator. It was more fun. I couldn't explain or articulate to you the

fun of commanding a battleship, seeing peoples' lives saved, and seeing very scary people just disappearing whenever you moved in. That was a real thrill. It was like a surgeon saving somebody's life. It got to be a real satisfaction when you knew you made the right cut or the right diagnosis. I'll never get that opportunity and I don't think many other people will, either. But that's beside the point. Stop and ask yourself, how do you get anything done in the Washington area? I remember the paper I wrote at the War College, "The Five Sided No-Sayer," meaning the Pentagon. They can't do anything but say no. I really verified that after I got there. I would see sometimes as many as 12 flag officers' signatures on a piece of paper before it got to the Secretary of the Navy. That was ridiculous. I think it was ridiculous.

INTERVIEWER: Tell me about taking all the various components of your program and moving them down to Bay St. Louis?

ADMIRAL SNYDER: That resulted from a directive by the Congress of the United States for the Navy to move X number of people out of the Washington, D.C. area. I don't know how they stated it, but it was to move like a minimum of 10,000 people away from the so-called 'greater Washington area.' It was probably led, in fact, I'm pretty sure it was led, by Representative Sikes of Florida. His motive, in my opinion, was to relocate some of it into his district. If you remember, Panama City got a lot. It was resisted but it got a lot. When I came back as the oceanographer, I reported to the Assistant Secretary for Research and Development, as well as to the vice chief and a few other flag officers. Dr. Potter had been involved in the ocean engineering business with General Motors (GM). He had done some tremendous things, was really fascinated with it, and was very capable. He was the director of the GM laboratories. All of a sudden, he called me in and said, "Ed, I want you to move the oceanographic program away

from Suitland. You go find out where to move it." I went on a hunt and it wasn't long before the word got out. You don't go to Senator Hollings' area and ask the kind of questions I was asking without Senator Hollings, who's in that kind of business, saying, "What's that snappy young admiral doing there? What does he want? I understand he's in this ocean business." That was also happening out in Seattle, Washington, because I was only going to the coastal states. I was not going to Illinois or to West Virginia, for sure. I had no political purposes, but other people influenced me. It was other people who found Mississippi and New Orleans. They found the NASA base there. Dr. Frosch, by the way, became the director of NASA and used to ask me to go down with him when he would talk about this huge facility down there. It's 25 miles in radius and carved out of nowhere. Everybody in Mississippi wanted to do something else with the site, but NASA needed to have it as a stand-by place to build explosives and so forth. It's empty and free, basically. It's on the water and next door is a computer site to handle all the computers for meteorological, oceanographic and charting data. Also, over in New Orleans were other free, open buildings. I went back and reported all of this to Dr. Potter privately. The next thing I knew, I got an order to examine the possibility of moving the Bureau of Naval Personnel to New Orleans. Well, I looked at the boss and said, "You don't want me to do that. You don't understand." Navy officers then, in the early 1970s, did not know how to confront anybody on the telephone. They had to see them eyeball to eyeball, and they were never going to let you take personnel control out from under their eyesight. He said, "Ed, you didn't hear me." Of course, I went over and told Congressman Hebert, who was a very powerful guy, what I wanted to do. I asked if he would support it and he said, "Yeah, I think we can do that." To make a long story short, though, it didn't happen and I had to go back and tell him. He treated me okay. He was

very good about it. Congressman Hebert was not one of these people who said, "Get it out of Washington." He was pretty good. You've got to realize that I had told him I was going to put the whole Navy personnel office down in all these empty buildings in the New Orleans area. Then, I came back and told him that I couldn't. He didn't appreciate it, but he treated me nicely. He treated me very well whenever I went there. I remember going there once with Jim Hannahan, the one black man I had on my staff. The Congressman was taking us to some exclusive club for dinner, but club policy was that no blacks were permitted. This was thirty years ago, when it was still common practice in many places. I told Congressman Hebert that it might be a problem. He said, "I am on the board, and I will change the rules." We walked up to the club and had our dinner.

INTERVIEWER: Good.

ADMIRAL SNYDER: That was Hebert. I guess he had never paid attention to it before. Once, I said something to him, bang. Things happened when he'd say something in the State of Louisiana. Little things like that were always fascinating to me, because he was a real gentleman and a man of his word. Senator Stennis was also a man of his word. The other person I dealt with a lot was Senator Magnuson. I dealt with him while I worked with the assistant secretary, and Magnuson was wonderful. I shouldn't say this, but in my opinion, he was an alcoholic. In fact, I used to get assigned to go to parties with him. When the secretary would go to a party, he'd say leave me and go follow him. I didn't know what alcohol is and only lately I've learned that we have alcoholics in a lot of professions. I guess I was fortunate.

INTERVIEWER: Let me go back to Bay St. Louis, where the computer was a NASA computer. Did you have to buy a new one, or did the Navy enlarge the NASA computer after they arrived?

ADMIRAL SNYDER: I bought a new one because I wanted the world's best computer. The only good one the Navy had was over at the Naval Research Laboratory, but it was too technical a computer. It wouldn't handle the kinds of things you have to deal with in meteorology and oceanography. We did have another computer in Monterey on the west coast. As a matter of fact, in the 1960s and 1970s, the most competent Navy officers, not civilians, in the computer world were the oceanographic and meteorology people. They were running this computer facility out in Monterey. I had already planned for a new computer in my budget, whether we moved or didn't move, to handle what I could see coming down the road for the next ten years. It was approved after I left, but those things take a long time. I'm not sure whether the assistant secretary thought it was a power grab, or what kept holding it up, but I did have the General Services Administration's approval and the OMB's approval, and in those days, it was hard to get computer approval. But I had all the approvals except within the Navy. That was slowing it down.

INTERVIEWER: They drag their feet. First, it was air conditioning. We had to go through hoops to get air conditioning for our buildings. Then, it was computers. I don't know what it is now.

ADMIRAL SNYDER: It was also perfectly clear that if you really wanted to tie all of that stuff together, you had to do it within the ability to have it classified. You might disagree with that. A lot of people do. But it was true. You had to be able to classify it when you needed it classified. Yes, I gave everything to everybody. Yes, I gave things to the Soviet Union. But certain people in the military departments, the Department of Defense and the Navy, particularly the civilians, understood that the United States came first in my mind, but I didn't over-classify. As a matter of fact, I remember walking into an argument that took place while Secretary Nitze was Secretary

of the Navy. It was over the issue of the Transit Navigational System. The Transit Navigational System, using a satellite system, played a part in telling the Polaris when to fire. Its other role was purely navigational. Well, I gave the Soviet technical people the navigational part of it and of course, that blew a lot of peoples' minds. They didn't see Transit as just a navigator. They saw it as a Navy weapons program. I remember throwing down a South African paper article about the Transit in front of the desk with all these admirals. I said, "Who the heck are we trying to keep it from? Here's a declassified version from South Africa. I'm talking about navigation." Before the Global Positioning System (GPS) became available to everybody in the world, Transit was a heck of a fight. But it probably set the stage so that GPS later did not have to go through that same fight. The United States Navy did permit industrial receivers the capability to use the Transit Navigational System, but again, that was over strenuous objections.

INTERVIEWER: What was the Transit system?

ADMIRAL SNYDER: It was a satellite system used to navigate before the GPS, which we needed for the Polaris program. It was the predecessor to the GPS. The big issue was over whether we improved and increased the number of Transits or created a new system. The decision made by the Secretary of Defense to do a new system. I was involved with the GPS when it first came out, and I was supporting it. I think the only thing wrong with it was the altitude. The third thing the GPS can give you is absolutely accurate altitude. Well, so what? Simple radar gives you the inches you are above the building, the earth, or anything else. The GPS only gives you altitude above a geodetic position. I'm sure they have that capability, but what good was that to me? It's a three-dimensional navigation system but you don't need to know feet above anything.

INTERVIEWER: They proposed using it for hands-off landing of aircraft. For that, you would even have to integrate the polar wobble.

ADMIRAL SNYDER: In that case, they would need to know the feet. I'm not sure that the technical details are available to the rest of the world. They will be, eventually, because you can't hide that forever. Then, I didn't see that it was that important, from a navigational viewpoint. I think it's just fascinating. I remember in the early part of the Polaris program, when I was the warhead officer. I was also double-hatted to the Atomic Energy Commission and Livermore, to Dr. Teller. In addition to the other problems, you had to know where you were. If you didn't, you were going to miss. In those days, we didn't have the smart bomb ability to sense a specific target and go after it. We had to know where we were and where the target was and do both geodetically, since we were operating in geodetic space. How do you rectify and resolve all of those issues when the Navy says to you, "We know where we are within feet?" You've got admirals asking you, "What are you talking about?" or saying "That's a waste of money." I went to the Naval Academy. I know how to blah, blah, blah. I said, "Okay, we've got a really simple problem. Let us put out an order that when the Sixth Fleet returns from its next deployment, no ship can talk to any other about its position. I don't want the admiral given the noon position from the ships. He can get that from his flagship, but not from the rest of the fleet. When we come back, we'll look at them, and I guarantee you that they will average more than ten miles apart." They were 18 miles apart or something like that. That was not accurate enough for a missile to launch against a target in those days. The need for having a navigational system became obvious. Forget the business of all the old Navy guys being able to use a sextant. I think they had their picture taken with sextants but never really knew how to use them anyhow.

INTERVIEWER: You were, I think, the program sponsor for a lot of officers whose designator put them into an odd bag of Navy career programs like oceanographic specialists, weather specialists and divers. I think you even got involved with EOD, or explosive ordnance disposal, and SEAL officers.

ADMIRAL SNYDER: I did, but that wasn't always appreciated. I remember, for example, when a chief quartermaster came up to me while I was the oceanographer. He paid an official visit to say his group needed a sponsor. He said, "We don't get anywhere in the Navy and nobody wants us. Will you do it?" He wanted me to sponsor the enlisted quartermasters, to be their Navy godfather because they didn't have one. He said that I was not in the Pentagon but had a foot in it. I said sure. By the time I got finished, somebody took the quartermasters because it was pretty obvious they were trying to pull a power grab. I eventually took all restricted line technical specialist officers and put them under one 1800 designator so they would have a godfather, i.e., the Oceanographer of the Navy or the Navigator of the Navy, whatever title you want to give him. He's got a lot of titles these days. Other people would come over and ask that I be their sponsor, but being a sponsor entailed more than just standing up for that particular group. It eventually required getting into the detailing and billet business, and I did not want to do that. I would support them and try to get them brought into some system in the Navy.

In my opinion, the Navy had given up on insisting that senior officers have graduate degrees. EDs and technical people, yes, but I'm talking about unrestricted line officers. Remember that I was a line officer. A lot of people don't know that, but I was, in fact, an unrestricted line officer. I did have my Master's in nuclear physics from the Massachusetts Institute of Technology and a couple of honorary doctor's degrees. I grew up thinking the Navy

was the only service, and there were only two when I started and then, there were three, that really believed in education for its officer corps, both line and non-line. But I think the Navy later lost that desire, at least up until the time that I left active duty in August 1979 and stopped recognizing that it's a critical need. I used to say that people accumulated box tops in order to get promoted. I thought education was a really necessary box top, instead of the one that just kissed butt CC but I could be wrong. I always looked at the Navy as a very technical service, both line and non-line, and I think that in most of the non-line businesses, the medical profession, and even the supply corps, specialists have recognized the importance of graduate education.

INTERVIEWER: Who were included in the 1800 designator?

ADMIRAL SNYDER: Included were people who were specialists in meteorology, hydrography, scientific oceanography and ocean engineering. That turned out to not really be true for all of those officers because you had to volunteer to have your designator changed. You had to transfer from unrestricted line to restricted line. Some people wanted to do it and others didn't. I also don't know that I ever had a large group of what you call 'mustangs' interested in doing it.

INTERVIEWER: You're talking about former enlisted?

ADMIRAL SNYDER: Yes. I don't know why that was true because I have more respect for them than most people do. I ran the *New Jersey* with mustangs.

INTERVIEWER: What was your involvement with EOD and SEAL officers?

ADMIRAL SNYDER: Back when I was very young, I saw the SEALs as a group of people who could accomplish the dream of putting man on the ocean floor. They could exit from a submarine to walk around. Some people shared that idea, and some people investigated it. I remember a very fine young officer who went up to Woods Hole and made the equivalent of admiral in EOD

or SEALs. He was their first flag officer. But before that, they didn't have a flag officer to lead their community. Look at a line officer like Brad Mooney. When he was a young commander operating submersibles, who was supporting what he was doing? Nobody except for yours truly. Look at the medical people who were interested in doing hyperbaric work. Well, it doesn't mean I owned them. It doesn't mean I was their legal sponsor. I could help them in little but important ways when there was a big meeting going on. It is an important thing for the Navy to do. There are all kinds of sponsorship. There is also a dangerous sponsorship in taking to the legal term, because it then gets involved with billets.

INTERVIEWER: But you also have to have a career plan for them.

ADMIRAL SNYDER: Oh, yes, but that's one of the things you can do as an old man for the young people. That was one of the reasons you saw me having my luncheon reserved at least four days a week for outsiders and not staff meetings. Somebody who was running some kind of program would want to come over and discuss a problem with me. These were people who recognized that something different was going on in my office. They didn't know what it was or how it worked, but it seemed to be reasonably successful, not only from a promotion viewpoint, though. It was successful in getting something done. I would always let people bring their kids over if they could. I was also getting concerned that everybody wanted to be in biological oceanography and I didn't think that was all this country needed. We needed specialists in physical oceanography, too. Don't misunderstand me. We need biology, but not exclusively. You know that when I hired my first aide, I turned down the aide they wanted to send me. He was captain of the football team at the Naval Academy. But I chose Ron Tipper instead, with his big eyes and he was absolutely scared out of his pants. But he had a Ph.D. and understood

biology when I hardly knew how to spell it.

INTERVIEWER: He's a great guy.

ADMIRAL SNYDER: That shook up the Bureau. The Bureau didn't understand why I didn't want this super performing naval officer as an aide. I said, "I don't use an aide to carry my briefcase. I use an aide as part of my brain. Everybody on my staff is either a part of my brain or I reject them to just go sit in the corner."

INTERVIEWER: If Navy diving officers liked diving and tried to stay with it, they gave up their chances for advancement.

ADMIRAL SNYDER: Nobody supported them. That was very true. I went out to see Brad Mooney when he was operating submersibles on the west coast, long before he made admiral, and he was frustrated. I don't think we really understood the frustration of people who liked to dive. I remember the diving group when I first knew it, and it wasn't a community of its own. It was a machinist's mate who qualified as a diver. It was an electronics technician who qualified as a diver. It wasn't a true specialty. It was a subspecialty. Maybe today we have a rating called 'diver.' I don't know, but we didn't then. We had a subspecialty, and specialists have nobody to be their godfathers. Well, I was perfectly willing to take that on as long as it was not a billet issue. Somebody could support you, tell you where you ought to go, see to it that you got a recommendation to get to school and see that you got utilized periodically. The problem with divers in the seagoing Navy is that they aren't used as divers as often as you think they are. Divers are only used when there's a real problem, with a propeller or something like that, and they're stopped in port. They put a diver over the side to look at it. I'm talking about warships: carriers, battleships, cruisers, destroyers, and DEs. I don't know the submarine force. I'm talking

about occasionally putting a diver over the side to do repair work, which is mostly for what the surface Navy uses divers. But that's not what divers always want to do. There are people who love to dive. Ike Kidd was another guy like that. That was one of the reasons we got along after I made admiral. I don't know whether he wanted to dive or what, but he just liked diving. I could always get him to do something with diving if I asked him. But his staff would absolutely refuse to let anybody in there because they knew he'd do it and it would just waste time. But it's interesting. Diving is a profession but also a venue.

INTERVIEWER: When I went to the Antarctic, many of our aviators there were guys who loved to fly. They were all passed-over lieutenants and lieutenant commanders. They spent all their time flying and avoided what was necessary for further promotion.

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1. FORMER ASST. SECRETARIES FOR AIR/R&D/RE&S/RD&A

HONORABLE JAMES H. WAKELIN, JUNIOR, Assistant Secretary of the Navy for Research and Development, 05 June 1959 to 30 June 1964

HONORABLE ROBERT W. MORSE, Assistant Secretary of the Navy for Research and Development, 01 July 1964 to 30 June 1966

HONORABLE ROBERT A. FROSCHE, Assistant Secretary of the Navy for Research and Development, 01 July 1966 to 19 January 1973

HONORABLE DAVID S. POTTER, Assistant Secretary of the Navy for Research and Development, 14 September 1973 to 16 August 1974

HONORABLE H. TYLER MARCY, Assistant Secretary of the Navy for Research and Development, 15 October 1974 to 04 April 1977

2. BLUEJACKET ADMIRAL, J.T. Hayward & W. Borklund, Naval Institute Press, Annapolis, 2000, page 252:

That got lost in Congress' media-fed reaction to Sputnik. There, the consensus was, "the Russians beat us because we weren't organized properly and had all this interservice bickering." 'Re-organization' became the biggest game in town. By late 1958, a truckload of it was in place. Oddly, Congress' Defense Reorganization Act of 1958, enacted in August, affected mostly not R&D, but the command structure. Its keys: (1) The president and the secretary of defense, aided by the Joint Chiefs, "will establish and decide the forces assigned to unified and specified combat commands," their commanders to report directly to the defense secretary, (2) a "truly unified" six-hundred-person Joint Staff, set up along conventional staff lines - J-1 for Personnel; J-2 Intelligence; J-3 Operations; and so on, to support the Joint Chiefs whose strategic planning and other JCS work "shall take precedence over" their separate service roles.

It was Ike's heavy hand at work, really. He wanted a single military Chief, the JCS chairman, with a single military staff like the German General Staff the army seemed to admire. Fact is, in World War II, it didn't run the show. Hitler did. The German General Staff just deployed forces. Besides, we also beat the Japanese, who had two staffs; and the Italians, who had three. Burke opposed it since it made the military departments mere suppliers of people and hardware to the combat forces, and put a CNO outside the chain of command. Being the tough-minded leader he was, he didn't buy at all the idea of agreeing to a plan and then making someone else responsible for carrying it out. The idea of having a CNO had first come up in 1915. Over nasty opposition in the Navy secretariat, it was created but that CNO was not given any money or tools, except his own prestige, to do the job. The 1958 act took us back to 1915, the CNO once more becoming just chief of naval staff in Washington, D.C. Burke was our last real CNO.

What the act did in R&D was more encouraging. It raised the Assistant Secretary for R&D to Defense Director of Research and Engineering (DDR&E), later naming my Lawrence Livermore Lab director, Herb York, as the first DDR&E. In Pentagon jargon, an Assistant Secretary advises the boss. A Director can issue orders on behalf of the boss. More importantly, the DDR&E would receive all appropriated R&D funds and distribute them to the services. My diary notes, "This won't be the last reorganization, I'm sure." It wasn't. ...

Meantime, at home, cascading down from the 1958 Act came the Franke Board, chaired by Navy Under Secretary William B. Franke. Its package, proposed in May 1959, included folding the Navy Assistant Secretary for Air's role, among other tasks, into a new Assistant Secretary for R&D office. On the military side, they created a chief of naval material. What it did was merge BuAer and BuOrd into a single Bureau of Naval Weapons, headed at the outset by Rear Adm. P. E. Stroop. Before, BuAir and BuOrd had been private fiefdoms reporting to the Navy secretariat who, being appointees who usually serve only two to three years, could be outwaited.

3. SLADE CUTTER Submarine Warrior, Carl Lavo, Naval Institute Press, Annapolis, 2003 page 205:

The issue was the imminent launch of the *NAUTILUS* (SSN-571), the world's first nuclear

submarine. The design of the top-secret vessel had been unveiled eight years earlier at a top-secret meeting at the Bureau of Ships in March 1946. Vice Admiral (Charles A.) Lockwood was at that meeting as were other ranking Naval officials, surrounded by futuristic diagrams, blueprints, and mathematical equations taped to blackboards. Dr. Phil Abelson, the young physicist who pioneered a means of harnessing uranium as a source of energy, held his audience spellbound.

"The atomic-powered submarine in this report is designed to operate at 26 knots submerged for many years. ... The power unit requires no added fuel or oxygen, and personnel oxygen could be replenished by electrolysis or chemical methods. It should be remembered that the 26 knots proposed is merely a beginning. With better power conversion, machinery and hull design, there is no reason why the speed should not go up to approximately 40 knots using screw propellers. Beyond this speed, combining atomic power with jet propulsion may provide speeds well over 60 knots. To function offensively, this fast sub-marine will serve as an ideal carrier and launcher of rocketed atomic bombs."

4. EFFECTIVE USE OF THE SEA, Report of the Panel on Oceanography, PSAC, The White House, June 1966, GPO.

Page 106: "Captain Edward Snyder met with the Panel on numerous occasions. He provided detailed information on many aspects of the Federal program as a representative of Dr. Robert Morse, Chairman of the Interagency Committee on Oceanography."

5. In the 2001 U. S. Naval Institute Press Book IMPROBABLE WAR-RIORS by Kathleen B. Williams, Roger Revelle is quoted to say that LT(jg) Mary Sears USNR(W) was "the first Oceanographer of the Navy in modern times" for her wartime work as Chief, Oceanographic Unit, of the Navy Hydrographic Office.

UNDERSEA & HYPERBARIC MEDICAL SOCIETY

INTERVIEW OF JACKSON TOMSKY

Kensington, Maryland

April 2003

PROCEEDINGS

MR. TOMSKY: Well, my name is Jackson Tomsky. I'm a retired commander, United States Navy.

INTERVIEWER: Let's go back to the beginning. Where did you grow up? Where were you born?

MR. TOMSKY: I was born and raised in San Francisco, and I was born on August 29, 1919, in the city of San Francisco.

INTERVIEWER: Were you educated there, also?

MR. TOMSKY: I went through high school and then enlisted in the Navy.

INTERVIEWER: When was that?

MR. TOMSKY: 1939.

INTERVIEWER: Why did you enlist in the Navy? Was there a particular reason? Did you have an affinity for the water or was it in your family?

MR. TOMSKY: No. I didn't really have an affinity. It was a more practical reason, in that I was looking for a job and there was no work. The Great Depression was still on, so I went down in 1938 to enlist in the Navy, and I qualified. It took a year before my name came up on the waiting list for enlistment. There were that few people taken into the services at that time.

INTERVIEWER: That was on the eve of the war, so the big build-up hadn't yet occurred

MR. TOMSKY: It hadn't quite occurred.

INTERVIEWER: There was great competition for a few spaces?

MR. TOMSKY: Yes.

INTERVIEWER: Had you been to college?

MR. TOMSKY: No. I was just out of high school.

INTERVIEWER: Could you describe what was it like? You went down and took the oath?

MR. TOMSKY: Well, you went down to the recruiting office and took the oral and written examinations and then, a cursory physical. If you qualified, your name was put on the waiting list. As the waiting list diminished and your name rose to the top, you suddenly got a phone call, and if you were still interested in enlisting in the Navy, you were to be down at the Post Office building at such-and-such a time. You were to bring your clothes with you, as they would enlist you right there and send you off to the training station.

INTERVIEWER: Where was the training station?

MR. TOMSKY: It was in San Diego.

INTERVIEWER: What was that like, going through boot camp at that time?

MR. TOMSKY: Oh, it was a shocker. You were suddenly thrust into an arena of discipline. You were told when you went to bed, when you got up, what you ate and what you did at this hour and what you did the next hour. All of a sudden, you were regimented. It was shock treatment. I presume that there was a basis for why they created it, but it was tough. It was very, very difficult. Obviously, people were homesick. You left a good home and were thrust into these barracks with fifty other people. We slept in hammocks. When you arrived at the training station, one of the first things they did was cut your hair. The next thing they did was issue you a sea bag full of clothes, a hammock and a bucket. The bucket became a very important part of your life, particularly in shipboard, because water was a scarcity. You used that bucket. You used salt water to wash your clothes. There were no laundries on the ships at that time. The amount of water you had was very, very limited, because of the stills they used in those days to replenish the water supply. It was very difficult.

INTERVIEWER: You were getting a taste of what shipboard life would be like, at a shore station?

MR. TOMSKY: Yes, absolutely.

INTERVIEWER: How long did that training last?

MR. TOMSKY: It lasted three months.

INTERVIEWER: What happened following the training?

MR. TOMSKY: Following the training, you were then assigned to a duty station. I went out to the submarine base in Pearl Harbor. That was my first duty station.

INTERVIEWER: What was your first impression of Pearl Harbor?

MR. TOMSKY: Well, in 1939, it was a sleepy tourist town. The base itself had been running for probably 25 years. It was all quite new. It was hard to grasp, as a youngster, being put into a facility like that submarine base, among the idyllic surroundings of Honolulu.

INTERVIEWER: Was that considered to be a plum assignment for a young recruit?

MR. TOMSKY: I suppose so, in a sense. You certainly had a lot more independence than you had aboard a ship. However, we didn't know the difference. You just looked on a bulletin board, and there was your name and where you were going.

INTERVIEWER: There wasn't any particular reason as to why you were selected to go to a submarine base? You hadn't put in for anything?

MR. TOMSKY: No. As a matter of fact, we were allowed to put in for our choices of duty stations, and I wanted to go aboard a heavy cruiser. Those had been my first and second choices.

INTERVIEWER: But there you were, at a submarine base at Pearl Harbor. What was your assignment there?

MR. TOMSKY: Well, I was assigned to the deck force. In those days, we policed the grounds, cleaned the swimming pool, did general work and kept up the base. Then, I went and asked to be transferred, and was transferred, to the foundry on the base. I became a molder striker.

INTERVIEWER: What was that?

MR. TOMSKY: Well, molders were those who cast things out of metal. Without going into a lot of detail on the techniques and things, we made anything out of bronze or cast iron that was needed on base or to maintain submarines. We also re-babbitted the bearings for submarines, which in itself was an important segment of the foundry.

INTERVIEWER: In a sense, you were learning a trade?

MR. TOMSKY: I was learning a trade. From there, I found out that they were putting a submarine rescue vessel into commission at Mare Island, the USS *Chewink*, ASR-3. I decided that would be kind of adventuresome. I put in for that and was assigned to go to Mare Island on board the *Chewink*. Then, I became a second class diver on board the *Chewink*. In those days, the submarine rescue vessels were the only diving ships in the Navy. There was no SCUBA. It was strictly deep sea diving and deep sea dress. The *Chewink* was a sister of the USS *Falcon*, which was used in the rescue of the USS *Squalus* survivors.

INTERVIEWER: You'd heard about that.

MR. TOMSKY: I had heard of the rescue.

INTERVIEWER: Is that what got you interested?

MR. TOMSKY: I think so. That was the motivation.

INTERVIEWER: You reported to the *Chewink*. How big was this ship? What did it look like?

MR. TOMSKY: Oh, the *Chewink* was roughly 200 feet long and carried four officers and about eighty men, twenty-some of who were deep sea divers. As a matter of fact, we had a great

number of our first class divers and master divers who had just come from salvaging the *Squalus*. We went into commission just after the *Squalus*.

INTERVIEWER: Were there lots of stories about that operation?

MR. TOMSKY: Oh, yes, indeed. Those men were real honest-to-God heroes. There were many, many Navy Crosses and other awards.

INTERVIEWER: There was a whole group of idols to look up to, in a sense?

MR. TOMSKY: Oh, sure. Even our commanding officer had come from the *Squalus* operation. He was Captain Carl Whelan. He had been at the Experimental Diving Unit at the time the *Squalus* sank. Our executive officer was a chief gunner, Willy Baron, and he had had been on the *Squalus* salvage operation.

INTERVIEWER: You decided right then and there that you wanted to be a diver?

MR. TOMSKY: I wanted to be a diver. I stayed pretty much in the diving Navy, with a few exceptions. Then, I went on a recruiting duty in 1949, and while I was on recruiting duty, I took some tests and things for a commission and was fortunate enough to be commissioned as an ensign.

INTERVIEWER: That was after the war?

MR. TOMSKY: It was after the war.

INTERVIEWER: What happened during the war? Where was your assignment?

MR. TOMSKY: We were in the Atlantic, and we did largely mundane things. Because the submarine rescue vessels had sonar on board, we were always tied into the tail end of convoys, using our sonar. We just operated in the Atlantic. There were two things prior to the war. The O9 sank up off the Isle of Shoals and all hands were lost. During the war, the R-12 was rammed in Panama and sank with the loss of all hands. We went to both of those scenes.

INTERVIEWER: What was the 09? What was that operation like, trying to recover anything from it?

MR. TOMSKY: Well, the 09 was in excess of around four hundred to 440 feet of water, I think. That was a very, very significant depth. As a matter of fact, if my memory serves me correctly, we managed to get divers down to the submarine and that at a very, very great risk. The risk came in the guise of the air hoses that were not designed to withstand the pressure that was required to pump the breathing mixture down to the diver at the bottom. There was a great fear that one of those hoses would burst.

INTERVIEWER: Was it just air that we're talking about?

MR. TOMSKY: No. It was mixed gas, helium and oxygen.

INTERVIEWER: It was mixed already?

MR. TOMSKY: Oh yes. We were doing helium and oxygen diving then.

INTERVIEWER: That would have been in what, 1940?

MR. TOMSKY: It had to be in 1941. Yes. It was the early part of 1941.

INTERVIEWER: It was even before we were in the war?

MR. TOMSKY: It was even before we were actually at war.

INTERVIEWER: What do you recall from the operation? Were you actively engaged in any of the diving?

MR. TOMSKY: No, no, no. I was just supporting the divers

INTERVIEWER: What was the outcome of the search?

MR. TOMSKY: Well, it was nothing. They did a memorial service. They found the submarine, but nothing could be done. They weren't designed for those depths.

INTERVIEWER: There was a collision, you said, in the Canal Zone?

MR. TOMSKY: Well, yes, but we just went there. Again, nothing was done.

INTERVIEWER: Were you doing any active diving at that point?

MR. TOMSKY: Yes.

INTERVIEWER: What kinds of chores did you have? What kinds of things were you doing during each dive?

MR. TOMSKY: Oh, there was one interesting chore that we had. The Portsmouth Naval Shipyard had a task to experiment on submarine hatches. They filled a COC section of a submarine and put hatches on it. Then, we would take it out, tow it, put it down to depth and set off depth charges to see the effects. We set off one too many and blew the hatch. The section sank. We had to recover it, which was quite a job, by using these things that were designated YSP. They were big pontoons. I think they had a sixty-ton lifting capacity in each one of them, and they were huge cylinders. To maneuver those things was quite a chore.

INTERVIEWER: That was essentially what you did throughout the war, then. You were doing diving-related activities.

MR. TOMSKY: I was doing diving, yes. Then, I went out into the Pacific and did the same thing. We were in Guam. I was on a salvage vessel, an ARS, in Okinawa. We cleared up the bottom in Okinawa, getting ready for dredges to improve the harbor. We were doing a lot of harbor clearance work in shallow water.

INTERVIEWER: Were they vessels that had been sunk in the invasion?

MR. TOMSKY: Yes.

INTERVIEWER: What was that work like? How was it different?

MR. TOMSKY: Well, it was just work. It was just very hard work. In most cases, we couldn't raise them, so we'd just blow them up and lift out the pieces. The ultimate goal was to bring

dredges in and dredge the harbors so that they could bring in the cargo ships, and other ships, and start stockpiling for the invasion of Japan.

INTERVIEWER: That was really late in the war. Was it in August, or June or July, perhaps?

MR. TOMSKY: It was very late in the war. I'm not sure in which months that happened, but I know we were there when the war ended in Japan.

INTERVIEWER: Do you have any feelings about that, the dropping of the atomic bombs? You were there. I always ask the veterans how they heard about it and what they thought.

MR. TOMSKY: I think the right decisions were made. I saw a lot of people killed. I saw a lot of American troops killed by an enemy, I had little or no feeling for the enemy. When it turned out that they did drop the bombs, and presumably that was what brought the war to a conclusion, I was very happy. To this day, I'm happy that they did it. I guess, from the estimates I've read, maybe as many as a half a million casualties would have occurred, had we invaded the Japanese home islands.

INTERVIEWER: Once the war was over, you stayed in diving.

MR. TOMSKY: I stayed in diving.

INTERVIEWER: How did that happen? How did you get your commission, and how did you change your role?

MR. TOMSKY: Well, recruiting duty was always sort of a goal because in my case, I was sent to a place called Idaho Falls, Idaho, and Yellowstone National Park was part of my recruiting district. Before the Korean War, for example, I had a quota of one man every other month. That was all we could enlist from my district because they just didn't need anybody. It was really like a vacation. When I found out about the limited duty officer's program that the Navy had, I decided that I'd take a crack at it.

INTERVIEWER: What was that? What was the limited duty program?

MR. TOMSKY: Well, it involved taking first class petty officers, chief petty officers, and warrant officers and giving them an opportunity to become commissioned U.S. Navy officers. My boss, who was in Salt Lake City, sent me some books to study. The examinations would probably be coming out of them. I was fortunate enough to pass it, I think. I'm not exactly sure. I know there were 46 of us in the Navy commission that year, and probably out of six thousand or eight thousand people who took the tests. I was quite fortunate.

INTERVIEWER: As a new, limited duty officer, I assume you were an ensign.

MR. TOMSKY: Yes.

INTERVIEWER: Did you still have diving responsibilities? Were you still in that field?

MR. TOMSKY: No. For my first duty station after I was commissioned, I was sent to the USS *Shenandoah*, which was a destroyer tender. I was an assistant repair officer, because my designator was engineering. I had been a chief machinist's mate. I stayed on the *Shenandoah*, but I wanted to get back into the diving business, so I applied to go to the Navy School of Salvage, which was, at that time, in Bayonne, New Jersey. I think it was a twelve-week course and I was, fortunately, designated to go. I went there and went through the salvage program. Then, I went out to the Pacific on board an ARS as a salvage officer.

INTERVIEWER: What was the school like at Bayonne? What kinds of courses did they give you there?

MR. TOMSKY: Oh, you went through basic diving courses. Then, you went through salvage officer's courses, which included naval architecture. You learned a lot about the basic designs of ships, how to handle problems, stranded ships and sunken ships, from a salvage standpoint.

INTERVIEWER: You ended up diving in that area?

MR. TOMSKY: I ended up diving.

INTERVIEWER: It must have been interesting.

MR. TOMSKY: Yes. It was very interesting. Without diving, you obviously could not perform tasks. Most of the salvage functions require some diving.

INTERVIEWER: I'm sure the clarity of the water wasn't particularly good?

MR. TOMSKY: It wasn't very good there. But later on, I left the USS *Deliver* and went to a duty station at the fleet training group in San Diego. Then I went as a repair officer at the Mine Craft Base in Charleston, South Carolina. From there, I finally got myself back into diving. I went to the post commanding officer's course at the deep-sea diving school. At that time, it was a ten-week helium and oxygen deep-sea diving course for prospective commanding officers, I think.

INTERVIEWER: You had dived using helium before?

MR. TOMSKY: No.

INTERVIEWER: You never had?

MR. TOMSKY: No. I did not until I got through the officer's course at the deep-sea school.

INTERVIEWER: How was it different? How did it feel to dive with mixed gas, as opposed to compressed air?

MR. TOMSKY: Well, the first thing was that compressed air is warm. Helium is very cold. The second thing was that it affects your vocal cords. Passing on information became a chore. It became a chore for the people listening, because of the 'Donald Duck effect' of helium. It allowed you to go to greater depths and safely return. In those days, I think we were limited to 200 feet on compressed air. Even then, some people couldn't get to 200 feet because of the nitrogen narcosis problem.

INTERVIEWER: Did you ever witness any of that yourself? Did you ever have any experiences with narcosis or any of that?

MR. TOMSKY: I had the bends, but I never had narcosis.

INTERVIEWER: How did they treat your case of bends?

MR. TOMSKY: They just treated it with decompression. I did it by just going to a chamber. There were standard Navy treatment tables in the diving manual.

INTERVIEWER: You were at various and sundry places doing this work. How did it really differ from what you had done earlier, as an enlisted man?

MR. TOMSKY: It differed in responsibility. You just took on greater and greater responsibilities. From the diving school, I went as the executive officer of the USS *Florican*. When I left the *Florican* I went to the USS *Sperry* as chief engineer. The *Sperry* was a submarine tender. Then I was assigned as Commanding Officer of the USS *Chanticleer*.

INTERVIEWER: When was that?

MR. TOMSKY: Oh, I took command of the *Chanticleer* in 1962. From *Chanticleer*, I went to become the assistant officer in charge of the Navy Deep Sea Diving School in Washington, D.C. I was there just a few months and was asked if I wanted to take over another job. In those days, it was under the Polaris Missile Program. It was the Deep Submergence Systems Project. I took over the job, which then included the SeaLab project, the large object salvage project, and the submarine escape project.

INTERVIEWER: That was where you encountered George Bond for the first time?

MR. TOMSKY: That was where I encountered George.

INTERVIEWER: What are your recollections of him? I know you have some real feelings about him.

MR. TOMSKY: Yes. I have some very, very strong feelings. George was probably one of the most unique individuals that I've ever met in my life. He was one of the kindest people that I've ever met. He was every inch a gentleman and an original thinker. George, you know, really developed the concepts that we're using today in saturation diving. But George was undisciplined. He was not a reliable individual. If you said, "George, I want you to come and be interviewed at nine o'clock in the morning," George would say yes. But something might get in the way. He had his own sense of priorities, which differed from those of most everybody else. That was one of the reasons I ended up in that program. We had two factions within the Navy. We had the engineering and salvage people, under the supervisor of salvage, and we had the medical people. When the Deep Submergence Project was given the SeaLab program, I ended up with the job and the responsibility for that program. I was with a bunch of strong-willed medical people and a bunch of strong-willed engineering people who all had their own ideas on how the program should be run.

INTERVIEWER: How did they differ?

MR. TOMSKY: I was given this task because the Navy decided that we should take saturation diving and make it an operational capability of the Navy for a specific reason. It was an intelligence gathering reason. When it was decided that the research and development had reached a point at which we could start to develop and train people and develop equipment as an operational arm of the diving Navy, those people still wanted to stay in the research and development. They wanted research and development programs. My task was to take this group and bring it to an operational capability.

INTERVIEWER: There was really a fundamental difference in philosophy?

MR. TOMSKY: There was a fundamental difference in philosophy.

INTERVIEWER: You had the George Bond philosophy, which was Genesis. In other words, you had the mindset of putting men on the bottom and having them colonize the ocean floor. The Navy had a job to do and it didn't include colonizing the ocean floor.

MR. TOMSKY: That's right. It was further complicated by the fact that we used it as a cover story for our real intentions. Therefore, we still had scientists who still had scientific programs in the mix and were not allowed to get in the way of our operational development. That further complicated matters. Again, you're talking about a lot of independent-thinking, strong-minded people, and they didn't take too kindly to the word 'no.'

INTERVIEWER: Well, SeaLab I had already taken quite a slide. SeaLab II had been successful. Those folks had pretty much run the show.

MR. TOMSKY: Absolutely.

INTERVIEWER: Both shows, I and II, were run by those folks.

MR. TOMSKY: SeaLabs I and II were run by medical people.

INTERVIEWER: You had Dr. Workman, who was involved with SeaLab I, I guess, or prior to I.

MR. TOMSKY: He was also involved with II and III, or the preliminary work that we did for SeaLab III.

INTERVIEWER: Perhaps now you would look differently at it, but at that time, did you see your role as being the disciplinarian, trying to take these disparate group of people and get them to work for a goal, which was the Navy's goal, rather than their goals?

MR. TOMSKY: That's exactly right. That's a good summation.

INTERVIEWER: What everyday problems did you encounter with that situation?

MR. TOMSKY: Oh, they were so, so numerous that I'm sort of at a loss. First off, there was money, and the control of money, and where the money was to be spent. One officer wanted a

photography lab at our base out in San Diego. I said, "And what do you want the photo lab for?" He said, "Well, we need to do this and we need to do this other thing." You looked into the photo lab. In those days, being designated a U. S. Navy photo lab was a function of BUAIR. You had to go to BUAIR in order to get the authority to create a photo lab. I had no desire to go through that. I kept stalling and finally visited Ballast Point, and there was a photo lab. They just went ahead and set it up themselves. Of course, those were the kind of people with whom you were dealing.

INTERVIEWER: Were there individuals in the medical community, with whom it was particularly difficult to deal? I know that George Bond was difficult because he had his own agenda. But were there others that were just difficult to control?

MR. TOMSKY: No. Fortunately, I was able to distance myself from most of it. I had a problem. My problem was that at that time, I had in my budget, let's say a half of a million dollars for biomedical research. I kept getting proposals from various universities and Navy laboratories. I'd look at those proposals but didn't understand them. I'd look at the recommendations and the conclusions, but they didn't really make too much sense to me. For example, the head of the Navy's toxicology laboratory wanted money to conduct a toxicology program under pressure. I didn't understand the program. I went to my boss, John Craven, and told him I had to have a medical officer by my side. I couldn't depend on Bond because he was too busy to fool with that stuff. I was able to get a hold of Dr. Robert Bornmann and add him to my staff. He took that burden and did a wonderful job.

INTERVIEWER: He became your medical filter, in a sense.

MR. TOMSKY: Well, he was my medical authority. When Bob said that it was so, it was so. If Bob recommended we do that, that was the way we would do it. It was very, very difficult until I had Bob Bornmann on my staff.

INTERVIEWER: Although the medical people had their own agenda, you had your agenda, or at least the Navy had its agenda. Were you, in a sense, the referee, trying to get those people to work for the goal? Did you find that the medical people were not cooperating?

MR. TOMSKY: Oh, no. They would cooperate. It wasn't the fact that they wouldn't cooperate. I think it can best be explained by the assertion that they didn't know what we were doing. In other words, they didn't know the reason. We had an intelligence program and I was the only one in that particular group cleared for the knowledge of what we were going to do. I think that was one of the big problems. They really didn't know why I wanted to proceed in a certain way or why I needed certain things.

INTERVIEWER: They weren't really privy to any of that, so they didn't understand what appeared to make no sense, but it had a purpose. They didn't know what it was, and they had no need to know.

MR. TOMSKY: Yes. That's exactly right. The difference was that SeaLabs I and II were strictly research and development programs.

INTERVIEWER: ONR supported both of those programs, I guess.

MR. TOMSKY: Well, I think SeaLab I was pretty much on a shoestring, but Bond got it up to funds and forced his issues. SeaLab II was supported by ONR. SeaLab III was taken from ONR and put into the Deep Submergence Systems Project (DSSP).

INTERVIEWER: Is that when you came into the picture?

MR. TOMSKY: That was when I came into it.

INTERVIEWER: You came in when II became III.

MR. TOMSKY: That's right.

INTERVIEWER: What are your recollections of that, of suddenly getting this new job? In other words, SeaLab was being added to your plate. You had a lot of things on your plate, and suddenly, you got SeaLab III, with all those personnel involved?

MR. TOMSKY: My whole awakening in management occurred when I went to the DSSP Project. Six months before that, I was the commanding officer of a ship and needed \$1,500 to buy a head for an engine. The squadron engineer wasn't going to give me the \$1,500, so I had to threaten him with dire results to get \$1,500 to buy a head for the engine. Six months later, I was thrust into a job, and my budget for those four programs was \$135 million. I didn't know how to spend that money. If I wanted a case of nails, I'd tell my supply officer to go down to the supply depot, take a 307 form and draw a case of nails. Now, I was expected to research the materials, design them, build them, and get them distributed into the Navy. I didn't know how to do that. Fortunately, I was given a staff of people, primarily civilian engineers who had been in the Polaris program, who knew how to do it. We worked very well together. I learned an awful lot. What an education it was.

INTERVIEWER: There were so many aspects to your job. SeaLab, obviously, was one aspect of it. I think the DSRV was another.

MR. TOMSKY: Well, I really wasn't too involved in the DSRV, other than a little bit on the life support system. That was another group of people in our project that managed that.

INTERVIEWER: What took most of your time? Let's set SeaLab aside for the moment. What were the things you were focused on at that time?

MR. TOMSKY: Well, I was focussed on personnel, selection, figuring out how to train people and the equipment designs we needed. We did some very, very interesting things and fortunately, they worked out. We designed a new semi-closed circuit breathing apparatus for our project, which ultimately went to Westinghouse, and it built them. You asked the question earlier of what some of the problems that I had interfacing with the medical and engineering groups. The supervisor of the salvage office wanted to have a closed circuit oxygen-breathing system. I didn't want one. I had two very good reasons why I didn't want it. One, it was a long way off from being developed. Two, I couldn't understand how we would ever take an umbilical off of an individual and going down to, say, a depth of 600 feet as a free swimmer. He would have needed to come back to a pressurized capsule somewhere. I couldn't see how you were going to develop the means of him finding his way back home, whether it was sonar he was wearing or some visual aid. I stuck to my guns and we developed what we called the 'Mark XI Semi-Closed Apparatus.' That was what we ultimately used. But by doing that, we kind of ran over some of the people in the Navy who had other views and other ideas.

INTERVIEWER: You said that at that time, you were working for John Craven?

MR. TOMSKY: That's right.

INTERVIEWER: What was that relationship like?

MR. TOMSKY: Well, relationships are funny. When John interviewed me for the job, he said, "Well, I can't use you, because from an academic standpoint, you don't have the background. You have a lot of practical experience, but you don't have any background in academia." I refuted that, in the sense that my practical knowledge was probably greater than one could learn in years of institutions of higher learning. The only thing that I lacked was the ability to understand engineering systems management and later I found that to be a necessary function.

John's real apprehension was in management. I finally convinced him that I could handle it. We became great friends later on. John listened to me. I certainly listened to him because John is an extremely brilliant man. But I laid out where I thought our program should go and how to get from here to there. He, for the most part, accepted it. He developed a trust in me.

INTERVIEWER: Were there any particular projects you worked on with him that you can talk about that would explain that relationship?

MR. TOMSKY: He has just finished writing a book, *The Silent War*, and it's explained in that. It is not a hundred percent accurate but for the most part, the common bond that we had was the end objective of our classified project, or working to make it a reality. It was a very hazardous undertaking. We were designing, building, and training people. We were going to interface them with a submarine and they were going to come out of a submarine at deep depths. These were the things that have never been done before.

INTERVIEWER: That was where SeaLab suddenly fit in.

MR. TOMSKY: That was where SeaLab fit in, as the training ground and the equipment test program. We got the people, selected the people and trained the people. Most of the people involved with SeaLab didn't know what was going on.

INTERVIEWER: It was, in a sense, a convenient cover for what you were doing.

MR. TOMSKY: It was a very good cover for what we were doing.

INTERVIEWER: SeaLab II had been highly publicized.

MR. TOMSKY: It had been highly publicized.

INTERVIEWER: Obviously, the evolution was to create another stage, and that became SeaLab III. It was in the press. People knew about it. It was being played up. I guess that Norman Polmar had been the publicist for SeaLab II.

MR. TOMSKY: Norman was our publicist.

INTERVIEWER: He was also the publicist for SeaLab III.

MR. TOMSKY: Of course. You know Norman.

INTERVIEWER: He wrote, at that time, extensively, I think. There were some articles in the Naval Institute proceedings on SeaLab that he wrote.

MR. TOMSKY: Yes.

INTERVIEWER: There was this convenient program that you could latch onto. It had manning already. You could have probably fine-tuned the manning if you had wanted to.

MR. TOMSKY: Well, we did. We pre-selected. The people who were to ultimately go out on the mission were all pre-selected and sent to this program.

INTERVIEWER: Those would be the top-secret missions for which they could get experience on SeaLab.

MR. TOMSKY: They also got the know-how.

INTERVIEWER: What were some of the qualifications for becoming a diver? In other words, the divers who you introduced to SeaLab, not the ones who came from SeaLab II, but the ones you were going to introduce?

MR. TOMSKY: Well, being from the old school, I decided that I was going to put every officer and every man through the six-month deep-sea diving course at the diving school because I had gone through the program as an officer. I decided that was the greatest training and if we were going to weed people out, that was the way to weed them out. We put them through the deep sea course. Then, we took them to San Diego and put them in a group that we had formed there. We then trained them to do saturation diving.

INTERVIEWER: SeaLab was beset by all kinds of problems. There were mechanical problems and helium leaks. What do you remember about all of that? What kind of frustrations did you run into? Did you find that the chief headache was mechanical, or was it the personnel situation?

MR. TOMSKY: It was mechanical in the SeaLab. What had happened was that the shipyard installed the seals and the penetrators that the cables went through. They had seals to block the helium from leaking, and they installed them backward. Even though they were tested in a dry dock, they didn't show the leaks until we got it down to depth.

We concluded that our biggest problem was that we had a saboteur on board. I certainly thought that. That was not based on the death of Berry Cannon and the fact that his diving rig did not have the carbon dioxide absorbent in it. After Berry's death, we had to decompress the other seven divers from 600 feet. That took a week. On three separate occasions, we found that breathing gas mixtures had been tampered with. We had tanks of gas with different mixtures for different depths, plus, we had pure oxygen, in case it was needed later on. Those people were decompressed. You switched the different mixtures in an emergency. You did it in the chambers. But you also had emergency mixtures. In the case that something happened, they could put on the masks.

Three times, we found that the valves had been changed and pure oxygen had been put into the built-in breathing system. Had they grabbed one of those masks, it would have killed them. You can't breathe pure oxygen at those depths. We wired the valves. Somebody unwired and changed them. Then, I put guards on everything. We got seven people back out of there.

There were indications that we had a saboteur somewhere in the group, and we had so many civilians. Naval Ordnance test people were helping to run our thing. We had military people and civilian scientists. We literally had hundreds of people involved in the operation. To

isolate who was doing it was impossible. I did have the Office of Naval Intelligence send an investigator out while that was going on, but nothing ever came of it.

INTERVIEWER: Because the project ended, it wouldn't have mattered, at that point.

MR. TOMSKY: The project ended. The project ended overtly. Covertly, the project continued.

INTERVIEWER: Okay. Overtly, it was obviously the accident with Berry Cannon ended the program. What are your recollections of that?

MR. TOMSKY: Strangely enough, my best recollections are of his diving partner, Bob Barth.

My best recollection is the heroic effort that Barth made to get Berry Cannon back into the chamber, what we used to call the 'personal transfer capsule'. He got him out of the water and in there. Then, other people giving Berry mouth-to-mouth resuscitation. Unfortunately, it was to no avail. I guess that's really my most vivid recollection.

INTERVIEWER: It was just a chance thing. He just grabbed the wrong unit. It could have been anyone. Could it have been Bob Barth who grabbed that unit?

MR. TOMSKY: That's right. Later, we checked. There were eight units hanging on the outside of the capsule. The other seven were all right, including the one that Barth had and the other six that weren't used. The only one that did not have the CO₂ absorbent was the one that Berry Cannon used. If he had grabbed any one of the other ones, I'm sure he'd still be sitting here with us today.

INTERVIEWER: You don't think that had anything to do with the sabotage effort?

MR. TOMSKY: Somebody emptied it. The man responsible for putting those units together and getting them ready to dive was an extremely reliable person. Nothing in this world could convince me that he made a mistake. He filled all of them, and he filled them properly. But somewhere in the interim, somebody got to one of them.

INTERVIEWER: You said that was the excuse to end SeaLab III. It took several days to get everyone back up again.

MR. TOMSKY: Yes. We got the lab back. That night, we finally got the lab to the surface. It took six additional days to get the other people decompressed.

INTERVIEWER: You said that was the overt end of the project but the covert project continued. How did it continue?

MR. TOMSKY: Well, we just continued to train the people and in the units that they were going to, equipment was being installed. They were sent to various units out of which they were going to work. They helped with the installation, familiarized themselves with the installation and trained on the installation.

INTERVIEWER: There was certainly continuity, as far as you were concerned. SeaLab III was over, at least the public's perception. They felt that further investigation would see that that accident would never recur. That kind of faded away. You continued doing what you had to do to support the mission.

MR. TOMSKY: That's right. I retired at that time. I had completed my thirty years and had to retire, by law. I was asked if I would stay on an extra year, as a retired officer, and help to finish the work in the project. I did.

INTERVIEWER: What follow-up work was there at that point, as far as SeaLab was concerned? Was there anything?

MR. TOMSKY: No. There was nothing on SeaLab. I got classified work strictly.

INTERVIEWER: The unit was taken back to Hunter's Point and presumably cut up for scrap at some point?

MR. TOMSKY: That was probably what happened. It was examined. It was found that the seals were in backwards. That was the usual post-mortem, I guess, in that type of tragedy.

INTERVIEWER: You retired but came back as a retired officer for an additional year?

MR. TOMSKY: Yes.

INTERVIEWER: You came back to continue whatever work you were doing?

MR. TOMSKY: That's right.

INTERVIEWER: Okay. Some time ago, when you started talking about your relationship with the people at DSSP and John Craven, I enjoyed your discussion about the relationship you had with Dr. Craven. But you mentioned that the administrative tasks you faced were quite daunting. You had people in DSSP who knew how to properly spend a budget consisting of millions of dollars. Who were some of the people at DSSP with whom you worked to manage the money in a way that you considered proper?

MR. TOMSKY: There were four department heads in the DSSP. I was the only military department head. I had the ocean engineering branch and the other three were civilians who had been in Polaris. You have me at a disadvantage on the names.

INTERVIEWER: That's okay.

MR. TOMSKY: One of those fellows headed up the branch involved in the sensors groups. His name was Joe Cestone. He was a retired Navy Reserve officer. He was a great help. Joe was a great help to me because he had been there. He understood my position and we became great friends. Joe became my mentor in how to deal with it. I was given a chief engineer, Bob Pfeifer, he was a GS-15. He had been in Polaris and understood how to get from point A to point B. I had two GS-14s who were well experienced, and a half a dozen GS-13s. We had a very high-level civil service group. I think Joe Cestone was a Public Law 313 appointee at that time. I don't

know whether you know what that was or not, but it was a special designation that they had in the civil service ratings. But I had a very, very knowledgeable group that was assigned to me to help me run my shop. I received some naval officers, including a CEC officer. They wanted to get into the diving business, so they transferred this fellow over to me. He was a great help. We had two civil engineer corps chief petty officers as divers. Those were the first dives with which the CEC people had ever gotten involved.

INTERVIEWER: Following your retirement, you stayed in the diving business, in a sense.

MR. TOMSKY: I stayed in the diving business. John Craven went out to Hawaii as the Dean of Marine Programs and called me one day and asked if I wanted to come out there and teach school at a community college. The school was in trouble and might have lost its sea grant program because of its inability, I guess, to put a program together that they would accept. I went out and spent three years with Craven in this program.

INTERVIEWER: You must have enjoyed that immensely.

MR. TOMSKY: Oh, I enjoyed it, except the administrative system of the university system was somewhat different. But it was a great education. As a matter of fact, the greatest thing I received from that, from an educational standpoint, was that I came to a decision early in the game that the nation was in good hands with these students. I think we had maybe 30,000 students in the University of Hawaii system, or maybe more. I had definite ideas about longhaired kids and things. But I didn't spend many months there before I decided that the country's future was in good hands. It was a good revelation.

INTERVIEWER: You ended your career on a very high note?

MR. TOMSKY: Well, yes. Yes, I'd like to think so. After that, I was offered a job in the diving industry in an offshore oil construction business in the North Sea. I went on to the Middle East

and took over the management of an ocean engineering company. I spent seven years running that operation. I finally re-sold it to a U. S. company and came home and retired.

INTERVIEWER: Do you dive at all now?

MR. TOMSKY: I don't dive anymore. I haven't in the last thirty years, probably. I used to do a lot of SCUBA diving while I was in Hawaii. The water was warm and there was a lot to see. Now, I'm afraid that I'm a coward. The water is too cold and too uncomfortable.

INTERVIEWER: California water is noted for that.

MR. TOMSKY: Oh, yes. As you get older, you turn to other vices, like golf.

INTERVIEWER: Is there anything you can think of that I should have asked you but didn't? Do you have any closing thoughts about your long, distinguished career in diving?

MR. TOMSKY: No, I think we pretty well ran the gamut.

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UNDERSEA & HYPERBARIC MEDICAL SOCIETY

ORAL HISTORY INTERVIEW: JIM BLADH

Solomons, Maryland

Monday, November 24, 2003

PROCEEDINGS

INTERVIEWER: Jim, when were you born and where did you go to school?

CMDR. BLADH: I was born on August 25, 1925, and I went to school in Palo Alto and Redwood City in California. Then I left home when I was 13. Shortly after that, the war broke out. I tried to enlist in the Navy, lied about my age and got kicked out. Then when I turned 17, I tried again and have been in ever since.

INTERVIEWER: How did you first get into diving in the Navy?

CMDR. BLADH: Well, I was on an icebreaker in the Antarctic and I came back in and thought, "There must be a better place than being on this," so I put in for diving in EOD School. I got into EOD first, spent a year in EOD, graduated, and went to a first class divers school.

INTERVIEWER: When was the first time you went to diving school? That would have been EOD school?

CMDR. BLADH: That would have been EOD school.

INTERVIEWER: Subsequently, you went to first class school?

CMDR. BLADH: That's right.

INTERVIEWER: Who was the person who influenced you or you admired the most in your diving career?

CMDR. BLADH: Well, there were so many.

INTERVIEWER: It can be more than one.

CMDR. BLADH: Well, when I came into salvage operations I think of Captains Mitchell, Boyd, and Searle. Those three, in particular, were the prime movers in Navy salvage in my earlier years.

INTERVIEWER: Of those, is there anyone else who had the greatest influence on you and your diving career?

CMDR. BLADH: Well, later on, I think it was 'Black' Bart Bartholomew.

INTERVIEWER: Is there anyone you ran into who you would classify as extraordinary? Was there anyone who stood out among the crowd, as far as your mentors in the Navy or people with whom you worked?

CMDR. BLADH: I think the main ones were Captains Searle, Mitchell, Bartholomew, Ringelberg and Milwe.

INTERVIEWER: If you can go back to your diver training, was there any one person involved in your training who made some magic marks on you, as far as an instructor was concerned, or someone that got your attention?

CMDR. BLADH: There was a master diver, Jack Hakerhausen, way back.

INTERVIEWER: That's good. You indicated you started out as an EOD and eventually flopped over into saturation diving. To my understanding, you went into EOD because you already were a gunner?

CMDR. BLADH: That's correct. I had an ordnance background and was the first diving officer on exchange to the British Navy. At that point, I went over there, filling an EOD billet, but the primary work was diving and salvage. I slid out from EOD and went into straight diving.

INTERVIEWER: Well, during your diving career in the Navy, when you were wearing a sailor suit, what would you say was the highlight of your diving career? I heard you talk a lot about the exchange billet. Does that come to mind as the one that you really enjoyed the most?

CMDR. BLADH: That was my twilight cruise. It was a great job. The British Navy fully took me into their group. I made a deep chamber dive. I guess that at my age at that time, my late forties, the U.S. Navy would have never allowed me to do that. It was just a great experience.

INTERVIEWER: I also understand that you were the first U.S. military type who was put in charge of a Royal Navy team?

CMDR. BLADH: To my knowledge, I was.

INTERVIEWER: I also have a privileged communication that you have a permanent mess number on the HMS *Vernon*, which is a considerable honor when it comes to the Royal Navy. In fact, I think I've even charged something to that number, 109, on occasion. I don't know why I remember that.

CMDR. BLADH: That's correct.

INTERVIEWER: Did you ever have any underwater experiences that were hair-raising or during which you maybe thought that you were in the wrong business?

CMDR. BLADH: I think the one that comes to mind was when I was working with Sea Dive 1 off of Bermuda. At the same time we were out there, a plane crashed. Anyway, we made a SCUBA dive on air at 250 feet to get a body out. That was the scariest and probably the dumbest thing I ever did.

INTERVIEWER: But you're still here, right?

CMDR. BLADH: But I'm still here, right.

INTERVIEWER: Well, it sounds like you started off on EOD, were involved in saturation diving in the early days of the SeaLab Program, and finished up on the salvage side of the Navy. Then your career as a serving officer is acknowledged, but I'm also familiar with the fact that you've had an extensive career with the supervisor of salvage office as a civilian. As a civilian with

SUPSALV, you and I have shared a lot of stories. I interviewed Huntly Boyd earlier today, and he reaffirmed what he has said many times, that you were the best point man that he has ever known, and I have a tendency to agree with him. Having said that, you were involved in a number of significant operations between Suez and Hong Kong and other places. Do any of those stand out in your mind? I'm talking about from salvage now. I know we did diving, but you were a salvage expert, a salvage operations type.

I know you were in Vietnam as a civilian and as a military person. You were also in Suez. I'm trying to draw out the story of the day you converted from a military officer to a civil servant. You were physically in Vietnam?

CMDR. BLADH: That's correct, yes.

INTERVIEWER: You took the uniform off one day and put on civilian clothes and were working for some Army general. Three days later you were back in uniform?

CMDR. BLADH: Yes.

INTERVIEWER: Continue the story.

CMDR. BLADH: That was General Kingston. I started to wear my uniform because I couldn't make things happen the way I wanted until I started wearing it. General Kingston came in, and I was in uniform. He said, "Jim, you're a funny looking civilian in that rig." General Kingston was a brigadier. I said, "General, don't give me any crap or I'll put on two stars and I'll outrank you." He was a great guy. He said, "Jim, you do whatever it takes to get the job done," and that was what I did.

INTERVIEWER: Well, obviously, you had a very long and varied career, but can you think of any one thing or two things that have brought you the most satisfaction, as far as a job well done

or a great experience? We talked about the Royal Navy saturation team. That was significant, but you've been on some great operations.

CMDR. BLADH: I think that the year I spent in the Suez Canal was a great year. I was a point man there and had things pretty well set up. Joe Mateo, who was a great man, was there as the head salvage master. A lot of them came and went through that job.

INTERVIEWER: Are there any stories or incidents that you've never told?

CMDR. BLADH: There are lots.

INTERVIEWER: Are there any that you want to tell now? I'm talking about diving now, Jim. I recognize that in Suez and Vietnam, we all took shortcuts to get things done, so I'm just wondering if something crops up.

CMDR. BLADH: Well, when I was at the lab in Panama City, Captain Richards T. Miller sent me to Vietnam. We were putting nets in the water - swimming nets. I remember we were out there working with these nets before we went over. Captain Miller asked me if I wanted another one of these engineers to go to Vietnam with me. I had just hired some local fishermen who knew how to do the job. I said, "No, I don't want any engineers, but I'd like to take a couple of those fishermen with me." We got out there and in that fast-moving river, you put nets in and they were gone. The admiral called me in on my assessment of putting the nets in the river. I said, "The only thing good I can say about that is it takes so many boats to tend the nets that the swimmers will never hit bottom." The admiral said, "That's a good report, Jim."

INTERVIEWER: That's good. If you could do it all again, would you change anything?

CMDR. BLADH: Oh, I can't think of anything I'd do better. I think I'd be a little craftier now.

INTERVIEWER: We have a lot of things going on in terms of new technology. This history you're writing is the last hundred years. Back in the twenties and thirties, there was a lot of

significant air diving going on. As you can appreciate, having stayed in touch with the industry, can you put your finger on the most significant advance that we made in diving in the last fifty or one hundred years?

CMDR. BLADH: Well, I think getting away from the old Mark V, which we all loved and were trained in, that and SCUBA have to be the biggest advances from what diving used to be.

INTERVIEWER: As early players in the saturation business, as you can appreciate, we were somewhat limited on depth, having the Mark V mixed gas rig. Then we got into saturation, and that opened up a lot of water, a lot of depths, and you were on the forefront of that, working in Panama City with Captain Bond, being part of SeaLab I and being there, where it was happening. Would you say that saturation diving has made a significant contribution to diving even though maybe our commercial buddies are making more money with it than we are?

CMDR. BLADH: I think there's a definite place for saturation diving. That's a tough one. I don't know. I think the commercial world is moving faster than the Navy because of our regulations. I would think that except for classified areas, we would be better off putting money into the commercial world to do the deep saturation diving. Now, I recognize that there might be some projects that are classified and we can't have contractors do.

INTERVIEWER: The Navy, from the first fifty years, was the leader in diving.

CMDR. BLADH: Absolutely.

INTERVIEWER: In the second fifty years, it has been the commercial guys. Clearly, they've had a profit incentive. The other thing that you and I both noticed was that in the early days of commercial diving, in the sixties and seventies, we had a lot of former Navy divers running major dive companies. Now, we see that the management of the diving companies, which are multi-disciplined now, and there are not that many former Navy divers in the business. It would

appear that the commercial world has the capability of growing their own, although a number of former Navy divers are still in that business but don't seem to be rising to the top as fast as they did in the sixties and seventies. I think that maybe I've answered my own question. It could be a result of the fact that they're getting enough training and experience commercially.

CMDR. BLADH: Back in the early days with Ken Wallace, Mark Badjovitch, and other hard chargers, there was nobody in the outside world who could compete with them. Then as they grew out of it, the other people in the companies who replaced the Navy divers, I think, were too restricted.

INTERVIEWER: Well, the training was such that it was fairly formal. The only time we were prone to consider risk was in wartime or a tough situation. I think the biggest risk evolution we'd see now would be in a salvage operation in which you had weather coming in or something and you might just have to do something or nothing was going to happen. Other than that, in the other areas of diving, I think warfare probably generated it.

I'm going to give you a list of things that have happened in the last hundred years. Please choose one or two of these as being significant. Basically, we're talking about air decompression tables, submarine rescue chambers, mixed gas diving, SCUBA, underwater habitats, closed circuit underwater breathing apparatus, saturation bell diving, and equipment improvements. You could read that list if you like. Can you pinpoint one or two of those that you would rate high on a priority list? You previously mentioned the new lightweight equipment. There are no wrong answers, by the way.

CMDR. BLADH: Well, I think one of the biggest evolutions, of course, is SCUBA. Then there were the decompression tables. I think the other one is habitat. Those three stand out.

INTERVIEWER: Well, with regard to underwater habitats, you were part and parcel of the SeaLab program. If you can recall, back in the sixties and seventies, we had a number of underwater habitats. It seems today, in these United States, we only have the Aquarius Habitat, which is in sixty feet of water. Do you have any observations or a prognosis of where the habitat business might be going?

CMDR. BLADH: I think there's a fantastic amount that could be done with a habitat. Now, I think it's awfully expensive and probably pretty risky, financially. I don't see where the problem is if somebody spends \$10,000 a night to live in a habitat. It's pretty far-fetched, but if this can be brought down, I think the Aquarius and other habitats could make some money from tourists. Isn't the Aquarius down in the Keys?

INTERVIEWER: That's right. We're looking at the Navy diving fleet getting down to some very small numbers with four salvage ships, three or four saturation systems, run by the Military Sealift Command. You, like myself, can remember when we had almost twenty salvage ships, submarine rescue vessels, and ships of that type. Do you have any opinion as to what kind of salvage capability the Navy is going to have in the future, beyond what we see in front of us right now?

CMDR. BLADH: I don't know. Personally, I see it diminishing. Like after every war, after every need, they love their salvers and divers when they need them. They don't want to pay the bill when they don't need them. We have to relearn that every time.

INTERVIEWER: Well, you and I both attended a conference sponsored by the American Salvage Association. One of the thrusts of the meeting was to get these new salvage regulations on the books so these commercial salvage companies would be able to make an investment in

training in their people. That assumed they were going to get a commitment from the industry that their services would be used even if it were in exercises.

And, having said that, you as well as I know that most of our salvage companies that we're familiar with in the U.S. all have day jobs with the exception possibly of Titan, who seem exclusively salvage although they do sell diving services.

If you couple where Navy salvage is and where commercial salvage is, it looks like it's the law of diminishing returns. Now, recognizing that fewer ships are going aground, or fewer things come up, at the end of the day, something is going to happen. It's not a question of 'if,' it is just 'when.' What would be the combined capability, either Navy or commercial, to respond to something?

Now, I'm thinking more in light of terrorist activity. We don't care how it happens. It would still be a marine casualty. Would you postulate that the Navy and the commercial guys may have some increased responsibility or role in being a firehouse service for an incident such as that? As you know, blocking a major port in the U.S. is not that hard, and the clearance of that port is a significant job. Even with the commercial resources we know about combined with the Navy's resources, my sense is that there may not be enough there to pull that off any more. Do you have a comment?

CMDR. BLADH: Well, what I see as the biggest problem thereabout would be between the Corps of Engineers, the Coast Guard, the commercial companies, and the Navy. They're all going to get involved in a conflict over who is in charge. I don't know who's in charge. That's the biggest problem, I think, because everybody is going to get involved.

INTERVIEWER: Well, as was mentioned in the meeting, with this incident command system, the Coast Guard is in charge. We're optimistic that the salvage master or salvage program

manager will be somewhere close to the top to advise all the bureaucrats who are trying to manage something they know nothing about. Your point is well taken. The Coast Guard doesn't have any capability. It just has the responsibility to manage.

The Navy, we just discussed, has minimal capability. Commercial guys have capability, but that could go away if there's no work there over time. There have been a number of things written about the care and feeding of the industry. If we do have a major maritime disaster and it is orchestrated like 9/11, with two major ports, one each coast, what is our capability to respond to those with a combination of commercial and Navy assets?

CMDR. BLADH: I think the assets are there. I think there would be some pain and struggling getting it organized, but there's no doubt in my mind that they would get it done. There would be some in-fighting and some mistakes, but they'd get it done.

INTERVIEWER: To further your earlier opinion about a conflict over who's in charge, that's still going to be an overlying issue because if there are minimal assets, it takes good coordination. We need some professionals in charge to make sure the right assets are brought to bear rather than this management by committee.

I've covered the questions that were of interest to our committee, but I'm wondering if you have any closing thoughts on where Navy diving is going and what it holds for the future. Clearly, it's meant a lot to you, but from where you sit and what you know, if we were having this discussion in twenty years, where would Navy diving be?

CMDR. BLADH: Well, I hate to say it, but I can see it slipping away. I don't see the hard-charging Navy divers out there. It's not that the talent isn't there. It may be the regulations tying somebody's hands and telling them do something. I think it's going to take some very strong leadership to say, "The heck with these things, this is what we have to do." There would be a

need to take some of the noncombatant non-divers out of the decision loop. It might be hard to find somebody who wants to do all that.

INTERVIEWER: That's the thing. It could be a career-ender, but short of another disaster that's going to call us back into service, my sense is that we're in a minimal maintenance activity now in which we're going through the drill. We're waiting for something to happen, but if something significant happened, I don't know if the Navy piece could grow fast enough to be responsive. I was told once that you build for the next war during the current war. You and I both worked for Bill Searle and Gene Mitchell. They had a lot of stuff going on during Vietnam that carried us through the eighties and maybe into the nineties.

CMDR. BLADH: It's got to be one of those people who pinpointed some junior officers and brought them along so that their expertise could be exhibited by us. I don't see that happening.

INTERVIEWER: That's a good point. I'm optimistic because I agree that the talent is there in these younger kids but the leadership and the mentoring is not. We both know what Mitchell, Searle and Boyd did for us to make sure we got in the right places at the right times and had the opportunities to perform.

CMDR. BLADH: In our day, we had Ike Kidd, Joe Tarsick, and some real heavies in there.

INTERVIEWER: Which we no longer have.

(Whereupon, the PROCEEDINGS were adjourned.)

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Interview of Jim McCarthy

For Naval Forces Under the Sea: The Rest of the Story

9 June 2003

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UNDERSEA & HYPERBARIC MEDICAL SOCIETY

INTERVIEW OF JIM McCARTHY

By

Lew Nuckols

June 9, 2003

PROCEEDINGS

INTERVIEWER: It's June 9, 2003. I'm with Jim McCarthy, President, of Gulf Coast Hyperbarics, and Jim, I wonder if you could just start out by giving a little bit of background on yourself and where you come from, your education and how you got involved in diving.

MR. McCARTHY: Well, I guess to start off with after getting out of school I joined Northrop Corporation in Anaheim, California. We went out to California on a vacation from Michigan and made a week of Disneyland. After a couple of days I told the family that they could go visit Disney Land (Mickey Mouse), and I'll go over to see what the aerospace industry had to offer for employment. I had an interview on Friday and started on Monday with the Northrop Corporation, Nortronics electro-mechanical division. At the time, they were just starting a contract to develop the Launch and Missile Guidance package for the Polaris missile. And, it was an interesting program from the perspective of a young engineer that was getting started in industry. Prior to working with Northrop I was working for the Burroughs Corporation in Michigan, which designed banking machines. With the Northrop Corporation, we teamed with Lockheed, and several organizations to develop the Polaris missile, and launch systems. We developed the Prototype missile in the San Francisco area. My relation to the "underwater" community was through the submarine. After final prototype was developed up in the mountains the production missile was produced at Lockheed. We traveled to Groton, Connecticut to do the installation of the missile launch equipment and

witnessed the cutting open of an attack submarine to install the sixteen-missile compartment. We tested everything and then we finally launched seven missiles down at Cape Kennedy—Cape Canaveral at the time. After the Polaris Missile program, I went back to Anahrim Northrop Corporation plant and started a new program that was the United States Navy SeaLab III program. The SeaLab program was foreign to me, but the people were, just genuine all the way from the very beginning. My engineering task was to design and build a SeaLab Command and Control Center and a Biomedical Testing Vans. The system was designed to perform biomedical testing for the aquanauts and moved the central control platform for the entire operation.

INTERVIEWER: Was that SeaLab II?

MR. McCARTHY: SeaLab III.

INTERVIEWER: This was SeaLab III.

MR. McCARTHY: Yes, SeaLab III. The SeaLab II, at the very tail end of it, I had seen the SeaLab II Habitat, prior to the over haul converting and modifying the SeaLab II Habitat for the SeaLab III Habitat. The first van was the primary Command and Control Center for the SeaLab operation. The van contained everything that communicated with the Habitat, with the ship, with the operational side of controlling the program and was housed in the control van. Both the command van and the Biomedical van were located and installed in the port side of the IX501 Elk River and connected through the

umbilicals to the habitat as well as the two deck decompression chambers. The chambers were the primary compression chambers and/or decompression chambers to pressurize the aquanauts that were going to be transferred under pressure, in the Personnel Transfer Capsule (PTC), down to the Habitat.

We developed the Command van and Biomedical vans in Anaheim and then shipped it up to Hunter's Point, Naval Ship Yard where we installed the Vans on board the IX501 Elk River.

The installation of the Recompression Chamber, the Command Van, The Biomedical Van, the Piping System took better part of nine or ten months to oxygen clean and install everything. The entire SeaLab crew went to work on Monday through Friday and sometimes even went back home on weekends. I traveled to Anaheim and everyone else was stationed in San Diego, so we were doing a lot back and forth traveling. After every segment of the system was installed we started to test the system in the dry dock where the *Elk River* (IX-501) was resting on blocks in a dry configuration. When the Habitat was lowered into the dry dock and then the dry dock was flooded. The Habitat itself would do all the communication links and testing between the control van, the chambers control station and the command center. The command van was primarily designed for command and control, gas analysis of the habitat environment, audio and video recording of all cameras located in and around the Habitat, the onboard chambers, and the Dive Station. We recorded everything between topside and the habitat the two decompression chambers and located deck on the *Elk River* (IX-501). After the termination of the SeaLab with the death of Berry Cannon the program just kind of fell

apart out there and the only thing that we were doing, we were getting things off and ready to go back to San Diego for storage. At the time, we didn't know that the U.S. Navy SeaLab was going to continue in that configuration or not. I went back to the engineering department at Northrop Anaheim. The U.S. Navy was requesting three or four major companies to build the Ocean Simulation Facility. At the time, it was a Southern Division program, but ultimately, everybody knew it was to be built for the Navy Experimental Diving Unit (NEDU).

INTERVIEWER: Before we get into the NEDU current, can we get back to the Sea Lab just a little bit more.

Mr. McCarthy: Sure.

INTERVIEWER: I know that there was a failure with the, I guess, a helium lock which was one thing that I heard. What do you think was the real problem with SeaLab III and the reason it didn't succeed?

MR. McCARTHY: Well, I'm sure it's recorded history as precisely what had happened, but let me first explain how the Electrical Interface for SeaLab I and II were both designed. The electrical cable (umbilical) was connected from the surface ship or barge down to the Habitat and routed below the Habitat then up into the Habitat through a stuffing tube then connected to the main power panel. In the design of SeaLab III, the

stuffing tube was not the current technology. The current and new technology is to have the umbilical connect to the Habitat through large electrical connectors, and so to provide a quick and easy field connection instead of a hard wiring configuration.

MR. McCARTHY: The new interface, I believe was designed by the Naval Research Lab. All our systems were located on the Elk River topside. Although, the interfaces with the habitat were a definite consideration as to how we obtained samples of gas from the Habitat and we communicated with the Habitat. Upon lowering the Habitat to the bottom the Habitat was secured with all hatches closed so it was essentially equal to water pressure outside. The pressure within the Habitat was maintained maybe five or so pounds over pressurized to the Sea depth. As we were lowering it, we could continuously monitor the interface pressure in the Habitat up in the Command and Control Van. We knew exactly what the depth of the Habitat and the corresponding internal pressure was at all times inside the Habitat. When the Habitat reached the bottom, the cameras were turned on and everything progressed as scheduled. The two teams of aquanauts were pressurized to the pressure of the Habitat and for traveling to the Habitat. Water leaked into the main electrical connector and across the pins, which in turn shorted out and blew a hole into the Habitat. When the connector shorted out there was an enormous inrush of water. With the inrush of water, they tried to pressurize the Habitat to keep out the Seawater. With massive amount of helium that we were pumping down into the habitat to try to keep it from flooding; the amount of helium was obviously running out rapidly; and we had a limited supply on the ship. We had the helium supply,

which was to support breathing gas for life support down below, but it wasn't enough to keep the water out.

INTERVIEWER: Yes.

MR. McCARTHY: Okay. But, during the course of things, that was the failure. Then more Helium was barged from the Long Beach area. We brought helium, oxygen, in tube trudes, on a barge and tied up along side of the Elk River. The barges were right along side of the Command Van. While we were transferring oxygen a fire started on board the oxygen barge, which started out as an explosion, then a stream of fire. Fast reacting Navy Divers entered the ball of fire and secured the oxygen. It saved us from a massive disaster not only down below, but then up topside and in the chambers. We had two teams under pressure in the chambers on board the Elk River at the time, and we were communicating with them as well as the team in the PTC. The PTC contained a 4-man team with Berry Cannon and Bob Barth who were trying to get down below to open the Habitat. The problem with the connector was the initial problem but there's nothing wrong with moving upward in technology. That's just saying if something works and works quite well, why go ahead and change it and make something brand new, but good engineers are always looking to improve the system.

INTERVIEWER: If it's not broken, don't fix it.

MR. McCARTHY: Right. But, engineers are engineers, you know, if we think we can make it better, well try, but in this case it caused the problem.

INTERVIEWER: Explosion of the oxygen.

INTERVIEWER: Yes. I know that the ultimate end of SeaLab III, my understanding was the death of Barry Cannon.

MR. McCARTHY: Correct.

INTERVIEWER: And, of course, very unfortunate in my understanding is that it was the result of a canister that had not been filled or some people have even called it sabotage. What are your thoughts on this?

MR. McCARTHY: Personally I don't believe there was any sabotage involved. With my relation with all the SeaLab Navy and civilian personnel there was nothing but a close relationship together, always helping each other, living together and partying together. I would say there was a similarity to the Astronaut Program. I think the sodasorb was washed out during the transit to depth, because everything was chaotic and rushed trying to get people inside the Habitat at the time. The communication link was primitive at best and communicating with Bob Barth and Berry Cannon by umbilical to the PTC trying to open up the hatch. We were trying to keep the pressure on the habitat so it would not flood, so as you know, this is an uphill battle. The coordination of

opening up that hatch exactly at the time the when they depressurized, is the thing that did it. When we knew that it was depressurized enough so that Bob could open it up, Seawater flooding started rapidly in to the Habitat at the bottom. Then Bob would have done is opened up the hatch to a flooded Habitat. There's a "catch 22" where as Bob and Berry tried their very best. When they come back up to the Deck Decompression Chamber (DDC) they were exhausted. The team worked totally exhausted, they were cold I mean it was miserably cold, you could see them shaking underneath. Bob was a pretty healthy diver and he could take the extreme cold and he could take a lot of shock. He did his best. He and Berry came back to the cold PTC, and they came back up to the *Elk River* and locked into the DDC they wrapped up to warm up and they ate dinner at this time. It was chaos on board the *Elk River* the topside crew was trying to keep the water out of the Habitat and trying to get ready for the next morning's dive. It was suggested at one time, to change the team and put the second team in. Bob, Berry, and Blackie decided that they had been there and knew what they were going to do, and that the same team was going to open the Habitat. They did get some rest. The topside Aquanaut teams were frantically trying to get everything ready to go for the next morning's dive. That meant refilling the Sodasorb canisters. The assumption was that The divers Sodasorb canisters were repacked and hung on the outside of the PTC, Whether the canister was not filled in all the confusion or the Sodasorb was washed out of the rig during the rush to get back down to the bottom the very next day will never be known. The washout could easily have happened, because they were traveling to depth at a pretty good rate to get from the surface and back down to the Habitat. It could have flushed out at that time. Sabotage? I had heard that talk but not from the teams. To me, the aquanauts

were the cream of the United States Navy Divers and were not a part of this talk or actions. If they ever knew anything like that had ever happened the person that had caused the problem would never had made it back to the United States mainland. These were a bunch of dedicated individuals and every one of them was very devoted to the program and protected each other. Had something like that ever happened I think in time, it would have come out, someone somewhere would have finally said, "I did it". At the time when we were running out of gas to pressuring the Habitat, the on scene commander of the SeaLab notified us that a U.S. Navy submarine was in the area and would attached a long hose over to the Elk River and transferred air down through the umbilical to the Habitat to try to keep the water out. I think the only major leak that we had in the Habitat was through the Electrical Penetrator.

INTERVIEWER: Are you aware of any level of the Navy of management that was negative towards what SeaLab III was trying to accomplish? It was very quickly after this that SeaLab was terminated. Are you aware of any political issues, I guess?

Mr. McCARTHY: I've heard them all, but, as in time when chaos happens, and this has happened two or three times in my life where finger pointing has always gone on, and individuals stated "it was not my fault it was somebody else's fault". And this is the time when good in the Navy will have to save their careers; they will have the tendency to point fingers at another person. Over all they're all the very best every one of them from George Bond, Tomsky, Mazzone, to the entire SeaLab Teams a very dedicated team. We also had people in Washington D.C. that I know were very supportive to the

program. I saw no reason why anyone would ever want to jeopardize a great Navy program, or our sailor lives. I've heard it but just discount it and say," You know, I guess I've been around you guys long enough to know that I'm a proud to be a part of it, and knowing that how proud I am, I can't believe that anybody would ever be negative about the program".

INTERVIEWER: Okay, can you talk a little bit about the leadership of the project, The SeaLab project?

MR. McCARTHY: We were all extremely close to the shipyard people in the San Francisco area. We all dealt day to day with everybody. Captain George Bond was essentially the main driving leader for me and the head of the program. Primarily I was in more of the medical side than I was in the operational side, George supported me. Walt Mazzone was my direct boss, and Jack Tomsy was his boss. All three of them, George Bond, Walt Mazzone, and Jack Tomsy, that trio were like close friends of mine. Since they knew who I was and what I was doing was an important part of the Northrop program. My direct point of communication link was commander Jim Vorosmarti. At the time, Commander Vorosmarti was more my leader in the Biomedical Department because my background was not medicine, he in fact, assisted me in every design decision. I consulted with him in every selection of medical equipment and proposed clinical procedure. "Okay, Commander Vorosmarti, what is it we need to build for the aquanauts? And, he'd say "Well here's what we're going to do. I'm going to sit you down in a room and here's what I want you to do. I'm going to give you certain things

that I want done, for an example, I want all blood and urine chemistry and hematology. I knew basically what it was, but I did not know anything about the details of doing the clinical work. Jim Vorosmarti was my mentor in leading me to do the best job for the U.S. Navy building the Biomedical van. We did all the blood work, physicals, and we continued this every day. It was enjoyable, because at the time, I did not even know how to draw blood, and they taught me how to draw blood from of the divers. It was kind of a kick for me to be doing this with them. After we finished it, everything was put together up in San Francisco, and then was moved on board the Elk River. Prior to the Elk River it being towed to San Clemente, we went to the island to make sure we had all the island support and facilities to support the program. We all had quarters, a good chow hall, movies, tavern and all the amenities for good living. Every night was a pleasure and shared with all the team including the upper management. The nice thing about being a Northrop employee was I could support from Northrop to get a lot of computer work down load recordings of everything; both video and audio, including everything we were doing on board the ship. I had permission from Commander Tomsy and Captain Bond to come and go back to the mainland, which was an experience in itself, since we had an old airplane DC3B (Mercy Airlines) that flew us from the Island to Long beach everyday. In flight the oil would blow off the wings and it was unbelievable. Everyday, we prayed that we could make it out to San Clemente Island or back again. Then we moved into quarters out on San Clemente Island, and it was enjoyable in itself. All of us lived together under the same conditions, so we had to make the best of it. We did have good food, movies, and good times. We made trips up to the San Clemente International Forest, which was three trees on the island, Goats were everywhere. It was a firing range

and some days we would get a large Navy Ship that would fire salvos over the Elk River. They'd fire salvos down range over our head to the other end of the island. It was a unique place to be and a great bunch of people to be with. The four unique management leaders that I worked with were, Captain Walt Mazzone, Commander Jack Tomsy, Captain George Bond, and Commander Jim Verosmarti individuals in themselves. Captain Bond knew a lot of people would say that there's was little conflict between Jack Tomsy, and Walt Mazzone, but when you boil all the chaff down, these four will stand together shoulder to shoulder and were U.S. Navy and you could not find any finer. There is always a small turmoil between great leaders, on what to do and how to do it. Everyone wants to be "The Main Commander". Tomsy was the on scene commander, but it was the dreams and hard work of George Bond that again brought us and the U.S. Navy out to San Clemente Island preparing to continue the SeaLab Experiments.

INTERVIEWER: That's great. You started to talk immediately after SeaLab III. Moving to that point.

MR. McCARHTY: in the same time frame the SeaLab III program was in operation the Navy planned to build a facility to safely dive in a chamber to simulate the pressure and depth of seawater. The NASA organization had the financial support to build facilities to test in a simulated mode but the Navy did not have the financial resources so testing of new equipments was done at sea. When new diving rig was introduced to the navy they had to take it out to the ocean to see if and how it worked. The same thing happened during the SeaLab program. If we had a place where we could

have tested the equipment prior to actual operations it may have turned out different. The Navy Experimental Diving Unit in Washington D.C. was the testing agency and the facility by which they did all the basic testing and diving at the time.

INTERVIEWER: Is this at the Navy Yard?

MR. McCARTHY: At the Navy Yard, right. At the time, when I was on the SeaLab program I had only heard of the Navy Experimental Diving Unit. But, after the completion and the shut down of the SeaLab program, the Navy found the funds to do it right, and design and build a large testing facility which could simulate the depths of the ocean in a controlled environment without physically going to the ocean. The Navy and Engineers at the Mine Defense Laboratory drew up the basic design for the facility. The initial design was accomplished by Sanders and Thomas for the Naval Facilities Engineering Command. The entire program was funded and program managed through the Southern Division of the Naval Facilities Engineering Command. They issued the Request For Proposal to large companies like, Lockheed, North American and Northrop. I think there were about seven large companies that submitted proposals and cost bids on the contract. With a stroke of luck and I guess a sound proposal, we won the contract. I was fortunate to assume the Engineering Manager Task and John O'Brien was the Program Manager. He was an Engineering manager with a solid managerial background.

The initial task after being awarded the contract was to pick a team and start the designs based on the conceptual designs provided as part of the contract with the system operating parameters of 2250 FSW depth and wet chamber temperature range of 34 DEG F. to 90 DEG F. The entire package was divided into the following major segments:

Gas Storage System

High Pressure Gas and Air System

Gas Management System

Wet Chamber Water System

Wet Chamber Water Temperature Control and Conditioning

Dry Chamber Sanitary and Portable Water System

Dry Chamber Holding (Bunks, seats, etc.)

Dry Chamber Electrical System

Dry Chamber Environmental Conditioning

Dry Chamber Environmental Analysis

Dry and Wet Chamber Pressure Control

Wet Chamber Vehicle Handling System

Chamber Closed Circuit Television

Chamber Communication System

Dry Chamber Fire Suppression System

Wet Chamber Door Control Console.

The Gas Storage System was sized to support the intended use of the facility during the dives. Sufficient volume of air, helium, and nitrogen for pressurizing the chamber and oxygen and mixed gas for breathing.

The design of the piping system from the air compressors, helium, oxygen, nitrogen, and mixed gas pumps to the gas storage flasks were sized and routed through the new trench system. The shelter for the gas bottles was designed for protection of the environment as well as strong enough for 120 mile an hour wind storms.

The gas supply system from the storage flasks to the chamber was designed to enter the building to the gas control console on the first deck. The gas control console contained pressure regulators to reduce the stored gas and air pressure to 1200 PSIG. Analysis equipment was installed to verify gas purity and control valves installed to route the gas to the chambers.

A Gas Mixer System (Mix Maker) was designed and installed to blend different gas mixtures of oxygen and helium or oxygen and nitrogen and piping through a mixed gas Corbin diaphragm pump to the mixed gas storage flasks or directly up to the chamber for breathing purposed.

Air and gases were routed from the gas control console to the headers on the third floor, to the second floor portable water sanitary tanks and to the wet chamber pressure control station.

The gas headers on the third floor were plumbed through the remote operating control valves directly into the five upper chambers and a second set of lines through five manual operations panel. These panels were located directly in front of each of the five upper dry chambers and were designed to operate the chambers manually in the event of a loss of electrical power.

The electrical power required to operate the entire facility was routed through the Navy Base power station. We installed a 500 KW backup generator to provide enough electrical power for the entire facility in the event of a power loss situation. Should a major storm or a hurricane occur while a deep dive was in progress we would place the emergency generator on line to prevent a power outage and harm or injure our divers.

The chamber fire suppression system consisted of five 600 gallon pressurized water reservoir located directly above each of the chambers. The water was pressurized with helium for deep dives or nitrogen for shallow air dives. The tank had a tracking regulator for pressurizing the reservoirs and maintained 60 PSIG over the chamber pressure, during both pressurizing and depressurizing the chambers. The original requirements for the wet chamber was to use salt water or fresh water and chill the water to 34 DEG. F and heat the water to 90 DEG. F.

After much consideration we decided not to use saltwater because of the corrosive effect it would have on the HY80 steel pressure vessel.

The heat exchangers for cooling the water in the wet chamber were designed as a single pass “tube in shell” assembly working with two high capacity chiller units, which circulated brine water. The size of the heat exchangers was based on chilling the 55,000 gallons of water in the wet chamber for ambient 80 DEG. F down to 34 DEG. F in less than 5 hours. The heater heat exchanger was required to heat the water to 90 DEG. F also within 5 hours. A large filter system was installed into the water circulation system to maintain water clarity.

The design of the piping system considered the effects of the wet chamber increasing both in diameter and longitudinal during pressurization and depressurization. This required the piping be run as a torsion bar and specifically dictated by the stress analysis programs.

The environmental conditioning system was designed to remove the gas from the chamber, dehumidify by cooling, scrub the carbon dioxide, remove odors, reheat to original temperature and add oxygen for metabolic makeup.

As part of the environmental conditioning system the gas within the chamber was continuously analyzed for oxygen, carbon dioxide and other contaminants. Through this system the makeup oxygen was designed to automatically be added in the ECS loops.

We designed the entire interior of the dry chambers for habitability, noise control and creature comforts using all consideration of elevated oxygen levels within the chambers.

We performed burn and ignition tests on all materials to be used as wearing apparel and bedding, and paints. We designed new toilet seats of stainless steel, this was cold to set on but it would not burn.

The potable water system was designed to provide water for showers and toilet use. We designed the potable water tank to hold 50 gallons and to withstand the operating pressure of 1000 PSIG.

The sanitary tank was sized also at 50 gallon capacity and pressure rated at 1000 PSIG. The tanks were physically located below chambers B and D and the water drained into the sanitary tanks by gravity. During a saturation dive at Taylor Diving in New Orleans Louisiana, one of the divers was sitting on the toilet; the outside tender opened the drain valve on the sanitary tank and pulled the lower intestines from the diver. The outside tender hearing the scream from inside, closed the drain valve causing the divers lower intestine to be partially outside at atmosphere attached to the diver inside. A physician had to be locked in to perform the amputation surgery to save the divers life. With this major safety problem the OSF sanitary system was designed with interlocks to prevent injury to the inside personnel.

INTERVIEWER: And, where the OSF is one of a kind, and what do you – can you talk about some of the unique features of the OSF and some of the challenges in designing it?

MR. McCARTHY: I think the challenges were everybody wanted the Ocean Simulation Facility to do everything. Initially the design was to pump seawater from the alligator bayou into the OSF wet chamber. Fortunately we all agreed that using seawater in the wet chamber would cause the short life of the HYBO Steel. You're not going to hurt the stainless steel, but you're going to limit the life of the large chamber complex.

As a footnote to the use of saltwater in the wet chamber; we designed a large container, installed it in the wet chamber and filled it with saltwater. We then filled the wet chamber with fresh water to surround the salt water container. The saltwater in the container was plumbed to a chiller system at ambient pressure and was cooled to 28 DEG. F with the fresh water cooled to 34 DEG. F. The second unique problem was the paint used in the chamber, especially the wet chamber. On the very first series of dives that we had in the OSF – when we came back to the surface and opened up the door – we had large pieces, I'm talking like 20 foot pieces of paint that peeled off the wall, fell down to the deck. We discovered that the chamber would expand and the paint would not expand, so as soon as the water found a tiny crack in the paint the water would get behind the paint, and it would peel. We contacted paint manufactures to find a paint that would take the expansion their response was to try the Corvette paint. So, the paint that General Motors uses on Corvette was a very pliable paint, called "Imron", manufactured by Dupont. We

ran off gassing studies and flammability studies on the paint. We applied it to the wet chamber and same Dupont “Imron” paint on the walls of the chambers that we put on in 1973. Another problem was the requirements to fly the chamber to 50,000-foot altitude. This requirement made for a specific design on the Viewports so they would not be pulled in with the internal vacuum.

INTERVIEWER: How long did it take to build the OSF, from the concept and the cost involved in it? Do you know?

MR. McCARTHY: The Government contracts to design and build the Ocean Simulation Facility was issued to three contractors. The building contract for \$1,116,505 was issued to Dyson & Co. of Pensacola Florida. The Pressure Vessel contract for \$2,468,387 was issued to Hahn and Clay of Houston Texas. The Life Support contract for \$3,740,000 was issued to Northrop Corporation of Anaheim California. The Life Support contract was started in early 1971 and the first dive was recorded in 1974. We were honored to have Captain George Bond to be the first person pressurized in the OSF.

INTERVIEWER: The hatch for the wet chamber always amazed me – that large opening. Can you talk about the design of that?

MR. McCARTHY: Yes Sir. The first design was a unique design that we knew wouldn't work, because, the number of times the door must be opened and closed and to get that 15 foot diameter door to make a good seal every time. We went back to Mr.

Larry Megow of Hahn & Clay who was the manufacturer of the pressure vessel and some of the greatest engineers in the world, as far as large pressure vessels. We sat down with Larry, and Larry said, "Now, look, I've got one that we use in the nuclear field for closing a door, and it's a double seal. There are two "O" rings." And, that's all there was, and we decided that out of the sealing mechanism being basically tongue in groove type mechanism, we decided that in itself, we had to keep that door from blowing open, so we decided that the design had to have a series of mechanical pins that locked into place, that held the door closed. It was calculated that we had to have somewhere in the neighborhood of a hundred pins, and it ended up being 96 pins. And, to this day, which is so surprising, we have never had a leak -- one drop of water never came out of that door. But, that door design was so good, and to my knowledge, in the 30 years we replaced that "O" rings, once. But, it was such a great design the door and it would always fit. But, we had problems with the door at times, because after the door rolls into place and slides into the tongue and groove, then there were three rams that pulled the door straight in, because the door came in on a hinge mechanism, and then once it aligned itself, then the three rams had to pull it in. Well, some of the problems were the misalignment was that the upper ram would get ahead of the lower ram to cause it to wedge. So, it wedged one time, and then we had to rebuild the upper ram because it was malfunctioning. So, we did that. But, some of the most unusual things that happened, I think, from day one were the life-support circulation of gas in the dry chambers. The dry chambers are built as all living quarters, and there are five chambers. We designed a life-support loop for each chamber, plus a spare. The spare loop provided us a method of disconnecting one loop and valve in the spare for maintenance. In the original design we had a big positive

displacement roots blower, or compressor system that had a compressive flow. The major problem was the noise we encountered when they were operating. When the blowers operated you could hear them inside the chamber, like being in a big brass drum, and you almost had to wear hearing protections while you were inside. It was more like a compressor than anything else. We could run it slow, but even at night it was very difficult for the divers to sleep. The second part of the problem was that the pressure seal between the motor and the positive displacement blower had to be changed every fourth dive, and in emergencies sometimes had to be changed during a dive to save the divers from freezing. In 1976 we attended an OTC meeting for large equipment in New Orleans and discovered a magnetic drive blower unit. The design was a complete forging with a centrifugal impeller driven by an external motor and connected with a magnetic drive interface. When operating even at full speed the noise was about 75dba inside of the chamber. This was a God sent for the divers inside and after the new blowers were installed we never changed them out in over 25 years of operation. We bought two of them, which were aluminum construction and requested the same units to be manufactured of stainless steel.

INTERVIEWER: So, there was no penetration.

MR. McCARTHY : No penetrations into the unit, we found that the magnetic drive was extremely quiet. A Canadian firm built the blowers of stainless material. The company built six of them; no actually they built eight of them. Mr. Chips Hurley came

to NEDU and discovered how quiet our units were by comparison to their units. NEDU loaned two units to the Naval Medical Research Institute, at the Naval Hospital.

Another problem was mixing the environments inside of the chamber. We were using helium oxygen mixture and blended the gas in the life support environmental conditioning system and returned it into the chamber. You could see gas layers inside the chamber; it was cold at the bottom and warmer at the top where it was entering the chamber. We had to build a big plenum to move the gas around and to make sure that everybody was nice and comfortable inside. Diver-Winch design was one that we enjoyed working on. The winch had to be electrically controlled up and down from inside and the motor located outside. We made a penetration on the outside that pierced the hull of the upper hatch on the trunk. We designed the cable housing located overhead inside the trunk with a gearbox with a shaft penetrating the chamber and driven by an electric motor outside. The shaft seal was a pressure bearing? Use the pressure from inside the chamber, which would equalize. The pendant control with up / down control could not have any electricity. We used two “sensor” magnetic relays so that when the operator would press the “up “ button, magnetically it would close a contact on the electric relay outside on the motor, and in reverse, a second magnetically operated relay would run the motor to the down position.

The chamber lights were another design challenge. In the chambers of days gone by the electric light bulb was located inside, in the over head. We contacted John Canty to design the new lighting system with the light bulb located outside the chamber and the light was reflected by a mirror through an acrylic rod to the inside the chamber. This design was the basis for today’s hyperbaric lights.

The next challenge was the fire suppression system, which must include a detector system that will work at high pressure. The forth system we installed would activate the automatic fire system if it saw a simulated fire of a movie with a fire in it. The sensors were redesigned and changed and have had no problems since.

INTERVIEWER: I know that NEDU North had a fire back in the early
1970's?

MR. McCARTHY: Right.

INTERVIEWER: What lessons learned did you apply to deal with
That?

MR. McCARTHY: In a hyperbaric chamber the increase of pressure will bring molecules of oxygen closer together. Once a fire starts, the pressure chamber the fire will react more rapidly, near an explosion. At NEDU North, as far as I knew about it, was caused by two problem; One, they had light bulbs inside of their chamber, and one of the divers hung a T-shirt over the light bulb to cut down the glare, and it heated up and ignited. The second fire that we knew was caused by the environmental conditioning blower motor, which was a standard electrical motor in the enriched oxygen environment. The grease used in the downhaul, which reacted with the elevated oxygen, caused the third fire. NEDU North had many years of successful dives based on if it works, leave it alone.

INTERVIEWER: Yes. Yes. This is fascinating. I know your expertise came from years and years of experience. Where did you start your education and –

MR.McCARTHY: Well, going back to college. I attended the University of Michigan, Mechanical Engineering. I got my real exposure to Hyperbarics with the SeaLab program and the design of the Ocean Simulation Facility. Theoretical and book learning will never be the end of knowledge, practical exposure will complete the education loop.

INTERVIEWER: I wonder if I could ask you some general questions.

MR.McCARTHY: Sure.

INTERVIEWER: What do you think is the most significant achievements made in the underwater field in the past 50 years?

MR.McCARTHY: To quote Captain George Bond, about the time of the SeaLab III program, he stated that the only reliable piece of diving equipment that continues to work well is the weight belt. With that said and realistically speaking of equipment, there have been enormous advances in helmet designs, equipment to keep the divers warm, but I think most of all communications, both audio and video links between the diver and support personnel on the surface as well as Diver to Diver. On the other hand the

achievements in the U.S. Navy have been suppressed because of the increase of criticism, certification and the desire to protect the good name of the inspectors.

From the technology developed by the U.S. Navy over the years in Hyperbarics. The Air Force has developed methods and equipment to heal many clinical problems in military and dependent personnel. The civilian community has taken advantage of procedure and equipment development to treat a wide variety of non-healing wounds and have saved many limbs.

INTERVIEWER: Well, this seems to be a good follow-up course, for the first half of the century; the Navy was the world leader in diving. Since that time, many Navy divers have been leaders in the commercial diving field. Clearly, neither of these facts seems to be prevalent. What are your thoughts?

MR.McCARTHY: In the short time that I have been affiliated with Navy Diving community we've gone from number one in the world of shallow and deep diving as well as salvage to a world of not being recognized anymore. The commercial diving companies have acquired the U.S. Navy experienced personnel and are now the experts and are the world leaders. Saturation and habitat capabilities are gone. Our training is pretty well limited to teaching divers how to breathe underwater. The Naval Diving Salvage Training Center, Panama City Florida is doing a good job at that. It was suggested and offered by NEDU to take one of the three NDSTC chamber complexes and modify it for a saturation-training complex. Management stated that we don't need saturation divers anymore. When the Navy was involved in the recovery of the Monitor,

the U. S. Navy did the saturation diving with a great number of inexperienced divers and turned to the commercial diving community to support the diving and supply the hardware. The United States Navy should be the diving leader as NASA is the Space leader.

INTERVIEWER: Well, I think you've probably answered this question. In your opinion, what should we in the underwater world be doing in the future? I think you touched on that to some extent.

MR. McCARTHY: I still believe in the concept of habitats. Habitats are not the answer to everything, but if we're going to live in the ocean, we need to be a leader in the ocean. The U. S. Navy needs to join hands with the National Oceanic and Atmospheric Administration (NOAA) and develop a habitat system to be used by all organizations of our Federal government. The only active habitat system is located in Key Largo Florida, owned by NOAA and operated by the University of North Carolina at Wilmington. The habitat is fully operational and utilized by sponsors such as NASA and Universities. Occasionally the U. S. Navy will participate in saturation dives. There is a current resurgence of interest by the U. S. Navy in the use of the habitat. Florida State University has re-invested in a program called "Scientist in the Sea" and is training students about living in and working in the sea. They also have a new program training law enforcement personnel on underwater crime investigation.

INTERVIEWER: Well, Jim, I want to thank you. I think this is outstanding, and I appreciate your time and sharing your experiences.

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UNDERSEA & HYPERBARIC MEDICAL SOCIETY

ORAL HISTORY OF THE MAJOR PARTICIPANTS
IN U.S. NAVY UNDERSEA TECHNICAL DEVELOPMENTS

INTERVIEW OF CAPTAIN JAMES VOROSMARTI

PROCEEDINGS

INTERVIEWER: What are some of the titles you've had that you're most proud of in your career?

CAPT. VOROSMARTI: I'm a retired captain in the Medical Corps, U.S. Navy. I guess some of my better titles are aquanaut, diving officer and submarine officer.

INTERVIEWER: You're from Pennsylvania. Is that where you grew up?

CAPT. VOROSMARTI: Yes. I grew up in Palmerton, Pennsylvania. I went to college in Easton, Pennsylvania, at Lafayette College.

INTERVIEWER: Where did you go to medical school?

CAPT. VOROSMARTI: I went to Jefferson Medical College in Philadelphia.

INTERVIEWER: When did you decide you wanted to be in the Navy? Was it something that you had considered during college?

CAPT. VOROSMARTI: Well, I knew that when I graduated I would have probably been drafted into the Army. In my senior year in college, I went into the Navy Reserve because I knew by that time that I was going to medical school. The Navy had a program at that time in which you could go on active duty during your summer breaks from medical school and make a little money. That was how I ended up in the Navy.

INTERVIEWER: What do you recall about entering the Navy? What was the procedure for someone in that program?

CAPT. VOROSMARTI: Basically, we just went through a recruiting center and signed up. There is only thing I remember that was a little unusual. There were three or four of us in my class in medical school who were in the Navy. We all had to go to the Philadelphia Navy Yard to get sworn in. After we were all sworn in, the yeoman there

said, "Captain Blood would like to meet you." We all said to ourselves, "Sure, lead us to 'Captain Blood.'" Sure enough, Captain Blood was the district medical officer.

INTERVIEWER: What did he have to say? What was the spiel?

CAPT. VOROSMARTI: I really don't remember. We were so taken aback that Captain Blood was a natural person that we didn't remember much of it. But we didn't get much training or anything. Nobody even told us what kind of uniforms or insignias we needed or anything else. Luckily, I was living in a rooming house during my freshman year with another medical student who had been a line officer in the Navy, so he got me pretty squared away.

INTERVIEWER: How did the program work? You were going to medical school and had some Navy obligations. How did the two fit together?

CAPT. VOROSMARTI: At the end of your freshman and sophomore years, you could do what was called a 'clinical clerkship' or a research clerkship, which involved sixty days active duty, I think, at a Navy facility somewhere. After my freshman year, for some reason I didn't have active duty, but after the end of my sophomore year I went down to the naval hospital in Philadelphia for the summer as a clinical clerk.

INTERVIEWER: What kind of duties did that include?

CAPT. VOROSMARTI: Basically, I acted like an intern. I spent about half that time in a pulmonary ward and about half the time in the orthopedic wards. You just learned had to start doing clinical medicine. It was supervised. You weren't allowed to do anything on your own.

INTERVIEWER: You were seeing patients at that time, though.

CAPT. VOROSMARTI: We were seeing patients. We were taking care of patients.

INTERVIEWER: When did you graduate from medical school?

CAPT. VOROSMARTI: That was in June of 1961. From there, I went down to Portsmouth Naval Hospital in Virginia for an internship.

INTERVIEWER: Do you remember what the internship program was like back then?

CAPT. VOROSMARTI: Back Then it was a general rotating internship. In those days, you didn't go right into a first year post-medical program. Everybody took a rotating internship, which included surgery, EMT, pediatrics, OB and everything else.

INTERVIEWER: Were you starting to focus your attention on a particular interest or clinical specialty?

CAPT. VOROSMARTI: No. I really didn't have a particular specialty in mind. I thought I might like general practice. But at some time during the year of our internships, we were asked to decide what we wanted to do. Basically, you could do general sea duty on a destroyer. Most people ended up on military transports, running dependents and kids back and forth from Europe.

The other choices were submarine and diving medicine or aviation. I had done a little flying in high school, and I didn't think it was very great. We kept hearing those stories about people in the aviation program, including medical officers, hitting the ground very hard and not surviving, so I didn't think that was a great idea. But submarine and diving medicine really sounded interesting because it was a yearlong program and included all sorts of different things. It included occupational medicine, diving, atmosphere and radiation control, and all kinds of interesting things that sounded pretty good after a year of internship and working 36 hours on and 12 hours off for a whole year. It sounded like it would be a lot more relaxing.

INTERVIEWER: What was the application process like for that program?

CAPT. VOROSMARTI: You just volunteered, as far as I remember. There was no special program you went through before you got accepted. After the internship, I spent a month as the OOD in the emergency room waiting to go to Washington, D.C. for diving school.

INTERVIEWER: Did you go to the Experimental Diving Unit (EDU)?

CAPT. VOROSMARTI: Well, the EDU and the Naval School of Deep Sea Diving and Salvage were conjoined. They were located in the same building as EDU.

INTERVIEWER: Was that at the Yard?

CAPT. VOROSMARTI: It was at the Navy Yard, or Gun Factory, or whatever it was called then.

INTERVIEWER: Yes, it was then the Naval Gun Factory. Do you recall how the actual training that you underwent transpired? What was the first stage in that? Was the title 'undersea medical officer?'

CAPT. VOROSMARTI: It was called a 'diving medical officer.' The initial training was to put everybody in an old Mark V air suit and drop him into a ten-foot tank of water at the diving school. They had found that over many years that was the best indicator of who was going to make it through diving school. If somebody didn't try to claw his way back out of the water after getting into it, he was giving a pretty good indication that he would get through school.

INTERVIEWER: It was a pretty basic operation of psychological testing. Just throw him in the tank.

CAPT. VOROSMARTI: No. By that time, I think they found out a lot of psychological

testing didn't predict who would do well, so they basically just threw you in the water in a diving suit.

INTERVIEWER: Once you learned the basics on the Mark V, what other things did you learn in that school? Were there any clinical aspects to the course?

CAPT. VOROSMARTI: There were few because we didn't really see patients or take care of anybody while there. You had the lectures on the medical aspects of diving, and that was all classroom work. A lot of the time was spent actually diving and learning diving techniques. We did the Mark V air dives, helium oxygen dives, and we learned SCUBA.

INTERVIEWER: Your initial experience was with the Mark V. Had you seen a diving suit before?

CAPT. VOROSMARTI: Yes. I knew what they looked like, but I had never seen one up close or handled one.

INTERVIEWER: Can you describe it to us and what it felt like, getting suited up and getting ready for the dive?

CAPT. VOROSMARTI: I really don't remember, except that they only had something like thirty sets of the underwear that was used. They were a woolen kind of long johns, and they were always wet. They were always cold when you put them on. That was a very clammy experience. But I don't remember any great anxiety about it or anything.

INTERVIEWER: That was the hard hat suit?

CAPT. VOROSMARTI: That was the hard hat.

INTERVIEWER: It was a complete body suit.

CAPT. VOROSMARTI: It was a full canvass suit with hands and feet enclosed, the

heavy boots, the great big weight belt, the brass collar and a helmet. It weighed about 180 pounds.

INTERVIEWER: The air source was a hose in surface?

CAPT. VOROSMARTI: It was just the hose from the surface, married to a lifeline.

INTERVIEWER: You had a communication setup.

CAPT. VOROSMARTI: Yes. It had telephone in the helmet. You'd talk back and forth.

INTERVIEWER: Was a lot of your diving practice off of the barge in the Anacostia River?

CAPT. VOROSMARTI: Yes.

INTERVIEWER: What types of exercises did they put you through? Did you get the old flange routine on the bottom?

CAPT. VOROSMARTI: Oh, yes. We did that using a Jack Brown rig on a hogging line underneath the barge. You were hanging your feet and legs, trying to change a flange.

INTERVIEWER: You were doing that with minimal visibility.

CAPT. VOROSMARTI: No. There was no visibility at all. In those days, the Anacostia was a big open sewer. Once you got a foot or so below the water, it was pitch black and full of all kinds of things. In fact, it was so filthy that when you were climbing up the ladder and out of the river back up to the barge, they used to hit you with a fire hose to wash off all the muck and everything before you started getting undressed.

INTERVIEWER: The worst thing you probably worried was a leaky suit.

CAPT. VOROSMARTI: That's right. If you swallowed water, you went on antibiotics.

INTERVIEWER: How long did the procedure take, as far as the training was concerned?

CAPT. VOROSMARTI: I think the school was about ten weeks. It started in August and

finished in November.

INTERVIEWER: Of course, you learned proficiency with the Mark V. Did you use any other suits?

CAPT. VOROSMARTI: Well, we used the Mark V helium hat, which was basically the same apparatus except it had a big canister on the back of that re-circulated the breathing gas. It contained the carbon dioxide absorbent because it was not a completely open suit like the air suit. The helium was expensive. We did that in the wet pots in the chambers. We made dives to 300 and some feet. We all had to do one of those, at least.

INTERVIEWER: You had to do the equivalent of a 300-foot dive?

CAPT. VOROSMARTI: Yes. Then we used the old Jack Brown rig, which was a closed rubber suit that you kind of crawled in from the back and then cinched up. It had a full-face mask with an air hose, and then there was the ordinary SCUBA equipment.

INTERVIEWER: Besides your familiarization with the different rigs and suits, was there any class work in the theory of, say, saturation diving or helium?

CAPT. VOROSMARTI: No. Saturation diving had not come out. In fact, most diving in those days, unless it was an exceptional case, was limited to 150 to 200 feet.

INTERVIEWER: Did you learn theory? Did they give you classroom work?

CAPT. VOROSMARTI: Yes. We had lots of theory. We learned the medical aspects of diving and the theory. We all had to learn how to mix gases and calculate gas mixes for semi-closed mixed gas rigs, figure out oxygen consumption rates and all sorts of things that had to do with diving. That was a lot of classroom work.

INTERVIEWER: Did you learn the diving tables at that point?

CAPT. VOROSMARTI: Yes. They taught those. We were taught how to calculate them

using the Workman method, which had just come out a few years before that.

INTERVIEWER: Was that Dr. Workman's method?

CAPT. VOROSMARTI: It was Dr. Bob Workman's method, yes.

INTERVIEWER: When did you graduate from that school?

CAPT. VOROSMARTI: I think it was late October or early November of 1962. From there, we went directly to Groton and the sub school.

INTERVIEWER: What was that like? What were your recollections of going to Groton? and to the school?

CAPT. VOROSMARTI: It was a lot of fun, basically, because you had lectures on summary and atmosphere. You had lectures on preventive medicine on submarines, which could be a real problem. But a lot of the time was spent learning about sonar, torpedoes and all kinds of equipment on submarines. We all had to go out to sea and learn how to dive a submarine, which was sometimes pretty thrilling.

INTERVIEWER: I certainly have talked to many who have served on submarines and particularly, corpsmen. They emphasize that when you serve on a submarine as a crewmember, particularly either a medical officer or a corpsman, you literally learn the boat.

CAPT. VOROSMARTI: Oh, yes. That didn't happen in sub school. They taught you the basics about how the general systems worked, but you didn't have to learn a particular system on any particular submarine. That came if you got sent off to a submarine. You had to learn that specific submarine system. I mean, you were taught how to blow bows, tanks and do all sorts of things like that on one of the school boats, but you didn't have to learn that boat particularly well.

INTERVIEWER: Did the school boats just go out into the sound?

CAPT. VOROSMARTI: They went out into the Long Island Sound on day trips, out and then back.

INTERVIEWER: What was peculiar to the medical aspect of that phase of your training? What types of things did they teach you, medically, that you needed to know as a diving medical officer, or in your case, a submarine medical officer?

CAPT. VOROSMARTI: A lot of it was general preventive medicine and sanitation. A medical officer on subs in those days was responsible for the sanitation on the boat, general help with the crew and doing a lot of physical exams on submariners. They were also, in a lot of cases, the monitors for the atmospheric control systems. I remember in a couple of cases on one of the subs I was on, I had to stand out on the pier while they were loading stuff and make sure no prohibited items were taken aboard because of the possibility of some strange toxic contaminant entering the atmosphere. You were taught about submarine escape. We all had to go through the submarine escape tower and learn about the submarine escape system. We were taught about what happened if a sub was disabled and what the problems were, chlorine from flooding batteries, cold from the flooding, low oxygen levels, high carbon dioxide levels and those sorts of things.

INTERVIEWER: We're talking about conventional submarines right now. We're not getting into the radiological aspects of submarines yet.

CAPT. VOROSMARTI: No. That was all general submarine stuff.

INTERVIEWER: It would have been about 1963, then.

CAPT. VOROSMARTI: Yes. I finished submarine school in April 1963, and there weren't many nuclear submarines around at that time. I forgot to mention that while we

were at diving school, we were all told we had to go get interviewed for the nuclear power program. One Sunday morning at about six-thirty or seven, they loaded us all on to a school bus and drove us down to the mall, where we met Rickover's staff and went through a whole day's worth of interviews. There was no cafeteria, and we didn't have a lot of time to sit around and think about anything. We thought that was a little unusual, but we all had to do it.

INTERVIEWER: Did you meet Rickover?

CAPT. VOROSMARTI: Yes. It was one of those famous thirty-second interviews.

INTERVIEWER: Tell us about your thirty-second interview.

CAPT. VOROSMARTI: I walked in and sat down in front of his desk. He did have that chair with the sawed off legs in the front. He just glared at me. I think he only asked me two questions. I don't remember one of them. The first one was, "You didn't do well in medical school, did you?" I said, "Sir, I don't know how well I did in medical school because we never got numerical grades. You either passed or you failed." I had no idea what my class standing was because we were never told. Well, he knew what my class standing was because he had gotten it. The second question I don't remember.

INTERVIEWER: That was about a two-minute interview.

CAPT. VOROSMARTI: Three or four people prior to that had interviewed us for hours at a time. They asked all kinds of questions like, what books do you read? Do you get any magazines? What are you interested in? What are your hobbies? Basically, your whole life got inspected.

INTERVIEWER: You said that you did the escape tower during your time at submarine school. Could you describe what it was like?

CAPT. VOROSMARTI: It was a lot of fun. They were using the Stehnke hood in those days, and I guess that is what they're still using. It's a life jacket with a hood and a little mouthpiece on it that you can open and shut. During the training sessions, you started at different depths from a small chamber. You started in a more shallow area and went deeper. You ended up coming up from a chamber that was at about a hundred feet deep, at the bottom of the escape training tank. That chamber got flooded and pressurized to whatever the pressure was inside at the bottom of that column of water. A hatch opened and you came out. In the training tank, they hooked you onto a cable that ran up through the water column. There were instructors around all the time. You just started exhaling and rushing to the surface.

INTERVIEWER: How long did it take to get to the surface from about a hundred feet down in that kind of rig?

CAPT. VOROSMARTI: It took five or six seconds, probably. I don't remember. It wasn't a very long time.

INTERVIEWER: I have just one final question about that episode in your life. On which of the training boats were you? Do you recall?

CAPT. VOROSMARTI: You know, I can't remember. It was a long time ago.

INTERVIEWER: You had your meeting with Rickover and his crew and the people who were asking you every question in the book to determine your suitability for their nuclear Navy. That was the next stage, Then in the training. You were going to be assigned, obviously, following the training, to a submarine.

CAPT. VOROSMARTI: First, we went off to nuclear power school to learn how to run nuclear reactors and do all the radiation monitoring.

INTERVIEWER: You went up to Ballston Spa?

CAPT. VOROSMARTI: I went to Ballston Spa. Back in those days, the medical officer was responsible for all the radiation monitoring on the boat, even for the power plant. They didn't have electronic technicians, who came in shortly after that. You had to learn how to do all the primary and secondary plant chemistries, as well as learning a lot of things about nuclear reactors, like safety, how to run them and those sorts of things.

INTERVIEWER: Did they have a reactor there?

CAPT. VOROSMARTI: Oh, yes. As I remember, they had two. They had a submarine reactor and a destroyer reactor, a surface ship reactor.

INTERVIEWER: You had to become proficient in the operation of both, or in the knowledge of how they operated?

CAPT. VOROSMARTI: Well, you had to be proficient in knowing how they operated. You didn't have to actually become a nuclear power plant operator because you would never be allowed to do that on a submarine. But you had to learn the basics of how to do it. That was really very interesting. It was a lot of fun, too.

INTERVIEWER: There were courses with some level of physics that you had to learn.

CAPT. VOROSMARTI: Yes. You had to learn all the basic radiation physics. You had to learn how to use all the equipment in the laboratory and how to do all the chemistries. You had to learn how to use all the different monitors. You were taught to do radiation surveys.

INTERVIEWER: What would a typical day be like in one of those schools? Can you remember what it would have been like to get up in the morning and go about your business?

CAPT. VOROSMARTI: Well, we were on shift work for the start. You worked six days and had a day off. Then you worked five days and had two days off. It was some sort of schedule like that. But it was not all day work. A lot of the time was spent 'in the hull,' as they called it in those days. You were inside the submarine hull, where the reactor and reactor systems were, just learning the system, tracing things out, learning the control boards, and so on. A lot of time was spent in labs, learning how to do the chemistry and doing radiation surveys. As I remember, there wasn't a lot of times spent in lectures, except when it came to radiation physics.

INTERVIEWER: Everyone who was going to nuclear submarines went to this school. The fact that you were a physician didn't matter.

CAPT. VOROSMARTI: No.

INTERVIEWER: There were other physicians?

CAPT. VOROSMARTI: There were other physicians. We did not have nearly as long a course as the line officers had because they had to learn to be proficient in running the plant and responding to all the different emergencies that could occur and all sorts of things like that. We had a much shorter course. I think their course was something like six months. Ours was 12 weeks or something in that time frame.

INTERVIEWER: How big was your class? Do you remember how many physicians there may have been with you there?

CAPT. VOROSMARTI: I think there were probably around eight because the diving school class that I was in was the first big one. I think there were 32 medical officers in that class. Then those who went to nuclear power school got split up. Some went to Boston Spa. Some went to Idaho to Arco. Some went to Connecticut, Windsor Locks.

INTERVIEWER: Following the stint at submarine school, was there a graduation? Was there some type of special ceremony indicating that you had completed it?

CAPT. VOROSMARTI: No. In fact, I didn't finish the whole course because I had gotten orders to the USS *Jack*, which was in Portsmouth, New Hampshire. A couple of weeks before the course ended, I got a set of message orders that read, "Take the final exam now and report in because we're going to start loading the core for the reactor."

INTERVIEWER: It must have been a bit intimidating to have to take your final exam before the course was over.

CAPT. VOROSMARTI: Well, it was. As I remember, it really wasn't a written exam. They sat you down in a room with a bunch of the faculty at the school and fired questions at you. I'm sure that they were a whole lot easier on me than they would have been on a real reactor operator. I drove off to New Hampshire, but the core didn't get installed until around Thanksgiving that year, so I could have finished the course.

INTERVIEWER: You reported to the Portsmouth Naval Shipyard and saw your boat for the first time.

CAPT. VOROSMARTI: That's right.

INTERVIEWER: How did you feel about that? What were your feelings?

CAPT. VOROSMARTI: Well, it was tied up next to a pier and looked like any other submarine. The first time I saw it, it was just a big steel hull. We weren't living on the boat because it was still under construction. As a matter of fact, it was being ripped apart by the time I got there, or soon after. I graduated from sub school the day before the USS *Thresher* went down. The *Jack* was a *Thresher*-class boat with some interesting modifications.

When I reported in, the skipper and the engineers had been having some trouble with the shipyard and both the hull surveys and hydraulic piping surveys. The skipper said, "You're a doctor. You know about x-rays. Go find all our hull and piping x-rays." Well, I went up to the radiation department at the shipyard and found all these x-rays, a lot of them unlabeled, unnumbered, in a Campbell soup carton. There was no system at all. The *Jack* went into dry dock because they had to start ripping out a lot of the internal systems so that they could start x-raying the hull again because of the new Sub-Safe program that had been started after the *Thresher* went down.

INTERVIEWER: Was that after the assumption was made that it had been a piping problem aboard the *Thresher*, then?

CAPT. VOROSMARTI: Well, I don't remember. I don't think they found that out until a little later. But since you couldn't identify any x-rays or link them to any parts of the hull or piping, they had to start all over again.

INTERVIEWER: Were you involved in that at all? Was your job simply limited to trying to find the old x-rays?

CAPT. VOROSMARTI: I was basically just trying to find the old x-rays. I had lots of other things to do. It was a new boat. You had to write all the instructions for the medical department. You had to help write instructions for radiation control and all other sorts of things. The medical officer was kind of a general duty medical officer for a lot of other things. You might do public affairs or whatever.

INTERVIEWER: Did you feel that you had a special status as the boat's doctor? Did they treat you any differently than any of the other officers?

CAPT. VOROSMARTI: No. They didn't really treat me differently. I think that was very

nice. You were treated as another officer who happened to have the specialty of taking care of people, which, I must say, didn't get used very much. It was not much clinical practice except for taking care of immediate problems with the ship. Sometimes, I took care of some of their families when they had problems and I also sometimes mediated with hospitals when the crew or their families had problems.

INTERVIEWER: That was all while you were still in yard status?

CAPT. VOROSMARTI: Yes. I never went to sea with the *Jack*. What happened was that the *Jack* was built with huge counter-rotating props with a huge low speed turbine because they wanted to try to decrease the noise from reduction gears from high speed turbines, which were a great signal for sonar to pick up. They had this huge turbine that took up most of the space aft of the reactor compartment. It was about a foot and a half or so between the turbine and the hull. That was installed. It was supposed to run on saturated steam, and when the yard decided to test the turbine used super heated steam, it over-expanded the blades in the turbine and wiped the turbine out. The *Jack* went in the dry dock for 547 days, I think, a Navy record, to get all this stuff fixed.

INTERVIEWER: It never left Portsmouth. It was sitting there the whole time.

CAPT. VOROSMARTI: The whole crew, except for the engineering officer and the captain, were basically shifted around. There wasn't much we could do anymore.

INTERVIEWER: Did it constitute sea duty, then?

CAPT. VOROSMARTI: No, it didn't. I got shifted to the USS *John Adams*, which was just being finished.

INTERVIEWER: Was that also in Portsmouth?

CAPT. VOROSMARTI: It was also in Portsmouth, and I relieved the blue crew medical

officer on the *Adams*.

INTERVIEWER: That was a whole different ball game. You were on a boomer.

CAPT. VOROSMARTI: It was a boomer, yes.

INTERVIEWER: How did your role change, as opposed to being on the *Jack*, as far as what you did on a boomer?

CAPT. VOROSMARTI: Well, I was basically doing the same thing. The big difference was that the *John Adams* had an electronics technician or two, so I was not responsible for plant radiation chemistries any longer. The medical department was only responsible for personnel monitoring. The medical department had basically been set up. The only unusual thing I remember was the outfitting. There used to be a standard initial outfitting list for medical supplies on all kinds of ships.

The corpsman and I were going through all of this stuff one day and found a dozen cans of ether. I said, "Wait a minute. We're going to sea. We're going to be at sea for at least sixty days. Who is going to use ether? You're going to have half the boat falling down, not to speak of this stuff exploding in the carbon monoxide burner or whatever." We found out that BUMED had never changed the initial outfitting list for nuclear submarines.

INTERVIEWER: Ether had been authorized in the table of allowances for conventional subs?

CAPT. VOROSMARTI: Yes. It was authorized for conventional subs, but you certainly didn't want that stuff on ballistic missile subs. I went up to the naval hospital and got one of the anesthesiologists there to teach me how to do local and spinal anesthesia and I loaded us up with Lidocaine, in case we ever had to do anything. I got rid of the ether and

wrote a letter to BUMED that read, "This is probably not a good idea, guys."

INTERVIEWER: What types of surgeries were authorized aboard a submarine, especially a boomer, at that time? I know that later on they changed the regulations.

CAPT. VOROSMARTI: Yes. Back in those days, there were so few submarines. That was one of the reasons for the FBM submarines. One of the reasons for having a medical officer on board was because they did not want to pull those boats out of the patrol areas unless there was a really dire emergency and somebody was going to die. You were basically authorized to do anything you had to, as long as you felt you were capable. I assume that you probably could have done an appendectomy or some trauma surgery if you had to.

INTERVIEWER: There was a point at which that was not authorized. You couldn't do appendectomies aboard submarines later on.

CAPT. VOROSMARTI: I don't remember when that occurred. You were urged not to do them. We were urged to try to treat them medically, but as I remember in those days, there was no law against doing them. There was no regulation that said you could not do them.

INTERVIEWER: Was there a particular regime that had been developed for treating appendicitis?

CAPT. VOROSMARTI: It was basically rest, intravenous fluids and antibiotics.

INTERVIEWER: What did you have available, penicillin?

CAPT. VOROSMARTI: I'm sure we had penicillin. We had tetracycline. I know we had some sulfa drugs.

INTERVIEWER: Did you have Aureomycin, perhaps?

CAPT. VOROSMARTI: I don't remember what specific drugs we had available.

INTERVIEWER: As far as your medical crew was concerned, you obviously had a sick bay for them.

CAPT. VOROSMARTI: We had a sick bay.

INTERVIEWER: What did that look like? How big was that compartment?

CAPT. VOROSMARTI: It was on the portside of the upper deck in the missile compartment. It was about four feet wide and maybe twelve feet long. On the outer side of it, at the forward, it had an examining table that was about 24 inches wide and six feet long, I guess. Next to that was a little desk, which was lower, and then there was some counter space. The rest was made up of tall cabinets full of medical equipment. The space between the bunk on an examining table and the cabinets was only about 20 inches. I remember once having to do some surgery on that table, and it was very hard to try to reach in and actually do surgery.

INTERVIEWER: What kind of surgery was it? Do you remember?

CAPT. VOROSMARTI: It was for hemorrhoids, believe it or not. We had one of the crew members rupture two huge hemorrhoids. As they will, he was bleeding all over the place. You can imagine how hard it was trying to get down in the cleft there with no headroom or good light and sew those things up.

INTERVIEWER: What type of medical crew did you have, as far as corpsmen?

CAPT. VOROSMARTI: I had a first class independent duty corpsman. The corpsmen were always very well trained. His name was LaRiviere. He took most of the general medical problems. He would come to me when he needed some advice or after he had done the basics. The other thing that the medical officer did on the boats was to stand

diving officer watches. I was standing diving officer watches submerged and junior officer of the deck (JOD) watches on the surface.

INTERVIEWER: What were the tasks that you had during those watches?

CAPT. VOROSMARTI: Well, during the diving officer watches, you just sat behind the two crewmembers who were controlling the rudder and depth planes. You had control over the trim of the boat. You had to make sure the boat was trimmed so that it didn't try to broach or start sinking. If it was going to be a missile launch, you had to have perfect trim. Basically, you were the supervisor for the crew in the control room that was handling the ballasting, depth and course of the submarine.

INTERVIEWER: You said you had another watch when you were at surface.

CAPT. VOROSMARTI: Those were the JOD watches. You went up to the conning tower and stood watches up there.

INTERVIEWER: It was just you and one corpsman. That was your crew?

CAPT. VOROSMARTI: That was the whole medical department.

INTERVIEWER: How large was the crew on the *Adams*?

CAPT. VOROSMARTI: It was about 125 men.

INTERVIEWER: Are there any particular cruise that you specifically remember, in terms of unusual events?

CAPT. VOROSMARTI: Well, I only made one patrol on the *Adams*. We went through commissioning, the missile load out, a trip down Cape Canaveral, where we launched some practice missile shots. Then we went off somewhere up north for 65 days, I think, and then into Holyloch, Scotland. It was very calm and peaceful. I did have a person who I thought might have a case of appendicitis. I had the guy with the bleeding hemorrhoids.

There was another crewmember who had dropped one of the deck hatches on his arm. Of course, we had no x-rays, so I really couldn't tell whether it was broken. I had to cast him and wait until we got back to port to find out whether he actually broke his arm.

INTERVIEWER: How long was that interval?

CAPT. VOROSMARTI: I have no idea. It was maybe six weeks. It turned out that he hadn't fractured anything. You had to do the treatment you thought necessary, so he was in a cast.

INTERVIEWER: That must have been cause for some worry, though, not knowing whether he had a displaced fracture.

CAPT. VOROSMARTI: Well, it was the cause of a little worry. If you treated it as a fracture, there wasn't much more you could do even if you knew there was a fracture there.

INTERVIEWER: You mentioned that toward the end of your patrol on the *John Adams*, you pulled into Holyloch.

CAPT. VOROSMARTI: Yes.

INTERVIEWER: Because that facility has since been decommissioned, can you describe to us what it looked like, what went on there, roughly where it was and what the environment looked like?

CAPT. VOROSMARTI: It was on the west coast of Scotland off of the Clyde River near Dunoon. Holyloch was long, narrow loch that went north from the Clyde. It was basically a submarine tender, moored in the loch, and that was about it. It was the typical Scottish countryside, with lots of heather and trees.

INTERVIEWER: Did you get a chance to get off the boat and go into town?

CAPT. VOROSMARTI: Yes. In fact, I remember we pulled in on the third of January, I guess it was, sometime in the afternoon. Some of us were given liberty that night, and they had to run a launch into the Ardanadam, which was the local town. Yes. You had to climb this twenty-foot ladder that angled out and covered with ice to get to the local hotel at the end of the pier. It was probably more dangerous to climb that ladder than to be on the submarine for 65 days.

INTERVIEWER: You said that was really the only patrol you were on.

CAPT. VOROSMARTI: Yes. When we got back to Holyloch, we got all our mail. Then I had orders to Pearl Harbor, Hawaii, which agitated the other officers in the wardroom.

INTERVIEWER: You were going to be at the submarine escape training diving school there, weren't you?

CAPT. VOROSMARTI: Yes. I was sent there to go to the submarine-based dispensary, and the submarine escape training tower. They had a second class diving school. There was also an EOD unit in Westloch for which we provided medical cover.

INTERVIEWER: What was your title at that new assignment?

CAPT. VOROSMARTI: I was a senior medical officer of the dispensary, with an additional duty with the Naval Fleet Training and Education Command. The escape training tank was under a separate command, though.

INTERVIEWER: You had some duties at the tank, didn't you?

CAPT. VOROSMARTI: Oh, yes. We used to cover the escape training. We reviewed the x-rays for all the people coming through for training, and we were actually in the water during the training exercises because of the possibility of somebody having an air embolism. They needed to be treated immediately.

INTERVIEWER: If you ran into a situation like that, an embolism, what was the common treatment?

CAPT. VOROSMARTI: The treatment was immediate pressurization. If the casualty was signaled, the first thing the medical officer did was get out of the water and jump into the chamber, which was at the top of the tower. The patient came in on top of you, and they started pressurizing down to 165 feet. Your duties were to do an exam and follow the patient as he started the treatment. You were often locked out and another tender was locked in if the patient was doing well and didn't need any special treatment while in the chamber.

INTERVIEWER: Did you have any situations like that while you were there?

CAPT. VOROSMARTI: Oh, yes.

INTERVIEWER: Were they frequent?

CAPT. VOROSMARTI: They were not very frequent, but they came often enough to keep you on your toes. I don't remember how many we treated. The other thing we were responsible for was treating all the bends cases that came in there. There were a lot of civilian bends cases that were treated there because the local diving fishermen, black coral divers and people like them were crazy. They used to do all sorts of risky things, and we were responsible for treating them. Luckily, that was in 1966, which was after the Navy was experimenting with Tables V and VI, which were the oxygen treatment schedules instead of the long air treatment schedules that have been in use for years. We never had to spend 36 or 40 hours in the chamber with anybody. We were using the shorter oxygen treatment tables as part of the acceptance trials for the tables.

INTERVIEWER: You were really testing the tables.

CAPT. VOROSMARTI: We were really testing those treatment tables, yes.

INTERVIEWER: What other types of hyperbaric medicine were you practicing in those chambers, besides treating bends and the air embolisms?

CAPT. VOROSMARTI: There was nothing else. Back Then there was no real hyperbaric oxygen therapy for anything but decompression sickness, air embolisms and gas embolism. It had not been developed as a treatment for anything else. That was about the time it was starting though, in the early and mid 1960s. People had been thinking and theorizing about it. I think that in Holland you could put animals in the chamber that had no blood and keep them alive if you pressurized them with oxygen. Then there was a lot of research going on in treating radiation burns with hyperbaric oxygen, and there were all these grandiose plans to do hyperbaric cardiac surgery in huge walk-in operating room chambers and things like that. That never really panned out.

INTERVIEWER: It was all theoretical.

CAPT. VOROSMARTI: A lot of it was theoretical, yes.

INTERVIEWER: I know that at some of the other facilities in some of the other bases, the equipment itself, like the chambers, were fairly rudimentary and old. Some of those systems had been built in the 1930s. Were they modern or old units at Pearl Harbor?

CAPT. VOROSMARTI: They were still the old units. We had a big chamber at the bottom of the tank that we used for routine decompression sickness cases. That was probably about six feet in diameter and ten feet long and had an outer lock attached to it. The one up in the top of the chamber was smaller. That was probably four feet in diameter and a lot shorter.

INTERVIEWER: How high was that escape tank at Pearl Harbor?

CAPT. VOROSMARTI: I think the top was 120 feet. It was very impressive to look at.

INTERVIEWER: Did you also do that tank while you were there?

CAPT. VOROSMARTI: Yes.

INTERVIEWER: What do you remember about that experience?

CAPT. VOROSMARTI: Well, it was a lot of fun. You basically spent most of your mornings floating around in this nice, warm clear water in the tank, trying to see how deep you could go on a breath-hold dive.

INTERVIEWER: How deep did you go? What was your record?

CAPT. VOROSMARTI: Well, I never got past about eighty feet. My lung volume wasn't large enough in those days. You took a deep breath and pushed yourself down. After about ten feet down, most people are negatively buoyant. You just kind of sink down in the water slowly.

INTERVIEWER: That was just in a suit.

CAPT. VOROSMARTI: It was just in a bathing suit. I think officers wore red bathing suits. The master wore the yellow bathing suit, and I think all the instructors wore blue so you could tell each other apart in the water.

INTERVIEWER: You said that you treated a lot of civilians for the bends. Is there any particular case that stands out in your mind, as a particularly egregious case of bends?

CAPT. VOROSMARTI: Well, there was one. I don't remember his name, but he came in and had done some horrendous dives. I think most of the divers there in those days used to self-treat themselves with Primo beer and aspirins. They always came in a day or two late. This guy came in after doing that and wound up paralyzed from about the T-6 vertebral level down, just irreversible.

Another one I remember was that of a Marine Reconnaissance team member. They all had to learn how to do free escapes, not with a hood, but just by coming up and blowing out as they went to the surface. He had a severe embolism, but he survived. Well, the other medical officer and I thought that he was a little slow, mentally, after the treatment. We had a little six-bed ward at the dispensary in those days at which you got to keep people for up to 24 hours. We put him in there. He was a local kid. We called his mother, and she came in. We said, "He's fine, but we think there may be a change, mentally, because of the bubbles he had." She went and talked to him and came back out and said, "No. He was always that stupid."

INTERVIEWER: Were you beginning to develop some research interests at that point, things that you wanted to really investigate, as far as diving medicine was concerned?

CAPT. VOROSMARTI: Well, one of the things that Dr. Mark Bradley and I did out there was get interested in the use of oxygen and what it did to people. Everybody knew that you got oxygen poisoning or the type in the lungs from long exposure at one atmosphere or you could get the cerebral toxicity that occurs with pressure. We decided to look around to find out what else the oxygen might be doing, particularly if anything was happening during the treatment sessions. You had a patient who was on oxygen most of the time. You had a tender who was in the chamber with him and had to breathe oxygen for the latter part of the decompression so that he didn't get the bends. We had a little lab at the dispensary, and we looked at the effect of short-term shallow exposures on red blood cells, or low-pressure oxygen on red blood cells. That was the first research that we did.

INTERVIEWER: What did you find?

CAPT. VOROSMARTI: We found out that it increased the fragility of the red cells, but that was not a significant finding. It wasn't really clinically useful, but it was the first research.

INTERVIEWER: How long were you at Pearl Harbor before you had a new assignment?

CAPT. VOROSMARTI: I was there for about two years. I had a senior chief hospital corpsman there named Sanders Manning, who, shortly after I arrived, disappeared. He went on TAD somewhere. I don't know where he was. He came back months later. I didn't ask him where he had been because in those days, if you were in submarines or diving, you never knew who was going where for what reason. He came back and then disappeared again. He got orders from TAD again. I asked, "What are you doing? Can you tell me what you're doing?" Well, he was on SeaLab I and II. He was on his way off to SeaLab II. That sounded pretty interesting to me, so I volunteered for the program.

A few months later, the detailer from the Bureau stopped in and said, "We've got your order volunteering for the SeaLab program, but we've decided we're going to keep you here for another year." I said, "Well, okay. I'd rather go to SeaLab, but Hawaii's pretty nice." He left. I think that was in July or August. On the first or second of September I received orders to report to San Diego to the SeaLab program within twenty days. We packed everything up and I went off to San Diego to what was the Deep Submergence Systems Project's technical office. I arrived there, and there was a master diver and nothing else because part of the crew was still back on the east coast. They were making dives at the EDU. We didn't have any facilities, so we used the commodore's office while he was at sea so that we had a telephone. SeaLab II had ended. They were getting organized for SeaLab III. That was in late 1966.

INTERVIEWER: What did you know about SeaLab at that point? You talked to Manning, obviously. He told you what it was all about. That piqued your interest.

CAPT. VOROSMARTI: Yes.

INTERVIEWER: Had you heard the name 'George Bond' at that point? Had you heard anything?

CAPT. VOROSMARTI: Well, I knew who George Bond was. I knew who he was, who Workman was and I knew who Mazzone was. I knew him because he had taught us at sub school. I knew who all those people were. It was amazing, though, thinking back on it, that we didn't know anything about the SeaLab I. It was not publicized at all. Even the people in the diving Navy didn't know what it was all about. SeaLab II had not gotten much more publicity. We had no idea what was actually going on, except for what Manning told me about living in this habitat under the ocean.

INTERVIEWER: How did you learn about it? There you are in San Diego, isolated. You didn't know what was going on.

CAPT. VOROSMARTI: Well, I got orders to it. It was called the 'Deep Submergence System Project Technical Office.' Shortly after I arrived, within a few days I guess, Mazonne arrived and so did a couple more administrative officers. A couple of more people dribbled in and we ended up taking over a huge old building above the submarine base on Point Loma, which had no facilities in it. We started planning for SeaLab III, ordering lab gear and designing laboratories and the spaces. Basically, we were trying to renovate the building and as get ready for Sea Lab III. Loads of equipment that had been used on SeaLabs I and II arrived from the sub base in New London. We just started setting up the medical department and design the medical research program for SeaLab

III.

INTERVIEWER: At that point, how much did you know about what SeaLab II was all about?

CAPT. VOROSMARTI: Well, by that time, we knew. We had a good idea of what it was about. They had come out with a big, thick report on it. A lot of people who came to San Diego came there from SeaLab II. There was plenty of information from those people.

INTERVIEWER: How was SeaLab III going to pick up where SeaLab II left off? What was the program?

CAPT. VOROSMARTI: SeaLab III was going to be a lot deeper, basically. SeaLab II was at 205 feet down or somewhere in that range. SeaLab III was supposed to be on the bottom, at 600 feet.

INTERVIEWER: That was going to be on the west coast.

CAPT. VOROSMARTI: It was going to be off of San Clemente Island, one of the Channel Islands, which was a Navy-owned island off of Long Beach.

INTERVIEWER: You said that you were setting up the medical department. What did that entail?

CAPT. VOROSMARTI: Well, you'd start all over again, writing the instructions for the medical department and setting up procedures. We had to design our own spaces. We wanted to put in a research lab to do the research, so we had to design that. We had to order all the gear for that.

INTERVIEWER: That was to go into habitat.

CAPT. VOROSMARTI: No. That was going to be in San Diego. The support for the habitat was separate. Northrop Nortronics had gotten a contract to build the medical van

and communications van, which went on the deck of the support ship, the USS *Elk River*.

I was a contract monitor for that, so I used to go back and forth to Anaheim to talk to the engineers there who were designing the lab and buying all the gear for it.

INTERVIEWER: At that point, you hadn't become an aquanaut yet.

CAPT. VOROSMARTI: No.

INTERVIEWER: You were in the support capacity.

CAPT. VOROSMARTI: So far, that was what I was doing. There was a big argument that went on at higher levels about who was going to run the research program, whether it was going to be the medical department in San Diego or the people back at the DSSP office in D.C.

The medical department that was out there said, "We've done research. We know about these things. Why can't we do research? Why does it have to be done out of the office in D.C.?" Basically, they were going to contract it out to somebody, I guess. There was a big argument that went back and forth for months before they finally decided we would run the research program from San Diego.

INTERVIEWER: Was Jack Tomsy involved at that point?

CAPT. VOROSMARTI: I think he was already involved. I don't know whether he was involved in that business or not. That meant we had to design the research programs and start setting up all the gear, calibrating everything, starting all the pre-dive, do all the baseline studies and everything else.

INTERVIEWER: Were you picking up where SeaLab II left off, then? You were using that as your basis?

CAPT. VOROSMARTI: Yes. There had been a little research on SeaLab I, a little more

on II, but nothing really exciting had been done. It had been of one of those piggyback deals with people thinking, “Well, we're going to have them down there, so let's draw lots of blood,” and all that business.

INTERVIEWER: It was an open-ended thing. SeaLab III was really open-ended, as far as the types of research you were going to do. There wasn't a preconceived program as to what would be accomplished.

CAPT. VOROSMARTI: No. It was open-ended.

INTERVIEWER: You were going to be in a habitat at 600 feet. What could you accomplish at 600 feet, medically?

CAPT. VOROSMARTI: The other thing that we were covering was a whole series of work-up saturation dives at the EDU. At any one given time, about half the crew was back in Washington covering those dives or being subjects on the dives. We had started doing research during those dives, too. I think we did quite a bit of research during dives. We had all these different things constantly going on two different coasts. Shortly after I got to San Diego, I was sent off to the underwater swim school in Key West for a month to learn how to use the mixed-gas SCUBA Mark VI, which we all had to learn to use.

INTERVIEWER: How did that differ from what you had already learned?

CAPT. VOROSMARTI: Well, it was the equipment that the EOD people used. It was semi-closed, so it didn't give off a lot of excess bubbles.

INTERVIEWER: It was the re-circulating system?

CAPT. VOROSMARTI: It was the semi-recirculating system. It was small. It was not much bigger than a regular SCUBA set and was non-magnetic because they had to get close to mines and other ordnance. I remember that school very well because I was not in

very good physical shape, as you can imagine one to be, after a couple of years on submarines and shipyards. The EOD class was composed of all these 18 to 21-year-old football players who wanted to be EOD people. We had to get out and do calisthenics every morning at six or six-thirty. It was too hot during the rest of the day to do it. The PT instructor was this 6'2", 240-pound American-Indian masochist who used to run his German shepherd into the ground before we showed up, and then he'd start working on us.

The other problem was that we didn't have a car. There was another medical officer and I there. We had to live in the BOQ, which was somewhere else. I can't remember where, exactly. We rented bikes and had to bike back and forth to the base every morning.

INTERVIEWER: That was probably helpful, as far as getting you back in shape.

CAPT. VOROSMARTI: Well, it got us in shape in a hurry, I'll tell you that.

INTERVIEWER: How long was that course?

CAPT. VOROSMARTI: It was a month.

INTERVIEWER: You were obviously taking the course because the aquanaut thing was coming up.

CAPT. VOROSMARTI: That's right, it was because the school used the same type of gear SeaLab was going to use.

INTERVIEWER: At that point, you knew that you were going to be actively diving in the habitat.

CAPT. VOROSMARTI: Yes.

INTERVIEWER: You must have felt pretty good about that knowing that.

CAPT. VOROSMARTI: Yes. That was exciting stuff.

INTERVIEWER: Were there other aquanauts training with you?

CAPT. VOROSMARTI: Oh, yes. I would have to figure it out, but there must have been 35 people who were actually going to be doing things on the bottom and living in the habitat.

INTERVIEWER: What were the criteria for selection of aquanauts?

CAPT. VOROSMARTI: I have absolutely no clue.

INTERVIEWER: Did you volunteer or did they come to you?

CAPT. VOROSMARTI: I volunteered after I met Manning in Pearl Harbor.

INTERVIEWER: You had gotten into the program at that point. You were going to be in Sea Lab III, but they picked you to be an aquanaut.

CAPT. VOROSMARTI: Well, almost everybody who was in the program was basically going to be an aquanaut.

INTERVIEWER: Okay. You knew that right from the start.

CAPT. VOROSMARTI: Yes. There weren't a lot of people standing around in the wings, hoping to get chosen. There weren't a lot of support people either. It was basically just the divers who were going to be aquanauts or those who had been on SeaLabs I or II.

INTERVIEWER: You got back to San Diego and passed your test, whatever it was to be able to use the closed system, the modified SCUBA system. In terms of your progress, where was the program at this point?

CAPT. VOROSMARTI: Well, it was kind of stumbling along. There had been some delays with some gear. There had been delays with getting the habitat ready. I think it was originally scheduled to take place late in 1967, but it kept getting delayed and

delayed for various reasons, most of which were engineering problems. Actually, they didn't start sinking the habitat until early February of 1969.

INTERVIEWER: What was the SeaLab III habitat like? What did it look like? How did it appear inside?

CAPT. VOROSMARTI: I don't know whether you've ever seen a picture of the Sea Lab II habitat. They had the Sea Lab II habitat refurbished and added a few odds and ends to it. It was a long cylinder. It looked like an oil tanker, a railroad oil tanker. It had a little tower on the top that was used for controlling the flooding and the blowing of the habitat itself. It had two big items that looked like cages underneath it at either end. At one end, divers exited the diving station, and the other end was where they had an observation cage of sorts. In the middle was a huge anchor clump attached to the bottom of the cylinder to hold it down on the bottom. Also, it had some hydraulic systems so that you could level the habitat no matter what the angle of the clump was. You could make the habitat itself level on the bottom. They painted it bright orange.

INTERVIEWER: In terms of facilities inside and the actual area you lived in, describe what it was like to have the habitat at its required depth of 600 feet. You dove to the unit to get down there. How did you enter?

CAPT. VOROSMARTI: Well, you arrived at the depths through what's called a PTC. It was a personal transfer capsule, which was basically a big ball that was pressurized according to the depth you were going. The whole scheme was to pressurize people in the chambers on the support ship to the depth that they needed to go. The reason for that was that the pressurization had to be done very slowly because of problems you ran into while getting to that deep depth. You could have all kinds of aches and pains, joint cracking, or

what is now known as high pressure nervous syndrome. The way to get around that was a slow compression. We were also planning to do some studies in the chamber at depth in the chamber on the ship. At the top of those chambers you could mate the PTCs by a mating system that enabled you to go from the chambers to the PTC at the same pressure. Then that was lowered over the side with a huge crane down to the depth you wanted to go. Basically, you just took a breath, held it and swam into the habitat. To open the habitat you needed to have diving gear in there, in the PTC, because you had to do a lot of work outside before you could actually get into the habitat. But once it was set up, you could just do a breath hold dive from the PTC to the habitat.

INTERVIEWER: Once you got in, you would go up a step or something, and then you were in the atmosphere.

CAPT. VOROSMARTI: Well, you went in this cage and popped your head up into the diving station at the bottom of the cylinder. You were in whatever atmosphere was in the habitat.

INTERVIEWER: What facilities did you have there? You had living accommodations. It looked like a house or something.

CAPT. VOROSMARTI: Yes. I think there were eight bunks at one end. That was the living space. There were two bunks up, two bunks down. There were only eight total bunks. The center section was the galley, the lab and the atmosphere control equipment and all of that business. One end was where all the diving equipment was kept and where all the gas controls for the divers were located.

INTERVIEWER: There were problems you mentioned earlier, like leaks. There were problems with a contractor or whatever.

CAPT. VOROSMARTI: Well, there were some engineering problems in design of the equipment. We were using a lot of stuff that had never really been used before. The diving equipment was new. We were using the Mark VIII and Mark IX semi-closed rigs, which were in the process of being built. They were basically prototypes. I can't remember specific engineering problems, but I know a lot of stuff was getting delayed along the line. We didn't get much involved in that side of it because a lot of that was being down through the office in D.C.

INTERVIEWER: Saturation diving was a practiced thing already. You were still pioneers in saturation diving at that point, but it had gotten past that initial stage.

CAPT. VOROSMARTI: Yes. The first saturation dives were made in the early 1960s. Workman, Bond and Mazzone had started doing the animal work in the late 1950s. They found out that animals could live in a helium oxygen atmosphere with no problems. They did some short manned runs. I think one was done at the Naval Medical Research Institute and one at the Submarine Medical Research Lab, and maybe one was done at EDU. I can't remember. Then they had SeaLab I. Well, Sea Lab I was not the first in-water experiment because Jacques Cousteau had stolen a lot of information and came up with his habitat program. Ed Link had done at least one saturation dive before SeaLab I. He also used information provided by the Navy. In 1966, the commercial diving company made the first commercial saturation dive at Smith Mountain Dam in Virginia. It wasn't new, but there was not a heck of a lot of it going on anywhere.

INTERVIEWER: It was less than ten years old.

CAPT. VOROSMARTI: Yes. The Navy was the only outfit that had that kind of program in it.

INTERVIEWER: What do you remember about George Bond?

CAPT. VOROSMARTI: He was a nice, old guy. He was the hero of everybody in the SeaLab program because he was one of the guys who came up with the thing. I think he liked to envision himself as a poor, humble, country doctor GP, which he had been at one time. We didn't see all that much of him because he was in D.C. But he certainly drank a lot. I remember that. That could sometimes be a problem.

INTERVIEWER: Walt Mazzone has some stories about that.

CAPT. VOROSMARTI: Yes, I'm sure he does.

INTERVIEWER: Sea Lab III did not have a very happy ending.

CAPT. VOROSMARTI: It had a very sad ending.

INTERVIEWER: You never even got to go aboard when it was at the 600-foot level.

CAPT. VOROSMARTI: No. Berry Cannon, Bob Barth, Blackburn and somebody else, but I can't remember who, were in one of the chambers on the IX-501. They started pressurizing to depth about two hours before the rest in Team I was to pressurize in the other chamber. Well, when we reached the bottom, those of us in my chamber were supposed to do an exercise study. I think we got down there late at night and were told not to set up the apparatus. We weren't going to do the experiment. We asked, "Why not?" Well, they wouldn't tell us. We found out later that a leak had somehow developed in the PTC mating system in our chamber, so we had to put a strong-back on the hatch inside the chamber.

In the meantime, Barth and Cannon had gone down in the PTC from the other chamber to try to open up the hatch to get into the habitat. Those of us in my chamber didn't know what was going on, but the habitat had started leaking. They couldn't get into

the chamber on the first try because they were trying to keep the habitat pressurized so that the habitat wouldn't flood. But if you try to push up a hatch that's four feet square against even a half an inch of pressure differential, you can't do it. He and Cannon made one dive and came back to the chambers on board the ship and then tried again a few hours later, and that was when Cannon died.

INTERVIEWER: The story was that his death was caused by a defective breathing unit or something.

CAPT. VOROSMARTI: Well, they found out afterwards that there was no carbon dioxide absorbent in his breathing rig, so he died of carbon dioxide poisoning.

INTERVIEWER: That accident effectively put an end to SeaLab III.

CAPT. VOROSMARTI: Yes. That's right. They raised the habitat. They brought out a submarine or two from San Diego and used the submarines' high-pressure air flasks to keep it from flooding as they raised it. It was taken off to Hunter's Point shipyard, I think.

INTERVIEWER: That was where it sat.

CAPT. VOROSMARTI: That was where it sat. The investigation was finished. The SeaLab habitat was cut apart.

INTERVIEWER: I've asked Walt Mazzone and Jack Tomsky about their recollections, and obviously, it's a very sensitive subject to them. Still, even after all these years, there's a lot of pain from what happened. Do you think it was the accident that caused the end of SeaLab or was that an excuse that the Navy used to put an end to a project they really didn't want to carry any further?

CAPT. VOROSMARTI: I don't think the Navy used that as an excuse. From my point of view, I think the Navy had learned that by that time what they wanted to know about

deep saturation diving, at least to that depth. The program was very expensive for the Navy, even though if you compare to what the National Aeronautics and Space Administration was doing, we could have kept the program going for twenty years on one lousy moon shot budget. I think the Navy decided that since they knew what they wanted to do, there was no sense in refurbishing the habitat and continuing the program. I don't think the death was an excuse.

INTERVIEWER: But it made a good cover for the press, had they wanted the Soviet Union, to be knocked off the trail with a red herring. That was a reason. It was unsafe, they could have said. Until we figure out what happened, we're not going to continue with SeaLab, and it just never went any further.

CAPT. VOROSMARTI: It never went any further. It was very expensive, and part of the funding came from a lot of other agencies that were doing research, like the Bureau of Fisheries and ONR. There were all kinds of research programs for the bottom time other than the medical research, and some of that funding was helping to keep the program doing.

INTERVIEWER: When the SeaLab budget was first created in the early 1960s, what extent do you think it benefited from the deep submersible Trieste, that made the deepest dive in January of 1960? Was there any link there, in terms of the Navy's willingness to commit?

CAPT. VOROSMARTI: I don't think so. I think what happened was that the diving research side was given a great kick in the butt when the USS *Thresher* went down. The Navy realized that it didn't have any really good systems for deep-sea search, rescue or salvage. That was part of that whole deep submergence program, which included a lot of

other things besides Sea Lab III.

INTERVIEWER: You see your experience in this regard as part of, say, Sub-Safe?

CAPT. VOROSMARTI: Yes.

INTERVIEWER: Do you have any lingering thoughts about your SeaLab III experience?

CAPT. VOROSMARTI: Well, there are a couple of things, I think. One, it was a heck of a lot of fun. Two, even though we didn't get into the habitat and didn't do any work on the bottom, we did a huge amount of medical research, which was very germane to deep diving. We were very happy about that because it turned out to be a good research program and we got a lot accomplished.

On the other side, it was very frustrating because there were some other problems. Personally, as I look back on it, I think there was a lot of PR push. Some of the engineering wasn't very good. A lot of the time the people who were designing all of the stuff didn't talk to the operators and get input from the people who were actually going to use it. We were just kind of ignored on that score.

One of the reasons I mention the PR push and the rush is because when we were in San Francisco with the habitat, we were told that they were going to take the habitat out to San Clemente Island without ever floating it in a dry dock and testing it. Well, by that time, most of us had enough frustration over what was going on and some of the problems that we said, "We are not going to do that. We are not going to go out to San Clemente with the habitat. Let's put it down on the dry dock and get it down to at least forty to fifty feet. Let's actually get in it, try things out and see what works." It wasn't a mutiny, but it was getting close to it. I think there would have been a lot of 'de-volunteering' otherwise.

INTERVIEWER: You actually made that step, then. They did put it in a dry dock.

CAPT. VOROSMARTI: They did put it in a dry dock, and they had some problems with it, which got fixed. There were a lot of other problems. We almost lost a couple of divers one day out in San Clemente because the cable for one of the PTCs that was being used to make a dive started coming apart while the PTC was near the surface.

There were just a lot of engineering problems. They say, "Well, we didn't know what we were doing." Well, that's only a partial excuse. A lot of this stuff was way over-engineered, I think, but didn't need to be, and other stuff that needed to be looked at wasn't really looked at closely enough. That was one of the big disappointments, I think, the engineering problems and the lack of somebody really taking charge of it.

INTERVIEWER: After SeaLab III was over, you were selected to be an exchange diving officer. There was something in between those.

CAPT. VOROSMARTI: There was something in between. I got sent off to the University of Buffalo for two years of post-doctoral training in environmental diving research. From there, I was told I was going to go to England to do an exchange with the Royal Navy for three years.

INTERVIEWER: What did they tell you the program was all about?

CAPT. VOROSMARTI: It was diving research. I didn't really know exactly in what I would be involved. But it was diving research. I arrived. Bob Bornmann was the person I was relieving, and he took me around and introduced me to all kinds of people. I met with the supervisor or superintendent of diving, who told me that he wanted me to work on saturation diving, and he wanted decompression tables from 250 meters to the surface. He told me that I had three years to do it and not to call him.

INTERVIEWER: When you achieved that goal, you could come home.

CAPT. VOROSMARTI: That's right. When I achieved that goal, I could call him. Peter Barnard had been doing a lot of the basic stuff in that program.

INTERVIEWER: He was doing that in England.

CAPT. VOROSMARTI: He was doing that in England before I got there. I kind of took over from him. He got transferred. We spent three years doing decompression trials for 250-meter dives and doing a lot of research on the side too, medical research.

INTERVIEWER: That was at Alverstoke?

CAPT. VOROSMARTI: That was at Alverstoke. The lab was the Royal Naval Physiological Laboratory (RNPL), and the Deep Trials Unit, where the chambers were, was actually on the same grounds. I had an office at the RNPL.

INTERVIEWER: How did you find the level of their technology compared to what you were used to in the U.S. Navy?

CAPT. VOROSMARTI: It was just as good as ours was, as far as I could tell.

INTERVIEWER: They were at the same level?

CAPT. VOROSMARTI: They were at basically the same level we were. They certainly did a lot of the basic research in diving over the years and knew what was going on.

INTERVIEWER: There was really a lot of cooperation between the U.S. Navy and the Royal Navy in all of the diving research.

CAPT. VOROSMARTI: Oh, yes. They had been very close for years, ever since the Second World War. After the World War II, there was a lot of close collaboration. I think that the first exchange officer went over sometime in the 1960s. For the medical officer, it was in aviation.

INTERVIEWER: What did their facility look like in Alverstoke? What do you remember about that?

CAPT. VOROSMARTI: The Deep Trials Unit was very much like the set up that the EDU had. It had the large chamber on one deck. A large center section was the living compartment. There was another lock at one end that could be used for locking things in and out. At the other end was a large dome that was over a wet pot, which was the floor below, filled with water so that you could actually do in-water diving at depth. It was designed in basically the same way as the ones at the EDU.

INTERVIEWER: When you went about the task of working out the tables, how did you do that? What was the procedure?

CAPT. VOROSMARTI: Well, Peter Barnard had started by looking at how far you could decompress somebody without giving them decompression sickness with the depth differential. He started at the surface and went down different depths and found out how deep you could be saturated and still come to the surface without causing decompression sickness. Then he began at a selected deeper depth and determined if you could come to the previously determined depth without bends. The only problem was that as you got deeper, you had to slow the whole compression, or as you got shallower, you had to slow the decompression procedure. Using the Royal Navy's tables, if you started from 250 meters, you could drop five meters immediately. Before you got to 240 meters, you had to stay at 245 meters for a certain period of time. Well, as you got close to the surface, that time period had to be expanded before you could go to the next shallower depth. Nobody really knows why.

The other thing we found out during those dives was that if you used a normal

oxygen tension, .21 bars of oxygen, in the breathing mix, you couldn't get the divers out without giving them decompression sickness. Now, saturation diving uses .35 to .4 bars of oxygen because it's very difficult to get anybody out without decompressing them. Nobody knows why that happens, either. The other problem was that when you're at in deep depths, people don't seem to be as efficient as they are at the surface unless you raise the O2 pressure. I've been convinced for years that there is probably something happening at the cellular level with the oxygen exchange, but we've never had the chance to really investigate it.

The other thing that we ran across because we were going that deep was that we started seeing a lot of high pressure nervous syndrome. That is what we think is a purely pressure-related event. It has nothing to do with inert gas narcosis or anything. People get very sleepy. They fall asleep very easily unless they're stimulated all the time. Their EEG changes. Mentally, they're not as sharp as they should be. It's thought that is due to the high pressure itself, that it causes changes in the cell membranes in the central nervous system.

INTERVIEWER: How about joint pain?

CAPT. VOROSMARTI: Well, if you go slowly enough, that really doesn't bother you much. Most people don't get joint pain at all if they are going slowly enough. It only happens on the really rapid compressions. Those two things can pose real problems if the Navy has an operation and they have to get somebody to 800 or 1,000 feet in a hurry. They can get them there, but they may not be worth much for a while afterward. They may not be able to do very much.

INTERVIEWER: Walt Mazzone used the term 'no joint juice.'

CAPT. VOROSMARTI: Yes. That's what it feels like.

INTERVIEWER: What was that? That's the nervous syndrome you're talking about?

CAPT. VOROSMARTI: No. It's the joint syndrome. It feels as though your joints aren't lubricated. They kind of creak and crack. You feel very strange.

INTERVIEWER: You did some research on the joint popping, didn't you?

CAPT. VOROSMARTI: Yes. We did a survey of divers once. Then we did some theorizing about what causes it. As far as I know, it's never been followed up.

INTERVIEWER: You were over with the Royal Naval for three years?

CAPT. VOROSMARTI: I was there for three years.

INTERVIEWER: You got your tables. You made your phone call.

CAPT. VOROSMARTI: Yes. That was a great tour because of the system they used there. I mean, I didn't have to turn in budgets every year. I didn't have to write reports every six months to somebody. I didn't have to worry about hiring and firing people. It was all there. The researchers basically did research. Somebody else worried about all the other stuff.

I also had additional duty with ONR London, and that duty entailed traveling to other labs in Europe to meet people, see what was going on and then report back to O&R. I got a lot of traveling in and visited lots of labs while I was there.

INTERVIEWER: That was a very good assignment.

CAPT. VOROSMARTI: It was a great assignment. We got double holidays. If the Royal Navy had a holiday on a day the U.S. Navy didn't, we took the day off. Well, if you were with the Royal Navy and it was a U.S. holiday, you also took the day off. It was a lot of fun and a nice place to live.

INTERVIEWER: Who was your contact, or the people with whom you worked at ONR London? Do you recall?

CAPT. VOROSMARTI: There were two commanding officers (CO) there while I was there, and I can't recall who they were. I hardly ever met the CO because I used to just go there once a month. I had a little cubby hole and did my thing, so I didn't spend a lot of time there, maybe only three or four hours a month. To go on travel, I never went up there. They would send me the orders, and I would just leave.

INTERVIEWER: You finished that assignment. What year was that?

CAPT. VOROSMARTI: That was in August of 1975.

INTERVIEWER: You got back and I think you then went to Naval Medical Research Development Command, didn't you?

CAPT. VOROSMARTI: No. I was the executive officer (XO) at the Naval Medical Research Institute for a couple of years.

INTERVIEWER: You were there when the new diving facility was being built.

CAPT. VOROSMARTI: Yes. I arrived just as the building was being constructed.

INTERVIEWER: What do you remember about that whole episode that you can talk about?

CAPT. VOROSMARTI: It was way over-designed and overly expensive. The main chambers themselves were very nice. They were pretty well designed. The problem was that the Navy, with its certification program, always designed things for systems that were going to go to sea and get shot out at and things like that. Basically, the engineering was a lot more than it actually needed to be for a research facility, so it cost a lot more. But it was a very good system. There were some problems with the human factors, but

we basically took care of those ourselves.

Someone had come up with a great scheme for doing animal toxicology research of pressure, and we had I don't know how many small animal chambers. They were all lined up in a big room in two rows. There was supposed to be a track down the center of the room with sidings at each one of the chambers with a traveling chamber so that you could keep animals at depths for a long time. Well, you had to feed them and clean out their messes, give them water and all that from time to time. Well, the chamber was designed to mate to the animal chambers, take the animals out, and then you cleaned out the chamber. We had some fun with the engineers on that one because we said, "How are you going to make the animals go from the chamber they're in to this other chamber?" They said, "Well, we have fresh food and water in the other chamber. We'll just turn out the lights in this first chamber and naturally, they'll go to the other chamber." I said, "Yeah, right."

Then they came up with a scheme for a lever through a pressure proof fitting so that you could push them out of the chamber. Then they came up with another system that was a tube that could be mated to a diving chamber. One day, we told the engineer, "The next time you come out here to discuss this, bring an eight-inch diameter piece of hot air piping with you, and we'll give you a beagle. We want to see you push that beagle through that tube. If that works, we'll go with your design." It got so expensive that we finally abandoned it. We never did build the final system. We gave all the animal chambers to the Air Force.

INTERVIEWER: You just gave up on it completely.

CAPT. VOROSMARTI: Yes. The whole thing was ludicrous to start with. The Air Force

got a lot of animal chambers that they were happy to get, and we got a lot more room in which to put some other chambers, a thermal stress unit, and things like that.

INTERVIEWER: What types of programs were going on once you got the system up and running and was the XO there?

CAPT. VOROSMARTI: Well, we didn't get it up and running while I was the XO because it just took years to get the thing finished. The building wasn't commissioned until 1981 or 1982, if I remember correctly. We eventually got it up and running.

INTERVIEWER: You got it up and running and then became the CO there.

CAPT. VOROSMARTI: Yes. In about two years, I went from being the XO to being the program manager at the Medical Research and Development Command for diving and submarines, and I then went back as a CO. I think that was in late 1981.

INTERVIEWER: What kind of support did you have for the work that was being done? Was the Navy supporting the program the way you thought it should have?

CAPT. VOROSMARTI: We had a lot of support. In the 1970s and 1980s, there was a lot of money for diving medical research. Most of it came through NAVSEA to BUMED. As I remember, we rarely got any significant funding from ONR. It was basically all from NAVSEA or the other, OP-22 or whatever. There was a lot of good support. There was a fairly well protected program at the higher levels. In fact, I remember Joe Bloom trying to steal money out of my program a couple of times. All I really had to do was pick up the telephone and call a staff member downtown.

INTERVIEWER: At BUMED?

CAPT. VOROSMARTI: No, OPNAV. That problem was solved. Joe used to get so ticked off at me. He could spit fire, I think.

INTERVIEWER: When did you retire, 1986, 1987?

CAPT. VOROSMARTI: 1986.

INTERVIEWER: Things were on a pretty high level at that point, as far as the diving research was concerned.

CAPT. VOROSMARTI: Things, as far as the diving was concerned, were going pretty well.

INTERVIEWER: You were still working on major projects, like diving table updates.

CAPT. VOROSMARTI: Weathersby did come up with his stochastic model for producing new tables. He came up with a risk assessment program for tables. They were working with oxygen toxicity, doing a lot of respiratory studies that were the basis for engineering specifications for diving gear. They were doing a lot of thermal balance work because divers needed to be protected from cold water for long duration missions. It was a good program.

INTERVIEWER: Just before you did your tour as a CO, you mentioned you spent some time with the submarine community between the XO and the CO tour.

CAPT. VOROSMARTI: That was the Medical Research and Development Command.

INTERVIEWER: Can you talk about that?

CAPT. VOROSMARTI: Yes. Originally, all the research had been run out of one of the codes in BUMED. Admiral Faucett used to be the head of the research. They started getting a lot of money into the research and development system for various reasons. The Combat Casualty Care Program really grew. Submarine and diving research really grew.

INTERVIEWER: That was in the late 1970s.

CAPT. VOROSMARTI: That was in the early to mid 1970s. They set up the Naval

Medical Research and Development Command as the body that oversaw the research.

There was a program director for each of the different areas who basically decided what kind of research needed to be done, reviewed all the proposals that came in from all over, decided which one of those was funded and what the levels were, and helped to prepare budget requests. The program directors also consulted and worked with ONR.

INTERVIEWER: It sounds like an ONR program, the way it was organized.

CAPT. VOROSMARTI: Yes, but there was very little 6.1 money because ONR was running its own program. On the diving side at least, if we had some spare bucks here and there, we tried to help each other out.

INTERVIEWER: You were operating on the 6.2-6.3 level?

CAPT. VOROSMARTI: We were operating on the 6.2-6.3 and 6.4 level sometimes.

INTERVIEWER: Hyperbaric medicine had finally reached a level at which high pressure therapy could be used for gangrene and a few other things. Were you seeing any of that? Were you working with any of that?

CAPT. VOROSMARTI: No. The Navy was not interested in hyperbaric oxygen therapy research. In fact, I don't think they've ever put a chamber in any other hospital. I recently heard that they're planning to install one in Portsmouth, Virginia, but I'm not sure about that. They had planned to put one in the new hospital in Bethesda, but for some reason gave up on that. Then in the late 1970s or early 1980s, the Air Force kind of took over as the de facto lead agency for hyperbaric oxygen therapy because for some reason, the Navy didn't want to know anything about it. I never did figure that out.

INTERVIEWER: They're playing around with it now out at Bremerton. They're doing some of it. You retired when Navy diving research was really at its zenith.

CAPT. VOROSMARTI: Yes. It was starting to lose funding about the time I went down to the Pentagon and retired. I really don't know why. One of the reasons is that the Navy has no saturation diving systems now, so as far as I know, they're not interested in going any deeper right now. There is talk about setting up a system that will go to 1,500 feet, but who knows how long that's going to take. The whole Navy operational system kind of switched to shallow water, littoral operations, which swung the emphasis from deep diving and salvage to Seal Team, EOD and those types of Special Forces operations. They're still doing research in those areas, and that research is being funded reasonably well, as far as I can tell.

INTERVIEWER: The deep-sea stuff is essentially gone.

CAPT. VOROSMARTI: The deep-sea stuff is essentially gone unless they decide to do this 1,500-foot system and need to do some more work.

INTERVIEWER: I had a chat within the last few months with Don Chandler, who had gone to a conference out in Tokyo. He said the thing that really upset him most, having been in the diving community as long as he had, of course, was that the Japanese would ask him, "What are you folks doing? What's the U.S. Navy doing? We depended on you. In previous years, we depended on the research, and diving tables, and everything else. Now, you've left us in the lurch. You're out of the business." Don was very upset about it.

CAPT. VOROSMARTI: Well, it's not just the U.S. Navy. I mean, Japan isn't funding any research. There was a whole list of places around the world that were doing a lot of research. There was RNPL. There was NUTEC in Bergen, Norway. There was Comex in Marseilles which was a private diving company. There was also JAMSTEC in Japan. A few diving companies did their own research on and off or did Navy-funded research.

The problem is that oil industry exploration disappeared in the last twenty years. The diving companies don't have that much saturation diving work anymore. The money for research around the world has dried up. I think NUTEC and COMEX are the only two outfits, besides the U.S. Navy, doing any active diving research. RNPL's efforts are basically devoted to submarine escape and rescue these days, as far as I know. The rest of those places are gone or not working.

INTERVIEWER: The demand is down.

CAPT. VOROSMARTI: The demand is down, funding is down and research is down.

INTERVIEWER: The Cold War is over, and so the dual with the Soviet Union over submarines. All that, I guess, is pretty well quiescent at the moment, and so there's no real need. The feeling is that the need isn't there. Well, in retirement, you became active in the Undersea and Hyperbaric Medical Society.

CAPT. VOROSMARTI: Yes. I've been active with them since the 1970s. In fact, I was a charter member back in the 1970s because it started when I was in the SeaLab program. Mazzone was the first secretary-treasurer.

INTERVIEWER: Those folks are kind of keeping the dream alive, so to speak.

CAPT. VOROSMARTI: Oh, yes. They keep trying. They're now working on a report for ONR to convince it they need a national naval undersea biomedical research program, which also includes submarine medicine so that there's a reasonable amount of funding to get stuff done.

If you look back through all the diving research literature, you can easily tell by the numbers of published papers when the funding was great. You can also tell what topics were of interest to a funding agency or particular researcher somewhere. People

say, “Well, why do you need to keep doing all this research? You've been doing this decompression research and O2 research and stuff since 1916, for God's sake.” Well, the problem is that there has never been a focused, coordinated, funded program long enough to come up with any of the basic answers.

We still don't know how bubbles form in tissue or in the blood. We know bubbles cause decompression sickness. We don't know how they form. We have no good clues as to how inert gas uptake and elimination work in various parts of the body or how they relate to circulation in different tissues. Unless you get some basic research that is aimed at trying to solve the basic problem, all you do is postpone things. There are operational fixes. Oxygen toxicity is a big problem. We're limited to so many minutes at forty feet. It's a nice operational fix. It doesn't take a heck of a lot of research. We still don't know what the basic mechanism of oxygen toxicity is. If you could figure that out, you could devise a method to get around that. You could maybe even get rid of decompression altogether. I don't think it is physically or metabolically possible, but nobody has ever looked at any one of these topics for long enough or funded it well enough to really do the basic stuff that is required.

INTERVIEWER: These are high budget items, to answer some of these questions.

CAPT. VOROSMARTI: That's absolutely true. It would take a lot of money and a lot of time. That's one of the other problems. It would take a lot of time.

INTERVIEWER: You wouldn't expect it to be something the private industry would get involved with unless there was a payoff.

CAPT. VOROSMARTI: That's right. Private industry is definitely not interested, and never did spend a lot of money on it. Their research money was spent on equipment and

techniques, not on the medical research side.

INTERVIEWER: How many years were you in altogether, in the Navy? Wasn't it 26 years or something like that?

CAPT. VOROSMARTI: Yes, it was 26 years. I had 26 years active duty, some of which was from previous reserve time. I don't know to what it all adds up.

INTERVIEWER: Do you have any last thoughts on your long, distinguished career, as far as diving is concerned?

CAPT. VOROSMARTI: No. It's been a lot of fun. I wouldn't have stayed around for so long if it hadn't been. The only job I didn't want and didn't like was the job in the Pentagon, and I got suckered into that. I think the biggest problem I have seen is that the administration of the Navy Medical Department has changed considerably over the years. To me, they seem to have gotten a lot more stupid. I don't know whether it's because I've gotten older and don't have as much patience anymore or that I advanced in rank. Maybe I got higher and higher and saw what was going on. Maybe I was previously totally ignorant of it. But they don't seem to want anybody to grow up and do anything on their own or show any initiative. Everything's got to be done by the book. You've got to answer all kinds of stupid questions all the time.

INTERVIEWER: George Bond would not thrive in this atmosphere.

CAPT. VOROSMARTI: No, no, no. That's also one of the nice things about having been in diving and submarines for so many years. I didn't have to put up with a lot of this administrative stuff. You were part of the crew and you were doing your job. You weren't bombarded all the time, on the line side anyway, with a lot of useless garbage that didn't mean much and didn't help take care of patients or do research.

The other thing I noticed is that BUMED has been notoriously ignorant of basic medical research. I don't think they ever knew NMRI existed. They tried to steal all our diver billets from us while the new building was being built. We had thirty-some divers coming online to fill diving billets and help build and learn the system while it was being built. We weren't getting any divers. We went down to the Bureau and they said, "We're using those billets for a corpsmen somewhere." We said, "What the heck do you mean? They're diving billets. They're not corpsmen billets. These people are machinist mates, electricians, ship fitters and divers." They knew better. Then they accused me of not knowing what I was talking about. I had to point out to one gentleman that the piece of paper he was showing me and telling me I didn't know about was one that I wrote. If he knew what the code numbers meant, he would have known that I had finished writing it about six months before. That's the kind of crap we used to get all the time there. It seemed to be getting worse and worse.

INTERVIEWER: I walked past the old diving facility at Bethesda yesterday and noticed a new name on a window that I think says it all. It reads, "Uniform Services University of Health Sciences." It's not the Albert Behnke Diving Facility any longer.

CAPT. VOROSMARTI: I have to tell you a funny story about that. It's very ironic. My first job as the XO in 1975 was to go over and get the plans for the first building at USUHS because they were going to close it, and it was going to be NMRI's new facility. Well, they never closed it, and now USUHS is taking over NMRI's building. I guess the National Institutes of Health has taken over the main building for infectious diseases.

INTERVIEWER: That's right. They have done that. Thank you very much.

CAPT. VOROSMARTI: You are very welcome.

INTERVIEWER: We certainly appreciate it.

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John C. NIEDERMAIR: the story of the S-51 (as told to John T. Mason, Jr., Naval Institute Press on 29 July 1975)

It was September 25th 1925 that the S-51 was hit by the City of Rome, and it wasn't very long before I got a telephone call that alerted me to the problem I was going to be faced with on the S-51. They called me up and said that I'd better get ready to leave for the salvage area. And so on October 19th [Captain Edward Ellsberg, USNR and I] left the yard on the Vestal, which was a repair ship -

When we got out there the Falcon was out there, and there was Captain Ernest King and Lieutenant Hartley, who was the captain of the Falcon. He later on became a rear admiral in the Navy and he was the captain of a cruiser during the war. And then Dick Hawse who was an expert on handling small boats in the rough "seas.

The S-51 was off Block Island in Long Island Sound in around 150 or 160 feet. You couldn't see Block Island except at times when you might see a mirage of it. We really couldn't see any land from where we were trying to salvage -

When we got out there we found that the Merritt, Chapman, Scott [contractors originally hired by the Navy to salvage the S-51] people were out there with their big crane, and they had attempted to raise the submarine. One of the worst things they did in maneuvering their crane around was to drop an anchor overboard and it so happened that they dropped it on the bow of the S-51. This gave us quite a bit of trouble later on because when we tried to get the buoyancy of that compartment air was leaking out of the rivet holes and the seam cavity sort of spread the plating apart, so we had to fix that up

with white-pine wedges that we drove in there. They'd swell up and we solved it in that way. It was a simple solution.

There was a salvage crew out there that had been down in Guantanamo Bay, practicing the raising of a submarine. It was a German submarine that they had, one from World War I. They never did really raise it. I found out later on that they had done a lot of wrong things. They could always get one end up but they never could get both ends up.

I had collected some plans of the S-51 and some particulars about her capacity plans, and arrangement plans. I never did check on where she was built. She probably had been built in New London. She could have been built up in Portsmouth, up in Maine, or New Hampshire.

Anyway, in getting going on this, we had to start mooring the Falcon, put 5-point moorings down, so that you could always position the ship any way you wanted to over the wreck. That's where Dick Hawse I told you about was a real expert. In the beginning we only had a Navy small boat to do this job and it wasn't very long before we found out that the Navy didn't have a single small boat that we could handle out there. We had to borrow one from the Coast Guard, a 26-foot motor whaleboat, and that worked perfectly. Hawse managed that thing, he was really clever, all right, and we'd get our five-point moorings, no matter which way we had to have the Falcon arranged, depending on the weather and the way the sea was running.

One thing led to another. There was no one alive in the S-51. They were all gone, except three who had been rescued from the water. They had been up on the bridge when she was hit and they were rescued from Long Island Sound. And they were the most

forlorn three people that I have *ever* seen. I still think of them, how forlorn they were. You can imagine. They didn't live very long after the S-51 went down. Somehow or other, they died one after the other in a very short time.

I right away got interested in making an estimate of the situation and how we would raise this submarine. I began to make some calculations, how much buoyancy we had to have by pontoons, what to do with the pontoons. But it so happened that this salvage crew that was there had their own way of handling the pontoons. I described my system of doing it to Ellsberg, but we had to let the salvage crew do it because that was their specialty.

When the day arrived to drop the first pontoon down for a test at the depth of 150 feet or so, I didn't go out because they weren't doing it my way and I felt they might be nervous about the fact that I was standing around, nosy on what they were doing. They were always conscious of the fact that I was there, so I stayed away for two reasons. One was my own reason, that they weren't using my method and I felt sure their system wasn't going to work.

Ellsberg left and I was in the office there. I had plenty of calculations that I had to make. He came back that night about eleven o'clock and I was about to ask him --in fact, I did say to him: "Well, how did you make out?"

He said: "Niedermair, first tell me again how you would handle those pontoons, how you would lower them."

So I told him how I would lower them. "Well," he said, "from tomorrow on, you're going to be in charge. We lost our pontoon today."

We later found [the pontoon], but they couldn't find it. They hadn't found it by eleven o'clock that night.

These pontoons had a problem because, unless you stopped the water from running into them --you know, when you opened the valves and you flooded them to sink them --because the pontoon had 120 tons of buoyancy capacity, the pontoon itself weighed 40 tons, and if you blew all the water out, you had 80 tons left, net. The trouble was when you opened the valves and let the water run in you'd have 40 tons pulling on your little lines with which you were trying to lower it down, which was all right when you were working in 60 feet of water or 50 feet of water. Then you could let it run before it gave you any trouble. But now when they had to go down to 150 feet or 160 feet, that was too much. By that time it got so full of water that the lines started snapping, they broke off.

What you had to do was allow so much water to get in--you had to put enough water in to sink the pontoon. I did it with a stopwatch. I would time it after we let the water run into the pontoon, and now the weight was beginning to come onto the lines before we started lowering. I would give it about five minutes or five seconds or some interval of time with the water still running into it to give it weight so it would pull it down. Then you'd shut it off, and you'd shut it off with an air bubble left in the pontoon. It was as simple as that, but they didn't realize that.

So we started working on it. Various problems we had in drilling underneath the submarine to get the chains down. The buoyancy problem of which end would be raised first. It appeared to me that the best thing to do was to raise the stern first because your chains could go through just forward of the propeller. The struts came out where the

propellers were so you ran your chains down in between them and they wouldn't slide off.

We finally got all our pontoons down, but in the meantime we'd learned how to handle the pontoons. We put six forward and two aft. The winter weather was coming on and we tried to come back home in November, around Thanksgiving Day, when Dr. Flothy and I made an estimate of the situation, using the Farmer's Almanac to judge the weather. We judged that we couldn't get more than one diving day a month from now on, or some such figure we came up with.

I remember Thanksgiving Day when we were sitting there. The Navy wouldn't let us come back home because the public wouldn't stand for this, they said, so we couldn't come home, because the bodies were still in the submarine. We finally prevailed on them to let us come back because we had certain other things that we had to do to improve the compressor up on the Falcon and the manifolds on the Falcon. There were certain things that had to be done to get ready for the final salvage. So they finally allowed us to come back home, but I remember listening to this Cornell-Pennsylvania game that they play every Thanksgiving Day. The radio on that ship was terrible but I was listening there.

The officer who was in charge of the crew's mess had Thanksgiving dinner with the crew, and the reason was that they were having turkey for dinner. I was eating in the officers' mess and we had meat loaf for dinner on Thanksgiving Day! Everybody chipped in about a dollar a day. The government paid me for that later, but I did it exactly the way the officers had to do it. I felt that that was the way to do it, and I didn't care, and we were allowed to come back.

My period back in the yard, in December now, sometime, we did a lot of things and worked on the pontoons. We also found out what it felt like to be in a diver's suit. Ellsberg did this, too, only he went further than I did. I only went far enough to know just what a diver was up against. I wouldn't dive. I felt that it wasn't my job. Ellsberg learned how to dive and he actually went down. He was a real daredevil. One of the bravest people I've ever known. He didn't mind it at all, and I found that later on in his career he did a lot of things and I was beginning to wonder whether he had his wits about him! But he knew what he was doing, all right. He knew just how far to go, but it looked pretty risky.

We got all ready and sometime in February we went back out to the salvage operation and got started again. We were having trouble with the divers' air hose freezing up, air being cut off because the water was getting colder and the air would expand into the diver's suit, because the air was coming down at a higher pressure than was down in the suit and now had to bubble out through the helmet. That would drop the pressure at the valve, and the combination would be such that the moisture that was deposited would freeze up the air valves. So we had to work out a method of drying the air before it got down there.

We solved it partly so that by the time the next salvage operation came around we had to rig to take care of that. But on the S-51 we didn't have any way to take care of it, so we didn't go out there until the weather started warming up a bit. It must have been the end of February. We got out there and we started placing the pontoons, digging tunnels, and all. For part of that operation Ellsberg went down because we had to haul out the main induction line, which was where the air came in for the diesel engines, to run the

engines. The valves on that, the hatch covers, and everything else --the hatch covers were all right, but quite a few of the valves were closed --no, the hatch covers weren't all right and these valves weren't right because when you put pressure inside the hull, they would lift because they were designed to be closed by water pressure round the outside.

So now we had no way of getting at the valve that was on this induction line. All we could do was to tear the deck out and get a section out of that main induction line. The divers went down and took the bolts out of the flanges of the section that we wanted to get. Then Ellsberg went down just as the risky part was coming, when you had to have something hauling from the deck in order to yank this section out between the two flanges, which was pretty tricky stuff, so he decided to do it himself.

Now he got into trouble with the salvage crew and the officer in charge of it, the warrant officer who was in charge of the salvage crew's divers. Ellsberg talked to the telephone operator and asked him to ask this officer how the lines were tending. All this officer would say was that it was OK, and that's what the telephone man told Ellsberg. Ellsberg wanted to know which way it was tending, because down there he couldn't tell and OK didn't tell him anything.

One thing led to another and they couldn't get together. I had never been on the telephone before but Ellsberg, who was down there, asked me to get on the phone. So they hunted me up and I came down and picked up the phone and talked to Ellsberg. And, you know, listening to someone under pressure down there is not the same as me talking to you. I finally understood through the squeaks what he was talking about, and he asked me the question, "Which way are the lines tending?" He had it all hooked up, with a line coming down and that was on the hook of the crane on the Falcon.

I called over to the officer and asked him which way the lines were tending. Ellsberg told me which way it was down below- -when he had talked to the telephone operator that was Greek to him, but he told me all about it.

I tried twice to get him to tell me which way the line tended and he wouldn't tell me. Then I said to Ellsberg, "Hold everything. I'll go over and look myself." So I went over to the side of the ship, examined the line and the way the crane was going, came back to the telephone and told Ellsberg everything looked all right to me. He told me where he was standing, out of the way of it. So then we gave the signals to haul the thing up.

As a result of that little incident, this officer went to King and told him that I was ruining the morale of the diving crew. King looked him in the eye and said, mentioning his name: "You know, you're sick. I recommend you take sick leave, and when the reporters' boat comes in you go back in it." So King was on my side.

[Merritt Chapman] went off the job because we decided --the Navy decided --that we would do it. They didn't have any equipment. We had the divers, we had the salvage ship. Their big cranes couldn't stand the rough weather out there. They could never get it that way, anyway, so they were sent back home. They never liked it. I don't think they like it to this day.

I had never been inside a submarine. I never took a dive in a submarine, and the S-50, a sister ship of the S-51 was right there. We could go and walk around on it but I wanted to be in it when it was diving. So I went to King and said:

"Why can't I go down in the S-50 and walk around while she's running submerged, just like the S-51 had been running?" I wanted to visualize this, where the doors would be open and what was the condition of the ship. I understood it. Everybody had told me, but now I wanted to see it, and not having been in a submarine I thought here's a good chance. King said no. "No," he said, "I don't think it's necessary. Your place is up here."

I said: "Well, but I really think I ought to make a run in it," and he finally *gave* in to me and I went down in the S-50 for a short haul. He *gave* orders to the captain about how long he could keep me down, so we made a little runaround out there in Long Island Sound, not very long, back and forth. Just enough time for me to walk back and forth, climb up in the gun access hatch and look out and see how that operated. I came back and that was it. Now I was an expert!

I was never an expert. I'd never been on a submarine before, actually. Everybody thought I was expert from that day on, when Rock put his hand on my shoulder.

We were back again in the spring and got our pontoons working and so on. I told you about how Ellsberg became a diver and got into trouble and almost got me into trouble, but King could see through that. That's the way King was. When you had the responsibility, all you had to do was to carry it out. You never had to go to him for instructions or anything else. You had to do it as you saw it or as you thought he would want it done, and when that was the case you had the authority to do it. I think that's why he only had about 100 people on his staff during the war. When I was there last March somebody told me: "Do you know Admiral King only had so many people on his staff?" And I said, "No, I never knew how many he had, but I don't see why he had that many

because he let the people he put in charge of this group, they could add people to their group, but he only needed enough people that he could put his hands on.” And if you didn't do it right, you were done.

We got everything ready by June, and a terrific storm came up. We had the pontoons up. Some of them were leaking. We went out in June to get ready to raise it -- we were getting ready to raise it the next morning, about the middle of June of 1926, and the storm came up that night. We had to go out in the storm and get divers down to see how everything was going down below.

We thought we could get divers down but as it turned out we couldn't. We could see that some pontoons were leaking very badly. It was very, very rough. I remember looking it *over* and trying to put a little air into a pontoon that was leaking. I knew which ones. They had told me the day before, so I tried to compensate for that.

We now had all our pontoons buoyant and the amount of air that was in them at that depth and the amount of air that was in them to hold them up with about five tons of extra pull, if they moved up the least little bit the air would start blowing out the water and it would lift them. Finally when they reached the top --once they started moving up, you didn't have to blow them out any more because they would blowout automatically. It was that ticklish at that depth.

So the bow went up and the result was that we got into all kinds of trouble that day. I sprained my ankle. The result was that we had to let the bow down again. Then we got everything ready again and within two weeks' time we raised the submarine and brought it into the New York Yard. We took it down Long Island Sound and just before we got into the yard we had all shaved, ready to go home when we got it into the yard.

The sun was shining. Thousands and thousands of people lined the shores of Long Island Sound to watch us come down with this long tow through Hellgate which was 1,000 feet long.

Just outside the Navy yard there was a submerged rock. We were to the right of the rock on the course we were going. I think they call it the White Horse Rock. We had a pilot aboard and that pilot was afraid that our tow was going to hit a yacht that was in the fairway. It wasn't supposed to be in the fairway, but there it was. So the pilot veered to the left. As he veered to the left, we were closer to that rock than he had estimated and we hit the rock and knocked out our middle pair of pontoons forward, and down went the submarine.

It wasn't very deep but the speed of the water was terrific in the East River. It wasn't at Hellgate. It was down by the Navy yard, where you had a rip tide.

After we got the submarine up out at the salvage area, I had noted all the drafts on the pontoons so I knew how much reserve buoyancy I had in each pontoon. That was a lucky break, because now we'd lost the forward middle pair of pontoons.

We had only four left. We had to have six because when you were lifting at the angle we were at, the water was deep enough so that we had about a 30-degree angle, which is about the maximum angle you could swing a bow up like this because everything would slip away from you beyond 30 degrees. It required a maximum moment to lift it, more than on how much buoyancy you had. You had to have a moment to do it. The ship's moment about the stern pontoons as compared with the buoyancy that we had there, you had to have more moment to do it.

I had made this estimate and I was pulling my notebook out and Ellsberg said in his book that as I was looking over my notebook --everybody was ready to go ashore --I yelled out: "Well, if we're going to hit a rock, it's a good thing we have a salvage crew on board." And all the people who had been kind of glum awakened to this, that now we all had to go to work again. I imagine he thought my statement really got them going. He was looking over my shoulder and he could see that my next idea was that if we lowered the four pontoons that we had up forward and had provide lift, we'd get some cranes out and the chains up, and sink them down till they were under water. Then we could get this reserve buoyancy, the amount of buoyancy that was sticking above the waterline when we were coming down the sound. That was just enough, the way I figured it out, to pick it off that rock.

By midnight we were able to do it. It was so close, I remember, that we had the floodlights going down, and I think Ernie King wanted a boat to go out with a sailor on it to stick a flag up on the bow of the submarine. In order to do that, the sailor stepped out of the boat, stepped on the bow of the submarine, and it started going down. I didn't know how far it would go. Maybe we had a little reserve buoyancy.

He couldn't stay there, anyway, but he noticed this happening and got off the bow right away, but it gave me a clue as to how close my figures were.

Now we had to turn it around 180 degrees and swing it into the yard at night, and the tide was going out in the East River, so when we got it swung around the tide was against us, and there was a very heavy rip tide there.

I had a bead on some way of telling whether we were moving or not. I was giving a signal when we were going to move. Ellsberg was ahead of me and he would get my

signal, then he would signal the tugboats. What we wanted was to just get the tow moving forward, but not any more than that. We didn't want to have much speed on it because what we were pulling on was a bow piece that I had worked up to put a hook onto the bow of the submarine. It was like a shackle up there that I had made to hook the towline on, and we didn't want to lose it again, so if we could creep into the yard that was sufficient.

We managed to creep into the yard and got it moored along-side of a dock there. Then I went home. Everybody went home. I probably only got home for a couple of hours and then I came back again the next day, and we put it in a dry dock.

That's the story of the S-51 as far as the boat itself is concerned.

Now appeared a thing that had to do with people, the vanity of people. You see, while the S-51 was out in the salvage area the Navy Department was anxious to have publicity. The newspaper people wanted information. Ernie wasn't a very great guy for publicity. He thought it was a hell of a waste of time. We were out there to work. But Ellsberg was a gifted writer so he wrote a few good articles about the salvage operations for the New York papers, and that seemed to be great so he kept it up. The Navy had asked for somebody to do it, and in addition to all the other things he could write and as fast as he'd fill a page he'd throw it on the deck and write another one, just like that.

So he got the publicity but what happened when we got into the yard was that the reporters all wanted to talk to Ellsberg. Now the Commandant, C. P. Plunkett, was left out. I don't think Ernie King liked it, either, although he didn't want them to bother him. He'd put up with a certain amount of hardship, you know, but he could do without it now.

Now Plunkett felt that this spotlight --it turned out that I felt he thought that Ellsberg was a bit insubordinate in this thing. The first thing I knew we were all called together outside of Plunkett's office and he gave Ellsberg a bawling out, a sort of a semi-public reprimand, about paying so much attention to newspaper people when we had all this work to do. I've forgotten just how the thing went, but it probably was along that line.

On the other hand, the Brooklyn Eagle came along and talked to Plunkett, and Plunkett gave them quite an interview. In that interview he talked about me. As I remember it, he didn't talk about anybody else, and he said that I was an unknown engineer when I went on this salvage operation and I now came back and raised this submarine with a lead pencil. I always thought that was a fine public compliment that Plunkett gave me. He at last got the papers to come in to see him, but the Brooklyn Eagle went out of business a couple of years later. I had a clipping with that statement by him in there.

Reminiscences
of
John C. NIEDERMAIR
(Naval Architect -Bureau of Ships)

U. S. Naval Institute
Annapolis, Maryland

Preface

This volume contains the transcript of six taped interviews with John C. Niedermair at his home in Stone Harbor, New Jersey. The dates of the interviews range from June, 1975 through April, 1976. They were obtained by John T. Mason, Jr. for the Oral History collection of the U. S. Naval Institute. Mr. Niedermair corrected the original transcript. It was re-typed and indexed. A number of documents have been added to the appendix as supplement to the interviews themselves.

John C. Niedermair was a longtime Technical Director of Preliminary Ship Design for the Bureau of Ships, U. S. Navy Department. Throughout his career combatant ship design was his primary concern. He is credited with many critical design innovations. Especial contributions were made to the ESSEX Class carriers. Perhaps his most dramatic contribution came on the afternoon of November 4, 1941 when, in response to a British requirement received in the Bureau that same day, Niedermair made a small pencil sketch and calculated the basic characteristics of an entirely new and radical ship which became the workhorse of World War II -the LST.

In another area -Niedermair's work on watertight integrity and ship stability has left an imprint on practically every merchant ship constructed in the United States since 1929.

John T. Mason, Jr. Director of Oral History

January, 1978

MR. JOHN CHARLES NIEDERMAIR

Mr. John Charles Niedermair was born November 2, 1893 in Union Hill, New Jersey. During his youth he lived in Staten Island, New York where he attended grade and high schools. He was selected for a scholarship to and entered Webb Institute of Naval Architecture and Marine Engineering in 1914. He graduated at the head of his class in 1918.

After a brief period of duty in the Navy during the first World War as an officer candidate, he commenced his active career in the ship- building industry in December 1918 by accepting a permanent appointment as a ship draftsman at the New York Navy Yard. He remained at New York until April 1928 when the Navy Department requested his services in Washington in the Preliminary Design Branch of the Bureau of Construction and Repair. Ten years later, he rose to the position of senior civilian in this Branch and still holds this distinction. His present title is "Technical Director of Preliminary Ship Design" and he is the highest ranking naval architect in the U. S. Navy, as well as the highest ranking civilian in the Bureau of Ships.

Mr. Niedermair has attained international stature and recognition among members of the naval architectural profession particularly in the fields of salvage, stability, and basic design. While employed at the New York Navy Yard, Mr. Niedermair was instrumental in the prosecution of a number of special projects, the scope and variety of which attest to his versatility as an engineer. One of these was the design, planning, and active supervision of the construction of the battleship building ways laid down in the early 1920's. However, his most significant work during this period was in connection with the salvage operations of the ill-fated submarines, S51 and S4. In each of these instances, he provided on the spot technical direction of salvage procedures which he himself had devised. In recognition of these services, which were so vital to the success of these operations, he was highly commended by the Secretary of the Navy and received a special promotion. Since that time, he has served in a consultant capacity on many other salvage jobs.

Mr. Niedermair's transfer to the Bureau of Construction and Repair in 1928 was occasioned by the fact that his talents were needed in connection with preparations for the forthcoming International Safety of Life on Sea Convention. Mr. Niedermair attended the convention, which was held in London in 1929, as the Navy's technical expert, and was one of the signers of the resulting agreement. He was personally instrumental in securing the adoption of the United States' proposal that every passenger ship be inclined upon its completion, and that operating personnel be supplied with information regarding the stability necessary to permit efficient and safe handling of the ship. For his services on this occasion, he received a letter of commendation from the Secretary of State. Again during the Senate Investigation of the "Mohawk" and "Morrow Castle" disasters, Mr. Niedermair served on the Subcommittee concerned with the watertight Integrity and Stability of passenger ships. As a direct result thereof, in 1935, Mr. Niedermair's services were loaned by the Navy to the Department of Commerce where he established the Technical Division of the Bureau of Marine Inspection and Navigation, an activity designed to safeguard the public's interests against further such catastrophes. Mr. Niedermair's contributions in the field of ship stability are marked by many milestones not the least of which is his co-authorship (with Vice Admiral E.L. Cochrane, USN (Ret.)) of Construction and Repair Technical Bulletin No.8, "Sub-division, Stability and Construction of Merchant Ships" (1935), a document still considered the basic primer on this subject.

In the field of basic design, Mr. Niedermair occupies a pre-eminent position and might well be termed the father of today's modern United States Navy. In addition, his contributions to the merchant shipbuilding field are also substantial. In the course of the design of the liner "America", Mr. Niedermair was appointed by Vice Admiral Emory S. Land, USN, to act as technical conciliatory between the design agent and the building yard. His contributions have left a lasting imprint on practically every merchant ship constructed since 1929.

It is in the field of naval ship design, however, that Mr. Neidermair has made his greatest contributions. As the civilian chief and Technical Directory of the Preliminary Design Branch of the Bureau of Ships for

almost 20 years, Mr. Niedermair has been primarily responsible for the basic design of all types of naval ships during this most trying and critical period. This includes Battleships, Aircraft Carriers, Cruisers, Destroyers, Submarines, Patrol and Mine Craft; Auxiliaries such as Tenders, Cargo Ships, and Tankers; Landing Craft including LST, LSD, and other special craft types. The designs which he guided from conception through construction became the ships which contributed so greatly to the winning of World War II and which excited the world by their performance. Worthy of particular mention is the part he played in the design of the LST. This ship, which was in large measure the product of Mr. Niedermair's originality and fine engineering judgment, was known as the work horse of World War II. Over 1,000 of these versatile craft were constructed, a memorial of which few, if any, other Naval Architects can boast. To date, approximately 8,000 ships, a staggering number, have been built from designs originated under Mr. Niedermair's guidance. It is improbable that a record such as this will ever be equaled. For his outstanding services to the Navy both prior to, and during World War II, Mr. Niedermair was presented the Distinguished Civilian Service Award, the Navy's highest honorary award, in 1945.

It is of particular note that Mr. Niedermair's genius has spanned the coming of the atomic age. The past few years have witnessed the advent of the first nuclear propelled ships. The NAUTILUS needs no introduction; SEA-WOLF and other submarines to follow will in turn be followed by the nuclear carriers and cruisers now on the drafting boards. FORRESTAL, SARATOGA and their sisters are other mighty milestones of this newer Navy. The basic designs of all of these vessels were made under Mr. Niedermair's direction and exemplify the versatility and scope of his ability as a Naval Architect.

Mr. Niedermair has always been active in the work of the professional technical societies. In 1932, he presented a paper "Stability of Ships After Damage" before the Society of Naval Architects and Marine Engineers (SNAME). In 1936, he presented a companion paper, "Further Developments in the Stability and Rolling of Ships" before the same group. In 1951 he presented a paper on "Ship Motions" before the International Conference of Naval Architects and Marine Engineers in London under the auspices of the Institution of Naval Architects. Local Sections of the SNAME have also heard Mr. Niedermair on several

occasions. He addressed the Chesapeake Section in 1950 on the subject of his own design experiences, and the same year presented a paper before the Philadelphia Section of the "Subdivision, Stability, and Damage Control of Merchant Ships." Mr. Niedermair has been a regular contributor to the discussions of technical papers presented before the Society. In addition to such technical activity, Mr. Niedermair has contributed his services on many occasions to the Society's work. He has served as a member of the Local Sections Committee since 1949. Currently he is a member of the committee engaged in revising the Society's book on "Naval Architecture." He has served as the Chairman of the Chesapeake Section (1946-1947), and has since served on the Executive Committee of that Section.

One of Mr. Niedermair's greatest and perhaps most lasting contributions to his profession lies in the interest he has always displayed in the younger engineers. Vitally interested in the future of the profession, he has fostered a high degree of technical excellence and professional pride among young Naval Architects and has done much by precept and example to inspire them and instill excellence into their work. He has constantly looked toward the future and his insight into it has led the way for many who follow. He has wisely counseled two generations of Naval Officers. Almost every high ranking officer of the Navy now actively engaged in ship design work has learned the fundamentals from "Johnny". A gentleman, a scholar, a man beloved by all with whom he is associated and finally as well as first and always, a Naval Architect, he has added a considerable lustre to an already honorable profession.

Interview No. 1 with Mr. John C. Niedermair

Place: His home in Stone Harbor, New Jersey

Date: Tuesday afternoon, 17 June 1975

Subject: Biography

By: John T. Mason, Jr.

Q,: Well, Sir, at last it's great to have the opportunity to meet you and sit across the table from you. I've been looking forward to this story of your remarkable career, so would you begin now in the proper way with a biography by telling me the date and place of your birth and something about your background?

MR. NIEDERMAIR: I was born in Union Hill, New Jersey, on November 2, 1893, and talking to my sister about this thing several times I was amazed to find out that she said I was born over a blacksmith's shop. So I always thought that any good fortune I had in my work, I guess, was that I was born over a lot of good horseshoes.

INTERVIEWER: Lucky ones!

MR. NIEDERMAIR: In about 1899 my father moved us over to Staten Island, which was one of the great things that happened -

INTERVIEWER: What was his business?

MR. NIEDERMAIR: He was an engineer, an operating engineer. He worked for several brewery companies at times, on and off, so I grew up on an island³ on the hillside with a beautiful name. I lived on Hillside Avenue, and the place where I lived, our lot, ran from Hillside Avenue to Pleasant Valley Avenue. Those two names in a way will describe the pleasant sort of life that I led on Staten Island.

INTERVIEWER: Describe Staten Island, not today but as it was then.

MR. NIEDERMAIR: At that time you had trolley cars running down the middle of the island, you had the railroad running along the edges down to Tottenville and to Port Richmond, Staten Island, and trolley cars running nearly everywhere on the island, particularly down to the beaches.

I remember the trip to Midland Beach. Midland Beach was always a beach that you had to pay to get onto. It's interesting because I came down here and just the last few years here at Stone Harbor and some other places they want to charge something for going on the beach to take care of it, to clean up and so on.

INTERVIEWER: People litter so.

MR. NIEDERMAIR: Yes, and there's a big protest, but I grew up on Staten Island and going to this beach on a trolley car with my father, who was a great swimmer, taking me down there. He'd put me on his back and swim out to the ocean. You could do that then because the water was really great.

As time went on, I got to be old enough to go to school, but for some reason or other my mother didn't want to part with me.

INTERVIEWER: That's not unusual with mothers!

MR. NIEDERMAIR: I was the firstborn and she delayed sending me off to school for two years, till my sister was old enough to go, my sister Elizabeth, and we went off to school together. I was two years late in going to school, but that didn't seem to make any difference.

INTERVIEWER: This was to grade school, on Staten Island?

MR. NIEDERMAIR: Yes, Emerson School. It was at the foot of the hill that was called Emerson Hill, where Ralph Waldo Emerson used to come for his vacations, and some of his sophisticated background rubbed off on Emerson. Emerson was really a very fine school to start in.

I finished there and even then I got out early, at fourteen, I believe. I delayed my education for a while. I got jobs in different places and so on.

INTERVIEWER: What kind of jobs?

MR. NIEDERMAIR: Oh, I worked for a plumber and a baker and in a machine shop on and off, and on and off, of course, while I was going to Westerleigh Collegiate Institute, where I went to school.

INTERVIEWER: What was that? A prep school?

MR. NIEDERMAIR: To prepare myself. I had plans for going to Cornell. I did all my work in poetry and mathematics and everything. I was getting ready to be finished at Westerleigh Collegiate Institute and they told me about Webb Institute of Naval Architecture where they had scholarships available. So I went off to the Bronx. Webb was up in the Bronx then, and I took my exams. One of the interesting things that happened during those exams was that I was having a little trouble with a math problem when a Professor McLean came to me and said: "What seems to be troubling you, young man?"

"Oh," I said, "I'm having trouble with this algebra problem here ."

He said: "Oh, don't let that worry you. Why, I solve more difficult problems than that every day."

But the interesting thing about it was that he was one of the consultant naval architects on the Titanic. Unfortunately, McLean died before I got into Webb in the middle of September.

INTERVIEWER: Of what year was this'?

MR. NIEDERMAIR: That was 1914.

INTERVIEWER: Tell me, by the time you applied for a scholarship at Webb, had you determined the direction of your career?

MR. NIEDERMAIR: I had been watching ships back and forth from the hills of Staten Island, all the liners and everything, and I'd been along West Street in New York. I started going into New York City,

along the maritime fringes of it, the docks that were there when I was ten years old. In order to get there I used to get on a horse car going up West Street to go uptown.

INTERVIEWER: First, you said, you had plans to go to Cornell, but you weren't going to find ships in Ithaca.

MR. NIEDERMAIR: No, what I was after was an engineering education. Even though I went to Webb, I studied the course intensely and in a very broad way so that I had a very broad background in engineering after I got through with Webb. I've forgotten now exactly what my average was, but I know that my average for the four years at Webb was over 95.

INTERVIEWER: What kind of degree do you get from Webb?

MR. NIEDERMAIR: They didn't have a degree at that time. Later on they did. They tried to get it and the only reason they didn't have it was that our library was too small. For some reason, we didn't have enough books, and at one time to get a little higher priority I told the people at Webb:

"Gee, I'll go down to Hinds and Noble and I'll get a truck-load of secondhand books and bring them up, then maybe we'll get this degree."

As I went through I met people there. The dean of Webb at the time was Chaffee, Professor Chaffee. He was a graduate of Brown University. Then there was George Crouch, who was a professor of naval architecture and a great designer of speed boats. I remember the time that George Crouch had four boats in the Gold Cup races, each one of them won its race, won its heat, and all the boats that were competing at the finish were his own boats and they came in one, two, three, four! The leading boat was what they called stepped -- it really wasn't a displacement boat because he had put the planking on transversely so that it was full of little steps. So the Rainbow IV I don't think got it and the Baby Bootlegger I believe won the Gold Cup.

INTERVIEWER: What kind of students did you have at Webb? Where did they come from?

MR. NIEDERMAIR: They came from New York Stuyvesant High. The people I was competing with were from Stuyvesant High and Stuyvesant at that time had a record of being almost equal to two years of college.

I don't believe they have that reputation now but they had it then.

INTERVIEWER: Did they come from other parts of the country?

MR. NIEDERMAIR: Yes, they came from scattered around. Most of them centered around New York State, not Staten Island. I was the only Staten Islander. I was the only hick in the crowd, but I soon caught on to the city ways and I was finally secretary of the student organization before I got through with my time at Webb.

The summer work was the interesting thing about Webb.

INTERVIEWER: Like the summer cruises at the Naval Academy!

MR. NIEDERMAIR: Webb instituted this system long ago and every summertime -- now they do it in the wintertime -- the first time I went up to Quincy, Massachusetts, and worked in the yard there on the Nevada, the battleship Nevada.

INTERVIEWER: At Fore River shipyard?

MR. NIEDERMAIR: Yes, and there I met Wakeman. The interesting thing about that was that in my background I had met a lot of people when I worked for the baker and so on because I ran the bakery and was a bookkeeper for the bakery while I was going to Westerleigh Collegiate Institute. There I met a lot of people and I found that the people with the most money were the hardest ones to get pay from. I had to go round every once in a while and some of the boys who worked for me had trouble, too.

I also learned that you can't trust everybody because one of my boy collectors that I had started falling by the wayside. He wasn't turning in the money, which was a good experience for me, how to handle that.

INTERVIEWER: Tell me more about this summer at the Fore River shipyard.

MR. NIEDERMAIR: At the Fore River shipyard I met Wakeman. I was the first one up there. Wakeman offered me \$7 a week and I said:

"Gee, I can't work for \$7 a week," because I actually had earned more than that before I ever got into Webb. So we talked about it a while and he had me sit on the bench outside, then he called me in and gave me \$12 a week, which was pretty good pay then, in 1915, and he said, "Keep it secret."

Well, I told him I couldn't keep it secret because my friend George Smith, I'm rooming with him and he's coming up in a couple of days. I can't keep it secret from him, so he gave George \$12, too. But one of the other fellows who came up from my class he only got \$7 and he always wondered what we did with all the extra money and George told him: "I have a big inheritance, that's why we can make all these trips."

INTERVIEWER: These jobs were provided by the Webb Institute? Did they make all the arrangements?

MR. NIEDERMAIR: They negotiated. They simply would contact the yards and the yards would say they would take so many.

It was really a great thing for me to get on the Nevada, and Wakeman evidently took a shine to me because I had a kind of tussle with him, so my assignment on that ship was really free. I had to work for the best shipfitter on the job, Tommy Grant, and my assignment was to go and inspect every part in that ship, brackets, where the desk beam would meet the side frame, and any part that was missing I would then have to check it out and find out what belonged there, go out to the ship and have them

punch holes into the brackets, go back and have them put in. I wound up crawling down through the inner bottom because Tommy Grant and his friend the shipfitter got so interested in me that they told me about the big secret in the Nevada and that was where one of the frames had missed the shell by several inches, so we crawled in through the inner bottom to show me this. They were really interested in showing me what goes on and, sure enough, there was the frame two inches away from the shell, filled in with wood, and they had put in a fake that looked like a rivet on the outside, but it was really a bolt on the inside, because they couldn't put a hot rivet through the wood.

INTERVIEWER: Sort of makeshift?

MR. NIEDERMAIR: So I had a great experience in that yard because I think of my first contact with Wakeman.

INTERVIEWER: Tell me something about his background.

MR. NIEDERMAIR: He was the manager of the yard. He had quite a lisp. I don't know very much about him because my contact after I left him was with the people in New York. I was there ten weeks and when I came back I knew what a ship looked like inside. I'd never been on a big ship before.

INTERVIEWER: What was Wakeman's first name?

MR. NIEDERMAIR: Oh, I have no idea. I couldn't tell you. I can't bring it back.

Then I went back to Webb and I went through the sophomore year and the next summer I spent at Cramp's shipyard. That was in 1916.

INTERVIEWER: That was in Philadelphia?

MR. NIEDERMAIR: In Philadelphia, in the mold loft, and I worked there for a George Dewey, who was the loftsman.

INTERVIEWER: What did you do in the mold loft?

MR. NIEDERMAIR: I helped to make patterns for the shell plating and for the rivet holes and everything that a regular wooden frame or paper that went with it to locate the rivet holes in all the plating, also molds to show where they went for the framing and so on. So I learned the mold-lifting business in the mold loft.

INTERVIEWER: How much did you get paid for that?

MR. NIEDERMAIR: I've forgotten how much. By that time I evidently was paid enough that I didn't run into any trouble. Now I was a sophomore, you see. Before I was a freshman, and Wakeman was really a very good person to meet the first time because he could tell, I think, the sheep from the goats, the way he did it, and the stand that I took with him evidently paid off.

INTERVIEWER: He reported back, I suppose, on your performance to the school?

MR. NIEDERMAIR: I never had any difficulty when I got back.

INTERVIEWER: How long a day did you have to work when you were working in shipyards?

MR. NIEDERMAIR: Probably 10 hours. At that time it was very busy there. The yard was working on submarines and all that sort of thing, besides, of course, the Nevada was there. I was particularly interested in the Nevada and what happened to her. She kind of stuck with me till she was decommissioned after World War II.

While I was at Cramps I went over to New York Ship. I arranged with New York Ship to go over there and see that yard because the Idaho was building there on the ways and I had a chance to see her.

INTERVIEWER: Did you get a thorough picture of her innards, too?

MR. NIEDERMAIR: No, I didn't because she was on the ways and there was a big strike in the yard at the time and I was unable to go aboard because strike-breakers were doing the work. It was really difficult for me to get into the yard, in the first place. The yard manager, I can't remember his name (Howard Towle-'OOWebb) met me at the gate and took me in. I had called up and talked to him and he said he'd meet me at the gate and he personally took me around.

INTERVIEWER: How did you students from Webb fit into the labor picture in the yards?

MR. NIEDERMAIR: I worked right with the people. I got along very well with yard workmen.

INTERVIEWER: I mean you didn't have to join a union?

MR. NIEDERMAIR: Oh, no, no union problems. None.

One of the last things I did at Cramps -we were running out of work and I talked to Dewey about this and I said:

"I notice you're not laying out the shaftstools." There's a support that goes under the shafting in the shaft alley. "Why don't they do it?"

"Oh, we never do that."

I said: "Well, you haven't got much for me to do, why don't you let me lay them out? I'll lay out the shaftstools my way and we'll see what happens."

So, he said all right. I went to work and I laid out the shaft stools, because I felt if you were going to put a shaft in you've got to always measure from the inner bottom up. If you've got it almost close to

where the bearing is going, it would be much easier to get it done in a hurry and get the shafting lined up easier. So I did. I laid out the shaft stools on that job, which was the first time they had ever done it.

I later got a letter from Dewey telling me -they were doing the work for the Henderson, which was building in the Navy yard at the time.

INTERVIEWER: The Henderson was a destroyer?

MR. NIEDERMAIR: She was a troopship. They put the shaft stools in the way I laid them out in the loft and they said it was a great job. They said, "We'll do it that way all the time," so I at least contributed.

I tried to find out while I was there how to work out shell expansions, plating, the shape of the plating. The loftsmen who worked out that expansion wouldn't tell me. "No," he said, "that's a trade secret."

I said: "Well, it's really not a trade secret. I know the principle of it. I studied that sort of thing at Webb and I know how you tackle it and I'd like to see you do it here in the loft and work with you." But he wouldn't do it, so I never did layout a shell plate in the loft.

Oddly enough, at that time they had a real problem in Philadelphia, a religious problem. The Protestants and the Catholics were really throwing rocks at each other.

INTERVIEWER: At Cramps?

MR. NIEDERMAIR: No, in Philadelphia.

INTERVIEWER: In the city itself?

MR. NIEDERMAIR: Yes, sure.

INTERVIEWER: In the city of brotherly love:

MR. NIEDERMAIR: Yes. And so they asked me what I was. Are you a Protestant or are you a Catholic? I said:

“Now, look, I never had to tell anybody what I was before and I’m not in the habit of telling you now.” So I never did tell them.

Once in a while you had to drill holes into the wooden things and you had an electric drill that you had to use, and they cut the electric wire on me. I didn't bother too much about that. I just let them get away with it. But that was one of the oddities that I ran into.

INTERVIEWER: Let me ask you at this point how much application there was from what you were learning at Webb and what you were doing in these various yards?

MR. NIEDERMAIR: What they wanted us to know was how a ship was built in a yard. We were learning how to design a ship. We learned descriptive geometry and we studied strength of materials and we learned about engines, but you went into the yard to see what was done with it. When I was on the Nevada I'd go down through the boiler rooms, down in the engine rooms. The ship had been launched now and they were getting her ready for commissioning. I did some work up in the fighting tops. They had a cage mast that you had to climb up. I put in the fittings for the portable mast that would fly all the signals and everything. I was working on the fittings that went with that at one time. Another job I did was work on the gun ports and get them ready for testing. We'd finally get them the way we thought would be tight, and I decided that that was the last time these gun ports would be tight. When she went to sea they wouldn't be tight. That's one of the advantages of going out into the yard and working because you'd see that it passed the test all right with the hose and everything, but we had a little pump that we designed, Tommy Grant and I, that squirted a very powerful little stream right along the edge of the rubber gasket that went around the guns. If the least little leak showed up, we'd tighten it up a little bit more, and so on.

I came back to Webb then and worked. Now I was going back to my second year. At the end of my sophomore year I was at Cramps, at the end of my freshman year I was at Fore River, which was a Bethlehem yard, and at the end of my junior year I went to New York Navy yard.

INTERVIEWER: What did you do there?

MR. NIEDERMAIR: There I had some very interesting things. One of the first jobs I got was to go over to Hoboken. The German ships had been seized. We had gone into the war in I think April of 1917 and we seized these ships, so there's where I first met Commander Henry T. Wright, who was greatly interested in me for the rest of my years at New York Navy Yard and also showed a great deal of interest after I left there.

He asked me to go over on the Leviathan, examine the ship, and decide how many troops it could carry, also check out and find where I would put life preservers on the ship.

INTERVIEWER: You might say that she'd been renamed, however, hadn't she?

MR. NIEDERMAIR: She was the Vaterland and she was renamed the Leviathan.

I went over to the piers in Hoboken. They had a guard at the gate, and I had my note from the yard, and so I walked down and climbed aboard that ship. There wasn't a soul in it. Everything was scattered all over the deck. They had damaged the engines. Everything was helter-skelter over the decks, but my job was mostly on the outside. I did wander through the ship a bit and then I went and checked up in order to find out about accommodations and so on, and I made an estimate of how many people it could carry. As I remember it, I came back and said that it would be able to carry over 10,000 troops. I also figured out where to put the life rafts. The life rafts were jury-rigged life rafts. As I remember, they looked to me to be made up of five-gallon oil cans boxed in with wooden frames, and they stacked those one on top of the other, with several of these cans in this wooden frame, and they would toss it overboard. I thought to myself while I was doing this and figuring it out that, yes, I've got enough of these things on there to take care of all the troops if they ever got into the water.

INTERVIEWER: That took up a lot of room, didn't it?

MR. NIEDERMAIR: Yes, it did, but what I worried about was that if any of them were in the water and they started throwing these hard-looking life rafts out, they'd kill a lot of people, just throwing the life rafts overboard. Fortunately, the ship was never hurt. She was faster than the German submarines.

INTERVIEWER: What was her speed?

MR. NIEDERMAIR: I think it was somewhere around 25 knots, 20, 25 knots.. I came away from there and went back into the yard and worked on many other things in the yard. The Tennessee was on the ways. In another year she would be ready to be launched. She was launched in the following April. The New Mexico had been launched and she was at the dock being outfitted. I did a lot of work on both of those.

INTERVIEWER: What kind of work did you do?

MR. NIEDERMAIR: I was connected with the scientific section in the yard. I was assigned to that section.

INTERVIEWER: What did that entail?

MR. NIEDERMAIR: It included all the technical calculations and ran the various tests in the yard, inclining experiments, strength calculations, launching calculations, all kinds of things that concerned basic naval architecture, I would say.

INTERVIEWER: Your math had improved considerably, hadn't it?

MR. NIEDERMAIR: Yes. Not to get too far ahead of it, I did so well that I didn't get back to Webb - Webb was willing to let me stay a month extra, so I didn't get back to Webb until October.

INTERVIEWER: Did you have the same buddies every year from Webb working with you?

MR. NIEDERMAIR: No. I remember one of the things I did was to work on a 100-foot sub-chaser, wooden sub-chaser, which was a great success. Later on, oddly enough now that you ask the question about what we did, I went down on that sub-chaser and did some work on it. Forty years later I made the presentation of a model of that 110-foot sub-chaser. I never thought of it until this moment. That model was made out of burley maple, a beautiful thing, and I inherited it when Bates left, and I felt I should give it to some place where they could put it up so I turned it over to the Mariners' Museum at Newport News. But I did board several of them in the early days when I was first in the New York yard, and ran several tests at sea including stabilizer experiments.

INTERVIEWER: And you say they did very effective work?

MR. NIEDERMAIR: Yes, they did.

INTERVIEWER: You also worked on other German ships, did you?

MR. NIEDERMAIR: There were a lot of other German ships in there. There were several big dockings and we had to go down and take off-set measurements so that we could make docking plans. We'd make up docking plans for these German ships and we developed naval architectural technical data.

INTERVIEWER: Had they been seized in other U.S. ports?

MR. NIEDERMAIR: No, they'd been seized in Hoboken. There were quite a lot of them over there. There was a Martha Washington, I think, and then there was a George Washington. There was a President Lincoln and the Amerika and others.

INTERVIEWER: Those were ex-German boats?

MR. NIEDERMAIR: Yes, and we had to get them into a dry dock, but the Leviathan was too big to dock over in the Brooklyn Navy Yard and I don't remember where they docked her (probably Boston).

INTERVIEWER: She was the largest ship in the world, wasn't she?

MR. NIEDERMAIR: She was one of the largest, yes. She bugged me for quite a long time afterwards.

Then I went back to Webb in October and I worked from then until about the 1st of May. The yard had latched onto me and they put me on extended leave until December and for Christmas vacation I was required to go to the yard and work about a week. Then they put me on extended leave again, which lasted until I finished at Webb. In that way, they really wanted to hang onto me.

INTERVIEWER: They had a latch on you!

MR. NIEDERMAIR: George Rock was the chief constructor at the yard at that time, Admiral Rock later on.

INTERVIEWER: What were you studying at Webb that final year?

MR. NIEDERMAIR: In that final year I was working on engine designs. I remember working on the design of a reciprocating engine, steam engines were being faded out at the time. We had a Commander Cathcart there. He was a real great personality. He took a great interest in me and he hoped I would write a book about these things some day. I soon dropped that idea because when I got away I didn't do any more work in the way of designing an engine. I did design an internal-combustion engine, also, while I was at Webb.

Then I became aware of the theory of carburetion. George Crouch had invented, who was an expert on streamlining and flow, was my professor in naval architecture, and I think he invented the first carburetor that looked something like a Zenith carburetor. George Crouch worked with the inventor of vacuum tubes. They were trying to work out an electric torpedo, and de Forrest had invented a vacuum tube.

I asked Crouch why de Forrest had sold that patent. I've forgotten now who he sold it to but RCA got it afterwards for about \$10,000.

INTERVIEWER: Wasn't it Atwater Kent?

MR. NIEDERMAIR: No, I don't think so. It had to do with RCA, I'm sure. Anyway, I asked George Crouch about this, why he got so little money for it, and Crouch told me:

"I asked de Forrest that, too, and all he said was bread and butter. He needed the money."

INTERVIEWER: So he couldn't bargain around?

MR. NIEDERMAIR: No, he couldn't. So that's a human-interest story to get into this thing.

Now, I was leaving Webb -

INTERVIEWER: Let me ask you at this point a question on your years at Webb and your summers in these various shipyards. What appealed to you most?

MR. NIEDERMAIR: What appealed to me most? I apparently had learned to tackle any job, regardless of which way it went. I soon developed a reputation for being a trouble-shooter. I had developed a multiple interest, and not a special single interest. I had perfected myself in the theory of naval architecture very well. I knew mechanics and materials and engineering, and I had Professor Cathcart, who was very good at that. He'd tell me stories about how the different yards and the engine tests that they went on and how they'd try to cheat the government with their readings on their instruments. Cathcart was pretty sharp. When they finished any test that required springs in something, he would take the springs home with him, to test them out and see whether they had the right tension or compression. He'd let me in on all things like that, so I had a broad knowledge when I finished, not very much as a designer, you might say, to create a whole ship, but I knew what to do with it after I had it, inclining

experiments and all these other things, and to build it, which is why I went in the yard, and the theory that I learned at Webb.

INTERVIEWER: That must have been pleasing to the school because that was certainly what they planned, was it not?

MR. NIEDERMAIR: Well, yes, I guess they looked at it that way because I got quite a reputation because of this. They remembered me and they remembered me all the time.

I used to worry about certain things, even though I was getting good marks, now that you ask about it. To give you some idea about how fussy I was about my understanding of things, we were studying descriptive geometry and I invariably got 100 on everything with Crouch. He taught math and his assistant math professor was Chaffee, and also naval architecture. In naval architecture, descriptive geometry plays a very big part. So one day I decided I'd better go in and talk to Professor Crouch about this because I was getting these good marks in descriptive geometry, but I couldn't see the thing in space. I couldn't see this solid in which I put planes through it and projected it this way and that way on three planes. But I couldn't really see the image in my mind.

Well, George Crouch said to me:

"Nidermair, don't worry about it. Some night, all of a sudden, you'll see it."

Do you know, the next day after I had gotten that off my chest, almost the next day, I could see these things. So I believe it was that sort of a close look at things, thinking about them and wanting to know myself whether I really could do them, that made the difference.

Then I finally got back to the New York Navy Yard.

INTERVIEWER: They still had a lead on you, didn't they?

MR. NIEDERMAIR: Yes, they did. George Rock was there and Wright. Then there was the chief draftsman whom I haven't mentioned. H. C. Fletcher was the chief draftsman and Ambrose Merrill was the assistant chief draftsman. Ambrose Merrill was an MIT graduate and Fletcher was a self-trained

person. He studied at night school and everything and he was really a beautiful person. Those four evidently, in one way or another, kept feeding things to me, George Rock, H. T. Wright, and Merrill, particularly.

I still write to Merrill. He's now over ninety years old. I got a beautiful letter from him just recently and I've got to get in touch with him and go and see him.

It wasn't long after I got back to the New York Yard before I ran into what I call my first spotlight job. You know, you get all kinds of jobs but something happens sometimes with one that you get and it brings management in on it. Well, that spotlight job was that the people in the scientific section had worked out an inclining experiment that was sent to the Bureau of C & R in Washington and had been turned down a couple of times. The inclining experiment was to determine the location accurately of the center of gravity of the ship and also its weight, accurate readings of the drafts and all that sort of thing, so you would find out what the metacentric height was by this inclining experiment. You put weights on the deck and the ship would heel over and from it you could determine where the center of gravity of the ship was. You can calculate the metacenter. The theoretical center is called the metacenter. That's determined by the form of the ship. It's a volumetric and a water-line inertial calculation.

That had been turned down by the people in the bureau.

INTERVIEWER: Did they give their reasons?

MR. NIEDERMAIR: I don't recall, but I do know that now they were on the spot. They ran the experiment, they worked it out, but it was turned down. Why, I don't remember. So I think they decided that I, being just out of Webb, they'd try it out on me, which they did.

I remembered all my work. I'd studied some of the work that Professor Hofgard had done over the years, I knew about his what they called the "lost buoyancy" method that concerned when water got

into a ship and you could figure it two ways: either use the water getting into the ship as an added weight, or you could figure it by assuming that the buoyancy of the ship, the hull of the ship, wherever the water was it wasn't there any more, so you lost buoyancy. So I applied what I knew about theoretical naval architecture and I had to make up all the data sheets, redo the whole thing, and bring in a brand-new report.

INTERVIEWER: This was for what specific ship?

MR. NIEDERMAIR: I've forgotten. I think it was one of the early sub-marines. It was the inclining experiment of a submarine. That's a very important point. I'm glad you asked that.

So what happened? It went to Washington and it came back. Apparently Rock got the notice in his office that it was approved. I guess they said "three cheers." Rock had a very gruff voice and he came to the doorway of the scientific section and he yelled out in a loud voice:

"Who worked up the inclining experiment on the submarine?"

Of course, everybody was willing to point me out -

INTERVIEWER: Because they thought it was going to be a turn-down!

MR. NIEDERMAIR: And Rock came over. That was really my first real meeting with Rock. He put his hand on my back, he congratulated me and shook my hand, and said what a good job I'd done. Then he left.

At that instant, I became a submarine expert, never having been on a submarine. The closest I'd been to a submarine was the old Iron Whale that was standing in the yard. I used to peek into the peephole to see a place where there was kind of a bicycle in there that turned the propeller.

From that time on, I was the one for submarines.

INTERVIEWER: That was indeed a spotlight job. I understand.

MR. NIEDERMAIR: I did get going very soon on that, but I missed a point here a little bit because in working all these things out -- I arrived in the yard in May -

INTERVIEWER: Of 1918?

MR. NIEDERMAIR: Yes -- and by the time September came around I'd decided that I wanted to get a commission in the Navy, so I enlisted in the Navy as a chief machinist's mate. This was the procedure that they had to become an officer.

INTERVIEWER: You already had the inclining experiment behind you, had you?

MR. NIEDERMAIR: Yes, I had that behind me and I probably had a few other things behind me. My note here tells that I had the submarine behind me.

Now I joined the officers' training and I went through all that from September and was finished with all the military --

INTERVIEWER: Where were you stationed?

MR. NIEDERMAIR: I was stationed at Pelham Bay, and it was a very rigorous training program. I remember some of the people who were in my group protested so much, they said they must be a bunch of Prussians who are running the place. But I timed myself very carefully. I was accustomed to keeping data, you know, so it was no problem. They used to tell me that I kept a stopwatch on them because I knew exactly when I had to wash my clothes and when I had to do this and when I had to do that.

I knew what I wanted to do and so I went through all the military training, including the Manual of Arms, company parades, rowing the boats, semaphore signals -I've forgotten how fast I could do the signals, but I passed all those tests, everything connected with that, and we were on our last company

formation, in which we were being examined, and now we're on a company front when I was called front and center and told to report at head- quarters.

The Secretary of the Navy, Josephus Daniels, had decided - - I always thought that Commander Wright and Rock had something to do with this -- they let me go through all this military training, ready for commissioning, and, of course, if I got the commission they would have no control on me getting back to the yard. So they wrote a lot of letters to the Secretary of the Navy, and the Secretary of the Navy ordered me discharged from the Navy and returned to the Navy Yard.

INTERVIEWER: That must have been a disappointment after you'd done all that?

MR. NIEDERMAIR: It was. I was quite disappointed, so I didn't report right away. I was a couple of weeks late in coming over.

INTERVIEWER: AWOL!

MR. NIEDERMAIR: I really wasn't because I was on a resigned status now and I could have gone anywhere.

INTERVIEWER: Did they try to get in touch with you?

MR. NIEDERMAIR: No. I had kept it quite a secret where I was going but I had told Wright that I was going into the Navy. I wanted to get this training. But I wouldn't tell them where or what part of the Navy or anything else. He said, Well, fine, but he did find out where I was. They let me go through the whole shebang so I finished all that, and it was very good because I had a lot of lectures on command. And one of the things I remember is when in doubt to carry on what you think the orders might have been.

INTERVIEWER: A common sense thing.

MR. NIEDERMAIR: Yes. Now the first thing that Wright said to me was: "What took you so long?" In the meantime the gradings had changed. They used to have a ship draftsman so much and so much, and now they had three grades of draftsmen. The lowest one was C, then B, then A. And I remember Wright told me all this. He said: "While you were away" such and such happened and the Macy Board awards had come in. "These are the grades," he said, and he described each one to me. "And where do you think you belong?" he asked me.

I said, A, top grade, and Wright said, "Fine, you tell that to Mr. Fletcher." So I did. I went in and told Fletcher that I'd seen Wright and had told him that I should be an A and "Wright said to tell you that that's where I said I belonged," and Fletcher put me there.

INTERVIEWER: On your say-so!

MR. NIEDERMAIR: So I started off at A. But you see those people really were on my side already because this spotlight job particularly, the construction officer was getting into trouble in Washington with the chief because, what's the matter, New York didn't know what it was doing.

In any case, I started off getting into really good jobs like launching calculations.

INTERVIEWER: Before you talk about that, would you give me a picture of the New York Shipyard in that time? That was World War I.

Mr."N.: Well, we had a couple of big dry docks then. *No.*2 dock was a great big one. We had a building ways that could take two ships, two battleships, and we had quite a few shops -all kinds of shops, very good shops, a machine shop, an electric shop, a forge shop, and so forth, pattern-making, a full shipyard organization.

INTERVIEWER: What sort of personnel, how many people were there?

MR. NIEDERMAIR: I have no idea how many people we had there, but we must have had thousands of people working there because we had the Tennessee there, we were taking in all these German ships that were being docked there, and some of the people who ran those dockings were really geniuses. I watched them dock one of those big German ships, and it would be a matter of inches at the head of the dock and the tail end of the German ship would come in between the ribs of the gate that would come in. You had to put the rudder over and they did it so well. It takes a lot of people to do things like that. So I would say that we probably had 8,000 or 10,000 people there.

I got going on the launching of the Tennessee, and now it was 1919. The launching of the Tennessee was heading up close and that was on April 30, the day set for launching. I had a habit of staying over. I'd get in early in the morning if I had a job to do and I'd stay over if I was in the middle of something to try to finish it up so that when I came in the morning I would have that thing finished, especially since, in this case, the launching was going to be tomorrow morning.

While I was busy working on this thing, Rock came in, George Rock, and said:

"I've been down in the yard looking at the Tennessee and looking down the ways. I think the armor shelf will hit the concrete sidewalls. What do you know about it?"

I said: "I As far as I know, everything's in the clear."

"No," he said, "I don't think it is. I think we'll hit it." On the Tennessee the armor shelf was going to be an angle that was put on the side of the regular shelf, so they had the angle on there to take the armor, whereas on the New Mexico, I imagine, they had the ship shape there and a kind of a shelf put into the side of the ship and then continued the side or the ship up, and the armor would be flush with the side of the ship instead of sticking over.

So I said, "The only thing I could do, Captain, would be to get a transit somewhere and I'll go down and set it up. It's getting kind of dark, so we'll have to get the transit and it must be locked up somewhere." So he called a yard watchman-- Rock, I guess, knew where the transits were -- to bust the door down.

INTERVIEWER: In the scaffolding, are they?

MR. NIEDERMAIR: This was in a building. It's a surveyor's instrument, and you set it up like a theodolite. I knew a little bit about them.

I went down there all by myself. I didn't have any help, but I worked out a parallel line and I took a sight as near as I could. It was parallel to the ship's ways, and I decided that it wouldn't hit.

INTERVIEWER: There was clearance?

MR. NIEDERMAIR: It was clear. So I went back and Rock was waiting patiently, and I told him that I thought we'd clear. I said that the way I figured it, we'd clear. He took my word for it, so we launched the ship the next day and it cleared.

INTERVIEWER: Were there a lot of notables there?

MR. NIEDERMAIR: Oh, yes, but I was in the launching pit. I hadn't been on any launchings before, but I made out all the different schedules on when to drive the wedges and get the ship onto the grease and all that sort of thing. Now I was in the launching pit under the ship and it was going down over my head. I could hear it humming as it went down. I was busy watching the schedule because we were the ones who from the pressure on the trigger would have to give the signals. Now we were sitting on the grease and the only thing that was holding it were these triggers. Finally, we spot the time to go and release the triggers and down went the ship. Of course, they hit it with champagne and the ship went into the water. Rock remembered that I did that job.

INTERVIEWER: You put his mind at rest!

MR. NIEDERMAIR: Yes. Later on theodolites and so on came in even more importantly. However, shortly after we launched the Tennessee I was elected to the shop committee.

INTERVIEWER: This, you said, was at the order of FDR, who had ordered that this be done in the shipyards?

MR. NIEDERMAIR: Yes.

INTERVIEWER: Tell me that background.

MR. NIEDERMAIR: You mean about the shop committee?

INTERVIEWER: Yes, about shop committees, the order to set up these committees.

MR. NIEDERMAIR: Well, if there was anything that the men complained about or anything happened between the supervisors or the officers and the men in a ship, they would come to the shop committeeman and the shop committeeman would then take it up with the command and talk about it.

INTERVIEWER: He became their spokesman?

MR. NIEDERMAIR: Yes, automatically. I did that.

INTERVIEWER: Was this an election? Did they elect you?

MR. NIEDERMAIR: Yes, I was elected. Evidently, people liked me. Anyway, it was very unusual because it was 1919 or 1920 and I'd only been out of Webb two years. Now when you get out of college we put you in training for a couple of years.

INTERVIEWER: You were a youngster, really.

MR. NIEDERMAIR: Yes. Anyway, I handled that shop committee job and quite a few cases" but a particular thing happened. The question of layoffs came up. Also something happened in the way officers were arranged over the design people. Up until this particular time, there was always a construction officer in a straight line between the design people and the constructor. There might be an assistant constructor who would be with the chief draftsman. Now, there was a struggle between the line and the staff officers. It started to show up that early.

By the time this happened Rock had gone. He was down in Washington, and Henry T. Wright was a captain and he was the chief constructor of the yard now. They put a line officer between him and his contact, between his assistant construction officer, who was with the chief draftsman and communicated orders through the chief draftsman, and that line officer was Fredericks.

I got along very well with Fredericks because he was a nut in -and it was well taken, too -the way that he felt a little fresh air twice a day would be good and a little exercise would be a good idea. So, twice a day we'd open the windows and every- body would go out and stretch themselves and breathe some fresh air.

INTERVIEWER: This was the early coffee break, was it?

MR. NIEDERMAIR: Well, we didn't have any coffee break, really, but this is what he wanted because the room was too stuffy for him. He was a ship officer, you see, and was used to being out at sea, and with all the windows shut I guess he didn't like it. He and I got along fine until he did something that I took exception to. They stopped work on the battleship that was building in the yard. I think it was the 49 that was in the New York Yard. I've forgotten now. Maybe they had her and the 50.

INTERVIEWER: They hadn't got names yet?

MR. NIEDERMAIR: No, they stopped work on them and so they had to lay people off. The work slackened off when they stopped work on those ships. They were going to scrap them.

Fredericks helter-skelter started laying off people without checking to see what their background was. Some of them were the best people during the war, but he would lay them off. It didn't make any difference how much seniority they had or any- thing. Of course, we didn't have any retirement laws in those days. I went to him and told him he was doing this wrong. I've forgotten his first name. He said: "Well, Niedermair, there's a lot of hankypanky goes on with these things, and I've made my decision that this is the way I'm going to do it."

So he had these people get their notice. I went to the construction officer, who was under Fredericks -- I don't want to mention his name because he's still alive -- oh, well, I can mention his name, it's Johnny Hale -- Commander Hale. He retired as a captain. I went to Hale and he would always try to fluff me off on these things, which I guess was a way or telling me he really couldn't do anything about it, but he didn't say so. He'd say things like this to me:

"You know what a white rat is, don't you?" You see, he was really carrying Fredericks' tale to me about hankypanky. I said:

"Yes, I know about a white rat. I was down on the Falcon." The Falcon was a rescue ship that was down in the yard, and it was true, I had been on the Falcon. She had a diving tank on her and all that sort of stuff. Little did I know how I was going to be connected with that later. I was on that ship and some of the members of the crew told me about the white rat they had as a pet, and they showed him to me. He was walking around, his ears would be bitten off and everything, but they told me that that white rat would chase all other rats off the ship. That's why its ear was nipped and so on. There weren't any rats on that ship but that white rat.

So I told Hale, "yes, I know what a white rat is. I just met one today on the Falcon and he chases all the other rats right off the ship."

Hale didn't say any more about white rats!

So I went off to Wright and told him about this thing and he said: "I agree with you." But you see, I didn't know about this line officer business. I hadn't signed that up as a problem because that wasn't any of my business. Navy was Navy, see. So I talked to Captain Wright and he said:

"Yes, I know all about it, Niedermair, and I was in talking to Captain Butler." He was the yard manager. "And he threw me out of his office."

"Oh," I said, "I guess there's no point in my going in to see him then. That's the end of the line, isn't it?" And Wright said:

No, it isn't. I can't go to see the commandant. I suggest you see Butler, anyway. He probably will throw you out, but you'd better go and see him."

So I did. I went to see Butler and told him what was going on. Of course, he was a line officer now and his contact was with Fredericks, in a straight line, which I didn't know --

INTERVIEWER: You were innocent of all that!

MR. NIEDERMAIR: All right. I went to work and talked to Butler just a few minutes when he got up and walked out on me. He didn't order me out because he knew better than that, and I walked out. But I never thought of going to the commandant about it because I didn't want to make such a fuss about this thing because

Captain Wright couldn't do anything about it and so on, but I had sense enough not to go back to Captain Wright's office after I'd been in Butler's office. I went back to my drafting board, and then when the opportune time came in a roundabout way I went and visited Captain Wright. I told Wright what had happened and he said: "I know all about it." He always worked at a stand-up desk and he had glass all around so he could see what was going on. And Willie Francis Gibbs loved to work at a stand-up desk, too. Anyway, I said:

"So, that's what happened to me." And Wright said:

"Now you can see the commandant. I can't go to the commandant, but there are no strings on you."

INTERVIEWER: What was the commandant's rank?

MR. NIEDERMAIR: He was Rear Admiral C. P. Plunkett, Commandant of the Third Naval District. The big boss of the Third Naval District. Imagine the training I was getting here! All right. I called up the commandant's secretary and made a date. She made a date for me right away. That is the next morning I saw the commandant. I told the commandant my story and he said:

"Niedermair, the thing we'll do is to call all the super- visors and all the officers in the yard to the sail loft and you tell them exactly what you've told me."

But before I took such a stand on these things, as a sort of extra thing I did for my own self, I'd gone over to the New York Telephone Company and several companies on Manhattan Island and talked to them about what they did about their senior employees.

INTERVIEWER: When they had to reduce their staff.

MR. NIEDERMAIR: So in telling the story that I told the commandant, I told them about what I had done and I came back and was more convinced than ever that this was the wrong move, that it's always a mistake to layoff your experience, and what Fredericks was doing was laying off experience, and really the only sales talk you've got is your experience.

INTERVIEWER: It's continuity, yes.

MR. NIEDERMAIR: Plunkett agreed with me. I had never made a real public speech before anybody and Plunkett said, "And you'll tell the story. I'll arrange a date. I'll let you know and then you come in my office and we'll go over there together."

Of course, I hadn't told Fletcher or Ambrose Merrill all the things I did, and they had to be at this meeting. Fredericks had to be there, Hale had to be there, all the officers in the yard who had any activity

in the shops had to be there, all shop committeemen. Plunkett introduced me. I had a pretty good introduction. He told them that I was going to tell them what I'd told him.

INTERVIEWER: Weren't you a little nervous at this point?

MR. NIEDERMAIR: I don't remember because I had been secretary of my student organization and when I worked for the baker I was accustomed to meeting people long before I got to Webb. As a matter of fact, I always decided about things my way, anyhow, even when I was a boy. This stayed with me all my life.

Anyway, I told my story and in about a week Fredericks came in to me and said:

"Niedermair, I've come to say good-bye." I said, "What happened?"

"I'm transferred to sea."

I said: "I'm sorry to hear that. Where are you going?" I And he said:

"I'm going to be captain of the Nitro, and I think a lot of people here hope it blows up."

And I said: "Oh, now look. This was not a question of personalities, really. There was a point. I felt you did the wrong thing and I carried it out the way my job as a shop committeeman required me to do the best I could for the people that I represented. I told you the story. I had to take it to the commandant and the commandant, I suppose, is responsible for you going to sea."

"Yes," he said, "and I came to say that, yes, I see. I never thought of it that way." He evidently believed other people, you see.

Of course, there's no other way of having everybody in the New York Navy Yard know me, but when the commandant of the yard introduces you.

INTERVIEWER: The whole system of laying-off was changed then, was it?

MR. NIEDERMAIR: Well, FDR did me a great favor there. I learned to get along with top people. I never in all my life really asked for a favor. I never had to. I did ask for favors for other people.

INTERVIEWER: But in that particular case, as a result of all this action, the whole system of laying-off men was changed, was it?

MR. NIEDERMAIR: Yes. They brought these other people back. Some of them were already out.

INTERVIEWER: And they brought them back?

MR. NIEDERMAIR: Yes. Gus Wenninger, one of my lifelong friends lives on Long Island and I'm still in correspondence with him.

INTERVIEWER: And then they let go the men who'd been there the shorter time?

MR. NIEDERMAIR: I don't know how they worked it out. They probably found they had plenty of work, anyway. I think some of this was just prejudice. This other thing was just to try to make a big showing. The orders were to layoff people and I guess he started at the wrong end.

INTERVIEWER: There was another example you wanted to relate of your usefulness in this job, about the sick leave.

MR. NIEDERMAIR: Yes, the sick leave thing. That was another thing that was minor in a way, but actually it was a very important thing. It might have been most important with George Rock, now that you mention that. I don't have it in my list of things here.

There was a question that came up about sick leave. A man named Sassensheid had been injured in the boat shop, and Rock turned down his sick leave because he didn't think there was an "and" in there. You either had to be seriously ill and worthy.

INTERVIEWER: Worthy? That's curious.

MR. NIEDERMAIR: Yes. I'm using that word now because I can't think of any other word.

I talked to Rock about this. I had to go to him after working hours, though, because the first time you brought a complaint in you had to do it after quitting time. You had to make an appointment to see these people right after quitting time.

INTERVIEWER: Why? Wasn't it a part of a working day?

MR. NIEDERMAIR: You had to do it on your own time. You couldn't use government time for this. But, as it worked out, when the commandant got in on the act, it turned it around. When it got to be a big thing, I had to carry it through with everybody in the regular way.

However, on this sick leave, I went to Rock and protested it, because the man had been injured in the yard and I knew that he had these spasms coming on and off, and he was really sick. Rack, I think, thought that his sickness wasn't really too bad, even though it was the same thing. Before I left him that night I said to him:

"Well, we'll have to take it up in Washington and have the word 'and' changed to 'or' in the sick leave regulations."

The next morning Rock called me into his office. He had a telegram and the "and" was changed to "or."

INTERVIEWER: Sick or worthy?

MR. NIEDERMAIR: So either one would do, and so Sassenshied got his sick leave. But Rock kind of wondered, I think. This was before the commandant thing happened because Rack wasn't there any more by the time I arrived at that sort of deal. That was a big deal.

INTERVIEWER: Yes, I understand.

MR. NIEDERMAIR: I think he always felt that I must have had an inside track. I was trying to remember the name of the man who did work with the Secretary of the Navy on that project, but I can't think of it.

Later on, before Rock got away, I did do something for him that was most interesting. It was very odd. Rock called me into his office and said:

“Niedermair, what do you know about civil engineering?” And

I said: “Gee, I don't know a damned thing about civil engineering. When do I have to know about it?”

He said: "Oh, in a couple of weeks." I said: “I'll know all about it by then. What is the job?”

And he told me: "Yards and Docks somehow or other can't understand what's required in connection with the shape of the ways. They'll turn all the money over to us and we should do the job ourselves.”

I had planned new ways in this way. I had put down the type of surface that I wanted. I had read up on it and decided that in building heavy ships, battleships, I wanted a small slope under the center of gravity at the beginning, but I wanted a big slope at the end. If you had a straight line, flat surface, you couldn't get an increase as it went down the ways, so I selected a circle that was part of a five-mile radius. Then Rock said:

“Well, Niedermair, they've turned the money back and now we'll build the ways. You'll do it.”

I said; “I can't do it alone. I'll have to get help.”

"You can get anybody you want, all the help you need. Go out in the yard and get the yard set up and order the materials, everything to build these ways." They were to be built out of wood. Blocks were to be built up off the concrete base.

And so I worked all summer, and who did I pick to help me? I picked people -- I interviewed a few civil engineers who were around there. I knew one civil engineer who was very close to me, Friedenreich, his name was, and I told him my problem. So we ganged together and we built a sawmill outside the yard and we ordered the building materials. I made one mistake in the whole thing. It was a mistake that I regretted because I ordered 14-by 14-dimensional timbers. They were pretty big. I thought about it and thought about it, because I think they denuded all the yellow pine trees down south in order to get 14-by14 timber. I always thought, gee, 12-by-12s would have been good enough, as it turned out,

because they never built a battleship on the ways. The first thing that was launched on the ways after we got done with it was a cruiser, and that's a long story in a way, it was the Pensacola. I had a half-inch slope now and a cruiser was going to be launched on there. This was sort of a surprise when some of the people like Ernie Rigg from New York Ship heard that we were launching this cruiser on a half-inch slope.

But in my research on the problem I said the grease doesn't know the difference of what's on top of it. The thing that launches it is the pressure per square foot on the grease. Now, if I have a weight on top that is wide enough to prevent the grease from sliding outside the ways at, say, 2-1/2 tons per square foot, we can put the cruiser Pensacola on that half-inch slope, be very careful how we do it, and the ship will be launched. So I figured that all out and by the time launching time came up I was no longer in the yard. I was in London. I knew the day it was to be launched but I couldn't find out whether it was in the water or not. I was worried sick!

Anyway, that is a good end for that story about the ways. But it was an odd job to give me. Actually, I had them build a sawmill for me, and, of course, the people from the woodworking shop ran it. The 14-by-14 timbers were delivered and we built the ways according to the way we surveyed the yard. We had established the centerlines and all that sort of thing.

I did one foolish thing in connection with that, though. While we were doing that surveying work, I tried to get some of the laborers to go -- I wanted to strike a very careful center-line and I took a spot on a bridge, I think it was the Williamsburg Bridge, that was exactly down in the plane that I wanted. I apparently had the thing set up so that the people were on the bridge throwing the sight, and I wanted the laborers to go out on the 6-inch angle beam when the ways was up about 100 feet or more in the air and establish it. I think it was the top of the crane that was there, then we could take that line and drop it down. The crane would stand still. I had the crane operator get out of the carriage when we were going to do this, but I couldn't get any of the laborers to walk out on this angle. Because I wasn't married then and I didn't have any family at all I said, "OK, I'll go out and do it."

I walked out on this 6-inch angle, kneeled down, and spotted it for them. I was quite well coordinated and, having worked in shipyards, you had to be used to climbing on things but not quite that way.

However, we finished the job and they launched the ship. Rigg from New York Ship was there and I talked to Ernie Rigg later about it, and he said:

"Yes, I went up there expecting to see the Pensacola stick on the ways. Actually, the ship was very anxious to get in the water. She broke loose a little sooner than they expected and down she went." That's the end of that.

INTERVIEWER: Why did Yards and Dock renege on the design?

MR. NIEDERMAIR: They couldn't quite figure out how to get this surface, this half-mile radius. We *have* cambers that we put on the decks of ships and everything and using all kinds of odd-looking curves is a thing that a naval architect is working with all the time. A curve doesn't bother him. One of the things you really learn is all kinds of curves. You know the names of some of them. One that pops into my mind now is Lemniscate of Bernoulli. That's one I love to think about. It's one of these oddities that sticks in your head. I had selected the five-mile-radius curve and I knew how to get all the elevations -- they were a little cagey about it, so I worked it out for No.2 ways, which is what I was working on.

After we got the No.2 ways built -- Yards and Docks built the No.1 ways -

INTERVIEWER: Oh, they did?

MR. NIEDERMAIR: Yes.

INTERVIEWER: Do you want to talk about cost overruns?

MR. NIEDERMAIR: Yes. I got interested in this cost overrun thing which I talked about. I may have talked about it previously here. But the point was that I did take quite an interest in these cost over- runs

and so Captain Wright thought it would be a good idea if I ran these jobs, made the cost estimates and then ran the jobs through the shops and supervised them completely, all the way through the accounting office until the job was finished. It would be good experience for me and I would also find out why these things run over, which I did. But in the jobs I ran I also indicated or found out why they ran over cost often. The accounting office used to report to me every day all the charges to every job that I was interested in, which apparently no one else ever did before. They just waited till the job was done, then they added it all up, but I checked it practically every day on any job that I ran. I did very well on that. It was just about the time that I was studying economics and business management, so I was interested in a thing that had nothing to do with the meta-centric height.

INTERVIEWER: You were a little before your time. You would have been a good member for McNamara's team, wouldn't you?

MR. NIEDERMAIR: Well, I carried that idea on quite a bit. I have one other comment I want to make here.

Now we were approaching 1923 and on April 22, 1923, I married Ethel May Victoria Irwin, and she was a great lady, who for fifty years gave me the greatest freedom imaginable to carry on my chosen profession. Through it all, she was a perfect companion always, with a strong buoyant personality, with a song in her heart. She had a beautiful voice, she loved poetry. As a matter of fact, we met because of her love for poetry. And we met through an oddity. We would never have met, there was no way that Ethel and I would ever have met, even though we lived on Staten Island -- I was away from Staten Island more than I was on it at that time, except for one thing.

One day, as I was coming to the ferry to go on a ferry boat, there was a friend of mine there, Charlie Post. He had been in the Naval Reserve on Staten Island and when the war came he was in the crew of the President Lincoln. The President Lincoln was torpedoed and Charlie Post, after several days

in the water, was picked up on a life raft and his life was saved, and now I met him at the ferry house and Charlie said to me:

"Wait a minute, I'm waiting for a couple of girl friends," and one of the girl friends was Ethel.

That, I always thought, was an odd way to meet.

INTERVIEWER: No, indeed, but tell me how on earth did you have time for any courtship with all your activities? And your dedication to your job?

MR. NIEDERMAIR: I was a problem for Ethel because I would leave and go down. I remember one time I went away and I came back and my tie pin was missing. I didn't put any significance in it but later on I found out that the thing that worried her about that time was my tie pin -- I bet he met a girl down there or something. You used to give your tie pins away, you see, and I had a beautiful tie pin.

G: That was a sign of interest then?

MR. NIEDERMAIR: Yes, sure, and she thought maybe the other girl got it. But Charlie Post had warned her about me. He said that I had a girl in Brooklyn and he made up a lot of stories because I think he liked Ethel, too. Ethel and I had a slow courtship, I would say. It lasted from about 1920 to about 1923. But you see I was just getting started and I couldn't even think of getting married. I wasn't sure that I thought of getting married in April 1923, but by that time I was a supervisor and all that sort of thing.

INTERVIEWER: What were you making per week in those days, when you got married?

MR. NIEDERMAIR: I've forgotten what it was, but I was completely preoccupied with my job. When I was over at the yard there, I'd go down to the Philadelphia Yard. That's where I was when I supposedly lost my tie pin. Then I'd be up in Boston. There were different jobs that would come up, or there'd be a ship in the yard that New York worked on and I'd go up and see it. I would always be pegged for one thing or another.

Some of the things that happened were quite unusual. I got connected with diesel engines. I told you that I was working on a design of engines while I was at Webb, but that's not knowing very much about an engine. That's not knowing anything about how to build it. Even though an inventor can invent an engine, he may not know how to build it. There's a big difference.

INTERVIEWER: I can see that, the theory and the application.

MR. NIEDERMAIR: So by the time 1923 got around, I wasn't doing too badly. I could afford to get married. There were pay increases. They weren't very much, probably \$8 a day. That seemed like pretty good pay.

INTERVIEWER: It went a great deal farther than it does today!

MR. NIEDERMAIR: Yes.

INTERVIEWER: Shall we break off there?

MR. NIEDERMAIR: Yes.

Interview No.2 with Mr. John C. Niedermair

Place: His residence in Stone Harbor, New Jersey

Date: High noon, 29 July 1975

Subject: Biography

By: John T. Mason, Jr.

INTERVIEWER: It's great to see you again today, Sir, and to see that obviously you're in fine fettle. Last time we broke off with an account of your marriage in the year 1923 to a very charming young lady with whom you lived for the next fifty years.

Now, Sir, will you begin with a further discussion of your period with the shipyard.

MR. NIEDERMAIR: Yes. It wasn't very long after we were married - about a year and a half -when the question arose as to why the United States Lines was having a lot of trouble with the Leviathan as a passenger ship. This problem was caused by the fact that the first-class ventilation, as we found out when we went into it, was almost an absolute failure.

The reason for it was that they had not connected the amount of air supply from the fans into the rooms properly.

INTERVIEWER: This was from the beginning?

MR. NIEDERMAIR: This was the way Newport News did the work and they made the installations, and Gibbs Brothers were the naval architects.

Ellsburg and I went aboard and Jake Cohn -- Jake Cohn was a man who had worked in ventilation, that was his specialty. I was not particularly known in the way of ventilation, but again Captain H. T. Wright had loads of confidence in me. I noticed just recently, in going through my papers, that in the meantime, before I even got started on the Leviathan, it was in the wind that I was supposed to go off to a stability committee. William Francis Gibbs was to be the chairman of it, and this was for the Department of Commerce. It was an official government stability committee to investigate the stability of merchant ships in connection, I suppose, with steamboat inspection and so on, but I didn't know this. I noticed in the memorandum there that Captain Wright was speculating that I would have to miss the first few trips on the Leviathan. It was his note to Ellsburg in this regard.

I was unaware of what was happening. I was busy in the yard, doing the things that I was there to do according to my job specification, but I very seldom had a chance to work on. All of a sudden one afternoon, on a Wednesday of a week in about October 1924, Ellsburg, whom I had never met, came to me where I was working in the scientific section and asked me if I would be ready to go to Europe on Saturday. That was only a couple of days away, and I told him I thought I would.

Well, now, an interesting thing happened. He told me then that we would be traveling on the Leviathan, they were having trouble, and we would investigate this while we were at sea. That was a very intriguing invitation.

INTERVIEWER: A vacation and work combined!

MR. NIEDERMAIR: It would seem like that and it did work out partly a vacation, but it had other benefits for me that were far beyond that because I got the great experience of being in the North Atlantic, some 25,000 miles at sea that winter.

Ellsburg left, and it occurred to me that I didn't ask him how we were traveling, so I called him on the phone and asked him: "How are we traveling?" He said, "Cabin class, I guess."

I said: "Well, we're the experts, aren't we?" He didn't debate that, so I said:

"If we're experts, we should go first class -"

INTERVIEWER: And suffer the ventilation!

MR. NIEDERMAIR: I didn't know at that time where the trouble was in ventilation, and Ellsburg said, no, he thought we'd go cabin. I said: "If we're experts, we should travel first class. I'm certainly not going as an expert in second class. If that's the case, if it's cabin class, I'm not going."

That was the end of that conversation and a few minutes after I hung up, maybe ten minutes or so, I got another call back from Ellsburg saying: "We're traveling first class." But he never allowed for the fact that I was an expert. Actually, I wasn't in ventilation, but I was an expert in engineering, I suppose. Otherwise, I wouldn't be going.

Now we were traveling first class, and you've heard all the trouble about passports and one thing and another, how long it takes to do it. Well, by Friday, two days later, I had my passport and everything, and Saturday morning I left on the Leviathan.

We traveled back and forth on there and we were to investigate the ventilation, the first-class ventilation, which we did. I started to hit the thing pretty hard, and the first thing you know I was running that part of the show, and my expert in ventilation, Jake Cohn, got seasick to beat the band and I had an awful time driving him around all the time.

However, other things developed. Not only did we have the ventilation to take care of, but we found that the amount of air that was going into the boilers was insufficient. They had converted coal-burning boilers to fuel oil burning. Of course, fuel oil was a lot easier to handle and everything but it required air, more air than was coming to the burners. Tremendous cones of carbon would be deposited all over the first-class sections of the open decks.

So I not only dug into the ventilation but I dug into the amount of air that we would have to take care of on the boilers. And it so happened that when I finally discovered what the trouble was in the ventilation --they had overhead light fixtures in all the staterooms and around the edges of the lights they had a little screen in there that appeared like the stuff that they put in chair seats, woven chair seats. It was a pretty design but they didn't connect it to the air ducts. The air would be let into the ceilings of the staterooms and the best-ventilated space was between the ceiling of the stateroom and the deck over it, not the staterooms.

That meant that after we checked it all out we made the estimate and decided we didn't have to add a single fan, but we did have to go through the thing and put stateroom vent ducts into the ship, which we did when we came back, say, in December. Then we took the ship up to Boston.

But in going back and forth we also had to look into the forced-draft system, and there we did have to add fans to get more air because they were very-slow-moving fans and the pressurized boiler rooms needed more air, and we worked out a method of doing this. In one case where we broke through in the uptakes there to see over the boiler rooms, there we found pieces of two-by-fours that had been left in there had turned to char- coal. That'll give you some idea how hot those spaces were getting.

INTERVIEWER: What a hazard!

MR. NIEDERMAIR: A hazard, too, but there they were. They'd turned to charcoal and that was it.

INTERVIEWER: Let me ask, what kind of ventilation system did the Germans *have* when they operated her as a passenger ship?

MR. NIEDERMAIR: The old fans that were on there were the ones they were using, and I guess the Germans had the same thing. They *even* had controls at the doorway so you could turn a damper to open and close --the damper would be off in one corner in the ceiling space overhead --but it was never led *over* to this little thing around the light.

We changed all that. Where they probably got a charge of the air in the staterooms once every hour or two, we had an average of less than seven minutes' change of air in every single first-class stateroom when we got through, without adding a single fan.

INTERVIEWER: The passengers must *have* been complaining, weren't they?

MR. NIEDERMAIR: They sure did. There's an interesting little story about that because when Francis Gibbs would be called upon to come aboard and inspect the ship, they had cork on the decks so that the heat from the boilers on the deck wouldn't burn your feet! And they had a twofold problem, the way they took care of it. In any case, the result was that Gibbs had to inspect it there. He'd come aboard and go into staterooms, and I understand that one time they went into a stateroom where they had a real great problem and they claimed they could fry an egg on the deck. Willy Francis came in and looked at it. There were women in this room and they were practically naked. One of them said to the ship's officer who had William. Francis Gibbs along, "We need air. We don't want a minister here." They looked at Willie and he looked so sober and solemn that they said they didn't need a minister, they needed more air!

So those are some of the humorous things, but that winter in the North Atlantic was the worst winter in the North Atlantic on record, almost. It was that way and I haven't heard or one since or up to that time that was worse. Lloyds insurance company said that practically every ship that crossed the Atlantic that winter in one way or another was damaged --every single ship that crossed the North Atlantic in the winter of 1924-25 was damaged in one way or another.

By December when we were coming back with all the celebrities in the ship, not only was the ventilation system bad but the heating system was bad, too. They had little radiators in the rooms and so on and there was trouble with those. That was solved in other ways, but the main trouble was the ventilation. However, without the ventilation there the heat would be so hot that some of the Englishmen who traveled in the ship now and then couldn't stand the heat in these staterooms, be- sides

the fact that the system wasn't too easily controlled. However, coming back in December, just before Christmas, and my last trip back for that part of our job and before we took the ship up to Boston for repairs, why, the ship started breaking in two, off Newfoundland. Actually, through the two-inch-strength deck of the ship cracks started to appear early one morning in one of these bad storms. It woke me up and Ellsberg and I went up and took a look at it. The cracks were working their way across the deck and we had the ship's carpenters drill some big holes through the deck to try to stop the cracks from going all the way across the deck. That worked, and we got the ship back in to New York.

Now we had three things to repair. We had the ventilation to take care of, we had the forced-draft system for the boilers to take care of, which we had to do with extra fans, and we had to take care of the ship breaking in two. So we went up to Boston and got a certain amount of money to fix the ship.

INTERVIEWER: Why wasn't it done in your own shipyard?

MR. NIEDERMAIR: Because we couldn't get her into a dry dock there. The dry dock up in Boston was bigger than the one in the yard. We couldn't get the Leviathan into the New York dry dock.

INTERVIEWER: Refresh my mind as to the tonnage of the Leviathan.

MR. NIEDERMAIR: I don't know what it was. I see there was some argument by somebody that wrote a history about ships. There was a little article in the Institute Proceedings about the tonnage. I never checked into that but Gibbs had worked it out so it was the biggest ship in the world, according to the tonnage. It was pretty close to being the biggest.

INTERVIEWER: Before the "Queens" came along?

MR. NIEDERMAIR: Yes. They had her sister ships, you know. There was the Leviathan and then the British had one that was a sister ship to the Leviathan and it started breaking in two. As a matter of fact, on one trip over we landed at Southampton and we could see the sister ship of the Leviathan that the

British had. It was in a dry dock because it started breaking in two before the Leviathan was breaking in two. But they both started breaking in two during that same winter.

INTERVIEWER: How many round trips did you make on the Leviathan?

MR. NIEDERMAIR: Oh, I don't know how many. To get some rough estimate, assume 30,000 miles and a round trip about 4,000, or say, 5,000 miles, so there were at least six round trips. That works out about right.

INTERVIEWER: She was in constant operation and you just stayed a few days in port in England?

MR. NIEDERMAIR: Roughly we made at least six round trips. I met Rudy Valantino on there and the top movie stars. I got Rudi's autograph for my wife. I have it around here somewhere. And Jackie Coogan was there, Mary Pickford, and, oh, all kinds of movie stars were traveling first class.

Unfortunately for everybody the weather was so rough that most of them were seasick. I got to be friendly with all the crew because I had to go through all the crew's spaces --I had to go through that ship from top to bottom, even down in the engine room and everything, and they thought I was a spy looking for liquor and smugglers aboard. One day they caught me taking these lights down off the ceiling to find out what was wrong with the ventilation, when a second purser opened the door and yelled in -Jake Cohn was with me and I was up on the ladder, taking this thing apart, and looking inside to find out what was wrong with the ventilation:

"What are you doing? Looking for liquor?"

I said: "No, not exactly, but I would like to find some."

So I got very friendly with him and they thought that we were searching for the places where they had their liquor hidden, because you could lift these little panels out that were supposed to let the air in.

The second purser took us down to his space. He said:

"OK, come down and we'll have a drink when you're ready." So we went down to his stateroom and, sure enough, that's where he had his liquor hidden.

INTERVIEWER: And we recall the fact that this was in the days of prohibition.

MR. NIEDERMAIR: Yes, there was prohibition.

The purser was very suspicious of us. It turned out that one time -this is a little ahead of time but I might as well say it now. Sometime after the Christmas project, near spring- time, we were coming back and Jake Cohn and I were going down the gangway and the purser was going down ahead of us with his briefcase. We knew the customs officers, too. We knew everybody and they knew us. This purser, whose name was de Carow –

INTERVIEWER: de Carow?

MR. NIEDERMAIR: Yes. That's pretty good comeback. I haven't mentioned that name for a long time.

What happened was that the customs inspector was at the foot of the gangway. Everybody else was off the ship. The officers were leaving and we were behind the head purser. The customs inspector had looked in the head purser's briefcase and he said to Jake and me:

"Now watch. Don't walk ahead. Let de Carow walk ahead, because we're going to pinch him when he gets down through the next door. We suspect that he's smuggling diamonds."

And, sure enough, here was a man who thought we were making believe we were on board to fix the ventilation while we were looking for things like that. He said that he found the diamonds in Governor Smith's wife's stateroom. She was on the trip.

INTERVIEWER: Al Smith?

MR. NIEDERMAIR: Right, Al Smith's wife.

That gives you some of the atmosphere of this venture. It was full of color. de Carow got nicked and I don't know what happened to him.

Later on I talked to the customs people and asked them how they knew de Carow was doing this. They said:

“Well, he was very foolish. He would get in to Southampton and he would fly over to Belgium in a little plane. Then he'd fly back again. Besides, he came from a little island in the Mediterranean" -- it wasn't Sicily, it was a British-owned island, *I* can't think of the name now.

INTERVIEWER: Malta?

MR. NIEDERMAIR: Malta, yes. He said:

“He's a Maltese and they always end up in the end becoming smugglers. So he not only exposed himself by flying over there but also by the fact that he came from Malta and these people, no matter how well positioned they were, could be tempted to go into this sort of business.”

So, however, the December trip came along and our ship was in a hell of a shape, as *I* was telling you. Now we had to leave for Boston. We went in the dry dock up there and we started working to correct the troubles from the ventilation system.

INTERVIEWER: Was this the Boston Navy Yard?

MR. NIEDERMAIR: The Boston Navy Yard and in the dry dock. We got going on that and we started to cut out certain plating. We took a crew of Navy Yard workmen with us when we came back again to New York, so we could work on the ship after we got back into New York until she was ready to go and take the passengers back. I think that was some time in January. We had a very short time to do all this work.

While we were in the Boston yard we had to put up some staging almost from the inner bottom all the way up to the main deck, probably 100 feet or more of staging, so that the workmen could get at some of these vent trunks that we wanted to put into the ship in order to get a better distribution of this air, which was really up on the weather deck and they weren't getting it.

Darn it, if we didn't run out of money. We had used all the money we had.

INTERVIEWER: This was federal money?

MR. NIEDERMAIR: I don't know where they got the money from but Boston had to have the money to keep the workmen going, you see. I never knew where they got it. New York, I guess, from the U.S. Lines, they owned the ship and they had to pay for everything. It was poor judgment on the commandant's part, the commandant of the First Naval District. They didn't like us, anyway, because we came from the Third Naval District.

His solution to this no-money problem was to take all this staging down, which we already had paid for, but he said he owned the wood. We only paid for the labor. We wouldn't let him do that. It was solved later. They got some money and we left Boston and got into New York and got ready for the next phases of our trips across the Atlantic. In a lot of cases, in order to get this ventilation over the ceiling into the staterooms, we had to take the ceilings down, and they were made out of stuff that was like wallboard made up of residue like straw and so on. I've forgotten what the name of that stuff is. And the ceilings were all special. They had been sized for the rooms so there'd be no joints in the rooms. So we had quite a job to get these ceilings down because they wouldn't let us cut holes in them.

INTERVIEWER: Was that an early version of an acoustical ceiling?

MR. NIEDERMAIR: It has a name. You've seen it around. It was just like a very soft board that they put up. It came from some place out West and they had a hell of a time shipping it for that ship.

INTERVIEWER: It absorbed the sound, I take it?

MR. NIEDERMAIR: Yes, I imagine it was for sound. We started going back and forth --

INTERVIEWER: You had to stay with the ship now?

MR. NIEDERMAIR: Oh, yes, I stayed with it all the time. when it got to New York, between the round trip I could go home for maybe a day, then I'd be gone again. I probably was home maybe two days in a month.

INTERVIEWER: And the purpose of staying with it after the repairs had been made was to see that everything was operating?

MR. NIEDERMAIR: A lot of the repairs couldn't be made and some of the workmen had to stay with us because we couldn't keep the ship in the dry dock because there were scheduled dates to carry passengers.

INTERVIEWER: She was only partially repaired then?

MR. NIEDERMAIR: That's right. We would be working on the forced-air system for the boilers. I'd be crawling around through the whole ship while it was at sea. There weren't any rest periods in this thing. After January we got going again. The main thing that we had to repair were the cracks in the deck.

INTERVIEWER: That came first, yes.

MR. NIEDERMAIR: That had to be done first. Next we started to take the ceilings down in some of the staterooms and get the vent trunks connected up. All that had to be done while we were at sea. Some of the staterooms had to be kept vacant. I don't know how they did that, but we always had a batch of staterooms in which our people would be working. That took me from October 1924 all the way around to about the 1st of April, through March. In fact, we were there all winter, and it was the greatest experience and the roughest sea. I really liked that myself. I almost lost Jake Cohn one day when it was very rough and we were going up onto the boat deck. We opened the door and Jake stepped out. He'd never experienced this before. He was no seagoing man. The wind caught him and started to yank him

and almost blew him in between two boats that were up on the boat deck. I just managed to get hold of this guy and anchor him before he went overboard.

When he recovered~ we got our wits together and we went into the bridge and stayed around there, watching them navigate the ship. The seas would be piling right over the bow of that ship and the windows that were around the bridge - -

INTERVIEWER: Was there any danger from icebergs?

MR. NIEDERMAIR: No, the iceberg business was taken care of by the Coast Guard. They had the ice patrols going by that time. They were put into effect after the Titanic accident.

INTERVIEWER: In a lighter vein, you must have gained weight, eating first-class fare for all that time?

MR. NIEDERMAIR: Yes, I did, and that's a thing I wanted to mention. The head waiter told me later, "Gee, I'd rather keep you in clothes than feed you."

So that's the adventure as far as the Leviathan is concerned.

As soon as I came back --in fact, I didn't have more than one or two days in the yard, when I had to leave again and go with the Stability Committee over at 1 Broadway, New York, and spend my time from then until probably around October some time.

INTERVIEWER: Now you're going to tell me about your service on the Stability Committee, which began in 1925?

MR. NIEDERMAIR: Yes, around the 1st of April 1925.

The question at one time was where would I be stationed. It was agreed by Admiral Beuret, who was the chief of the bureau, that I could either set up a working space over in the Navy Yard or at any place that Gibbs would select. Gibbs gave me office space in his office, and I had complete freedom

to start the preliminary investigations in connection with stability. One of the first things I decided to do was to research the stability of merchant ships.

I went up to the Lenox Library at Fifth Avenue and 42nd Street and made arrangements with those people up there to haul out all the information. It took me quite a while to do this because I had from April, as it turned out, until September 1925 with the Stability Committee. I have a notebook in there that's practically full of the notes that I took in connection with the stability of merchant ships. I advised the committee and I attended the meetings during that time, and I would tell them what I was doing. I was the only one really doing anything, any kind of research on that.

I have always had a good streak of curiosity and that led me on to doing all kinds of things the minute I got my hands on something. And, as luck would have it, I hit on this and it was approved, and I went up to the Lenox. I spent most of my time, outside of the few committee meetings that we had, between April and September up in the Lenox Library.

INTERVIEWER: What were the particular problems?

MR. NIEDERMAIR: They weren't problems, but we had no stability standards for our merchant ships in this country. INTERVIEWER: They just built them!

MR. NIEDERMAIR: They had laws making the Steamboat Inspection Service responsible for the safety of ships up to a degree, but they had various ways of protecting themselves against anything happening. They always had some legal loophole, you might say. They would do odd things in their regulations. They would pay the most particular attention to what to carry in a lifeboat.

I remember one of the things that was really written out in black and white was how many matches they were to carry in the lifeboats. The trouble is you have to get into a lifeboat first before you can use the matches, but they had that all specified.

Here is the final report that the committee made up. That will give you some idea what that committee reported on afterwards. They gave me credit for how closely I had worked with them, and I did help them quite a bit.

In September 1925 the S-51 was hit. It was September 25th 1925 that the S-51 was hit by the City of Rome, and it wasn't very long before I got a telephone call that alerted me to the problem I was going to be faced with on the S-51.

INTERVIEWER: You were called from the Stability Committee almost before the job was completed?

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MR. NIEDERMAIR: The job was not completed. They called me up and said that I'd better get ready to leave for the salvage area. And so on October 19th, as I have a note here, we left the yard on the Vestal, which was a repair ship -

INTERVIEWER: Who was "we"?

MR. NIEDERMAIR: Ellsburg was there, and that's about all, Ellsburg and I.

When we got out there the Falcon was out there, and there was Captain Ernest King and Lieutenant Hartley, who was the captain of the Falcon. He later on became a rear admiral in the Navy and he was the captain of a cruiser during the war. And then Dick Hawse who was an expert on handling small boats in the rough "seas. He was a seaman gunner, as a matter of fact, but Ernie King prevailed upon him --he first had a warrant officer's rating and then King prevailed upon him to take a commission in the Navy. Hawse reneged a bit on that. He didn't want that responsibility, but King finally got him to do it and he became a rear admiral. His ship was the only ship in the Navy, as I understand it -I don't know the name of it, but it happened around the Philippines, that got two presidential citations during the war. And he was the fellow who didn't want all that responsibility! But Ernie King knew how to pick 'em.

INTERVIEWER: Will you re-create for me the situation you found when you went to the S-51?

MR. NIEDERMAIR: We got out there on board the Vestal-

INTERVIEWER: She was approximately where?

MR. NIEDERMAIR: She was off Block Island in Long Island Sound. You couldn't see Block Island except at times when you might see a mirage of it. We really couldn't see any land from where we were trying to salvage -

INTERVIEWER: How deep was she down?

MR. NIEDERMAIR: Around 150 or 160 feet down.

When we got out there we found that the Merritt, Chapman, Scott people were out there with their big crane, and they had attempted to raise the submarine. One of the worst things they did in maneuvering their crane around was to drop an anchor overboard and it so happened that they dropped it on the bow of the S-51. This gave us quite a bit of trouble later on because when we tried to get the buoyancy of that compartment air was leaking out of the rivet holes and the seam cavity sort of spread the plating apart, so we had to fix that up with white-pine wedges that we drove in there. They'd swell up and we solved it in that way. It was a simple solution.

There was a salvage crew out there that had been down in Guantanamo Bay, practicing the raising of a submarine. It was a German submarine that they had, one from World War I. They never did really raise it. I found out later on that they had done a lot of wrong things. They could always get one end up but they never could get both ends up.

I had collected some plans of the S-51 and some particulars about her capacity plans, and arrangement plans.

INTERVIEWER: Where had she been built? In New London?

MR. NIEDERMAIR: I never did check on where she was built. She probably had been built in New London. Until you asked the question, it never occurred to me to find out where she was built. She could have been built up in Portsmouth, up in Maine, or New Hampshire.

Anyway, in getting going on this, we had to start mooring the Falcon, put 5-point moorings down, so that you could always position the ship any way you wanted to over the wreck. That's where Dick Hawse I told you about was a real expert. In the beginning we only had a Navy small boat to do this job and it wasn't very long before we found out that the Navy didn't have a single small boat that we could handle out there. We had to borrow one from the Coast Guard, a 26-foot motor whaleboat, and that worked perfectly. Hawse managed that thing, he was really clever, all right, and we'd get our five-point moorings, no matter which way we had to have the Falcon arranged, depending on the weather and the way the sea was running.

One thing led to another. There was no one alive in the S-51. They were all gone, except three who had been rescued from the water. They had been up on the bridge when she was hit and they were rescued from Long Island Sound. And they were the most forlorn three people that I have *ever* seen. I still think of them, how forlorn they were. You can imagine. They didn't live very long after the S-51 went down. Somehow or other, they died one after the other in a very short time.

I right away got interested in making an estimate of the situation and how we would raise this submarine. I began to make some calculations, how much buoyancy we had to have by pontoons, what to do with the pontoons. But it so happened that this salvage crew that was there had their own way of handling the pontoons. I described my system of doing it to Ellsberg, but we had to let the salvage crew do it because that was their specialty.

When the day arrived to drop the first pontoon down for a test at the depth of 150 feet or so, I didn't go out because they weren't doing it my way and I felt they might be nervous about the fact that I was standing around, nosy on what they were doing. They were always conscious of the fact that I was

there, so I stayed away for two reasons. One was my own reason, that they weren't using my method and I felt sure their system wasn't going to work.

Ellsburg left and I was in the office there. I had plenty of calculations that I had to make. He came back that night about eleven o'clock and I was about to ask him --in fact, I did say to him: "Well, how did you make out?"

He said: "Niedermaier, first tell me again how you would handle those pontoons, how you would lower them."

So I told him how I would lower them. "Well," he said, "from tomorrow on, you're going to be in charge. We lost our pontoon today."

INTERVIEWER: They lost it?

MR. NIEDERMAIR: We finally found it, but they couldn't find it. They hadn't found it by eleven o'clock that night.

These pontoons had a problem because, unless you stopped the water from running into them -- you know, when you opened the valves and you flooded them to sink them --because the pontoon had 120 tons of buoyancy capacity, the pontoon itself weighed 40 tons, and if you blew all the water out, you had 80 tons left, net. The trouble was when you opened the valves and let the water run in you'd have 40 tons pulling on your little lines with which you were trying to lower it down, which was all right when you were working in 60 feet of water or 50 feet of water. Then you could let it run before it gave you any trouble. But now when they had to go down to 150 feet or 160 feet, that was too much. By that time it got so full of water that the lines started snapping, they broke off.

INTERVIEWER: It would go down on the submarine and squash it.

MR. NIEDERMAIR: What you had to do was allow so much water to get in--you had to put enough water in to sink the pontoon. I did it with a stopwatch. I would time it after we let the water run into the pontoon, and now the weight was beginning to come onto the lines before we started lowering. I would give it about five minutes or five seconds or some interval of time with the water still running into it to give it weight so it would pull it down. Then you'd shut it off, and you'd shut it off with an air bubble left in the pontoon. It was as simple as that, but they didn't realize that.

So we started working on it. Various problems we had in drilling underneath the submarine to get the chains down. The buoyancy problem of which end would be raised first. It appeared to me that the best thing to do was to raise the stern first because your chains could go through just forward of the propeller. The struts came out where the propellers were so you ran your chains down in between them and they wouldn't slide off.

INTERVIEWER: What was the S-51's overall length?

MR. NIEDERMAIR: Oh, I don't know. I couldn't tell you that. I could look it up for you.

INTERVIEWER: No, approximately?

MR. NIEDERMAIR: Maybe 200 feet. I used to know those figures right down to the last notch. My notebook has them in.

We finally got all our pontoons down, but in the meantime we'd learned how to handle the pontoons.

INTERVIEWER: How many pontoons did you have?

MR. NIEDERMAIR: We put six forward and two aft. The winter weather was coming on and we tried to come back home in November, around Thanksgiving Day, when Dr. Flothy and I made an estimate

of the situation, using the Farmer's Almanac to judge the weather. We judged that we couldn't get more than one diving day a month from now on, or some such figure we came up with.

INTERVIEWER: Was that more reliable than the Weather Bureau?

MR. NIEDERMAIR: Dr. Flothy happened to have a Farmer's Almanac with him, the famous almanac that they print in Maryland.

INTERVIEWER: I know.

MR. NIEDERMAIR: He had one of those and so we got together and averaged *out* the weather!

I remember Thanksgiving Day when we were sitting there. The Navy wouldn't let us come back home because the public wouldn't stand for this, they said, so we couldn't come home, because the bodies were still in the submarine. We finally prevailed on them to let us come back because we had certain other things that we had to do to improve the compressor up on the Falcon and the manifolds on the Falcon. There were certain things that had to be done to get ready for the final salvage. So they finally allowed us to come back home, but I remember listening to this Cornell-Pennsylvania game that they play every Thanksgiving Day. The radio on that ship was terrible but I was listening there.

The officer who was in charge of the crew's mess had Thanksgiving dinner with the crew, and the reason was that they were having turkey for dinner. I was eating in the officers' mess and we had meat loaf for dinner on Thanksgiving Day! Everybody chipped in about a dollar a day. The government paid me for that later, but I did it exactly the way the officers had to do it. I felt that that was the way to do it, and I didn't care, and we were allowed to come back.

My period back in the yard, in December now, sometime, we did a lot of things and worked on the pontoons. We also found out what it felt like to be in a diver's suit. Ellsburg did this, too, only he went further than I did. I only went far enough to know just what a diver was up against. I wouldn't dive. I felt that it wasn't my job.

INTERVIEWER: How many professional divers did you have?

MR. NIEDERMAIR: We probably had a dozen. He's got a picture in his book somewhere around that shows the whole diving team.

Ellsburg learned how to dive and he actually went down.

INTERVIEWER: To the submarine?

MR. NIEDERMAIR: Sure. He was a real daredevil. One of the bravest people I've ever known. He didn't mind it at all, and I found that later on in his career he did a lot of things and I was beginning to wonder whether he had his wits about him! But he knew what he was doing, all right. He knew just how far to go, but it looked pretty risky.

We got all ready and sometime in February we went back out to the salvage operation and got started again. We were having trouble with the divers' air hose freezing up, air being cut off because the water was getting colder and the air would expand into the diver's suit, because the air was coming down at a higher pressure than was down in the suit and now had to bubble out through the helmet. That would drop the pressure at the valve, and the combination would be such that the moisture that was deposited would freeze up the air valves. So we had to work out a method of drying the air before it got down there.

We solved it partly so that by the time the next salvage operation came around we had to rig to take care of that. But on the S-51 we didn't have any way to take care of it, so we didn't go out there until the weather started warming up a bit. It must have been the end of February. We got out there and we started placing the pontoons, digging tunnels, and all. For part of that operation Ellsburg went down because we had to haul out the main induction line, which was where the air came in for the diesel engines, to run the engines. The valves on that, the hatch covers, and everything else --the hatch covers were all right, but quite a few of the valves were closed --no, the hatch covers weren't all right and these

valves weren't right because when you put pressure inside the hull, they would lift because they were designed to be closed by water pressure round the outside.

So now we had no way of getting at the valve that was on this induction line. All we could do was to tear the deck out and get a section out of that main induction line. The divers went down and took the bolts out of the flanges of the section that we wanted to get. Then Ellsburg went down just as the risky part was coming, when you had to have something hauling from the deck in order to yank this section out between the two flanges, which was pretty tricky stuff, so he decided to do it himself.

Now he got into trouble with the salvage crew and the officer in charge of it, the warrant officer who was in charge of the salvage crew's divers. Ellsburg talked to the telephone operator and asked him to ask this officer how the lines were tending. All this officer would say was that it was OK, and that's what the telephone man told Ellsburg. Ellsburg wanted to know which way it was tending, because down there he couldn't tell and OK didn't tell him anything.

One thing led to another and they couldn't get together. I had never been on the telephone before but Ellsburg, who was down there, asked me to get on the phone. So they hunted me up and I came down and picked up the phone and talked to Ellsburg. And, you know, listening to someone under pressure down there is not the same as me talking to you. I finally understood through the squeaks what he was talking about, and he asked me the question, "Which way are the lines tending?" He had it all hooked up, with a line coming down and that was on the hook of the crane on the Falcon.

I called over to the officer and asked him which way the lines were tending. Ellsburg told me which way it was down below--when he had talked to the telephone operator that was Greek to him, but he told me all about it.

I tried twice to get him to tell me which way the line tended and he wouldn't tell me. Then I said to Ellsburg, "Hold everything. I'll go over and look myself." So I went over to the side of the ship, examined the line and the way the crane was going, came back to the telephone and told Ellsburg

everything looked all right to me. He told me where he was standing, out of the way of it. So then we gave the signals to haul the thing up.

As a result of that little incident, this officer went to King and told him that I was ruining the morale of the diving crew. King looked him in the eye and said, mentioning his name: "You know, you're sick. I recommend you take sick leave, and when the reporters' boat comes in you go back in it." So King was on my side.

INTERVIEWER: He was in overall command, was he?

MR. NIEDERMAIR: He was in charge of the diving crew.

INTERVIEWER: I see.

MR. NIEDERMAIR: It was his responsibility. He came up from Guantanamo Bay, but King said he was sick.

INTERVIEWER: No, but I mean King was in overall charge, or what?

MR. NIEDERMAIR: He was the head man. He represented the Navy. Later on, of course, I got into more trouble than that, but that's another story.

INTERVIEWER: Where did Merritt Chapman fit into this picture?

MR. NIEDERMAIR: They went off the job because we decided --the Navy decided --that we would do it. They didn't have any equipment. We had the divers, we had the salvage ship. Their big cranes couldn't stand the rough weather out there. They could never get it that way, anyway, so they were sent back home. They never liked it. I don't think they like it to this day.

I had never been inside a submarine. I never took a dive in a submarine, and the S-50, a sister ship of the S-51 was right there. We could go and walk around on it but I wanted to be in it when it was diving. So I went to King and said:

"Why can't I go down in the S-50 and walk around while she's running submerged, just like the S-51 had been running?" I wanted to visualize this, where the doors would be open and what was the condition of the ship. I understood it. Everybody had told me, but now I wanted to see it, and not having been in a submarine I thought here's a good chance. King said no.

INTERVIEWER: Why?

MR. NIEDERMAIR: "No," he said, "I don't think it's necessary. Your place is up here."

I said: "Well, but I really think I ought to make a run in it," and he finally *gave* in to me and I went down in the S-50 for a short haul. He *gave* orders to the captain about how long he could keep me down, so we made a little runaround out there in Long Island Sound, not very long, back and forth. Just enough time for me to walk back and forth, climb up in the gun access hatch and look out and see how that operated. I came back and that was it. Now I was an expert!

I was never expert. I'd never been on a submarine before, actually. Like I told you about the incline experiment. Everybody thought I was expert from that day on, when Rock put his hand on my shoulder.

We were back again in the spring and got our pontoons working and so on. I told you about how Ellsburg became a diver and got into trouble and almost got me into trouble, but King could see through that. That's the way King was. When you had the responsibility, all you had to do was to carry it out. You never had to go to him for instructions or anything else. You had to do it as you saw it or as you thought he would want it done, and when that was the case you had the authority to do it. I think that's why he only had about 100 people on his staff during the war. When I was there last March somebody told me: "Do you know Admiral King only had so many people on his staff?" And I said, "No, I never knew how many he had, but I don't see why he had that many because he let the people he put in charge

of this group, they could add people to their group, but he only needed enough people that he could put his hands on.” And if you didn't do it right, you were done.

INTERVIEWER: That day!

MR. NIEDERMAIR: We got everything ready by June, and a terrific storm came up. We had the pontoons up. Some of them were leaking. We went out in June to get ready to raise it --we were getting ready to raise it the next morning, about the middle of June of 1926, and the storm came up that night. We had to go out in the storm and get divers down to see how everything was going down below.

We thought we could get divers down but as it turned out we couldn't. We could see that some pontoons were leaking very badly. It was very, very rough. I remember looking it *over* and trying to put a little air into a pontoon that was leaking. I knew which ones. They had told me the day before, so I tried to compensate for that.

We now had all our pontoons buoyant and the amount of air that was in them at that depth and the amount of air that was in them to hold them up with about five tons of extra pull, if they moved up the least little bit the air would start blowing out the water and it would lift them. Finally when they reached the top --once they started moving up, you didn't have to blow them out any more because they would blowout automatically. It was that ticklish at that depth.

So the bow went up and the result was that we got into all kinds of trouble that day. I sprained my ankle. The result was that we had to let the bow down again. Then we got everything ready again and within two weeks' time we raised the submarine and brought it into the New York Yard. We took it down Long Island Sound and just before we got into the yard we had all shaved, ready to go home when we got it into the yard. The sun was shining. Thousands and thousands of people lined the shores

of Long Island Sound to watch us come down with this long tow through Hellgate which was 1,000 feet long.

Just outside the Navy yard there was a submerged rock. We were to the right of the rock on the course we were going. I think they call it the White Horse Rock. We had a pilot aboard and that pilot was afraid that our tow was going to hit a yacht that was in the fairway. It wasn't supposed to be in the fairway, but there it was. So the pilot veered to the left. As he veered to the left, we were closer to that rock than he had estimated and we hit the rock and knocked out our middle pair of pontoons forward, and down went the submarine.

INTERVIEWER: In what depth there?

MR. NIEDERMAIR: It wasn't very deep but the speed of the water was terrific in the East River. It wasn't at Hellgate. It was down by the Navy yard, where you had a rip tide.

After we got the submarine up out at the salvage area, I had noted all the drafts on the pontoons so I knew how much reserve buoyancy I had in each pontoon. That was a lucky break, because now we'd lost the forward middle pair of pontoons.

INTERVIEWER: You had only four left, then?

MR. NIEDERMAIR: We had only four left. We had to have six because when you were lifting at the angle we were at, the water was deep enough so that we had about a 3D-degree angle, which is about the maximum angle you could swing a bow up like this because everything would slip away from you beyond 30 degrees. It required a maximum moment to lift it, more than on how much buoyancy you had. You had to have a moment to do it. The ship's moment about the stern pontoons as compared with the buoyancy that we had there, you had to have more moment to do it.

I had made this estimate and I was pulling my notebook out and Ellsberg said in his book that as I was looking over my notebook --everybody was ready to go ashore --I yelled out: "Well, if we're going to hit a rock, it's a good thing we have a salvage crew on board." And all the people who had been kind of glum awakened to this, that now we all had to go to work again. I imagine he thought my statement really got them going. He was looking over my shoulder and he could see that my next idea was that if we lowered the four pontoons that we had up forward and had proude lift, we'd get some cranes out and the chains up, and sink them down till they were under water. Then we could get this reserve buoyancy, the amount of buoyancy that was sticking above the waterline when we were coming down the sound. That was just enough, the way I figured it out, to pick it off that rock.

By midnight we were able to do it. It was so close, I remember, that we had the floodlights going down, and I think Ernie King wanted a boat to go out with a sailor on it to stick a flag up on the bow of the submarine. In order to do that, the sailor stepped out of the boat, stepped on the bow of the sub- marine, and it started going down. I didn't know how far it would go. Maybe we had a little reserve buoyancy.

INTERVIEWER: Enough to have him get washed off, though?

MR. NIEDERMAIR: He couldn't stay there, anyway, but he noticed this happening and got off the bow right away, but it gave me a clue as to how close my figures were.

Now we had to turn it around 180 degrees and swing it into the yard at night, and the tide was going out in the East River, so when we got it swung around the tide was against us, and there was a very heavy rip tide there.

I had a bead on some way of telling whether we were moving or not. I was giving a signal when we were going to move. Ellsberg was ahead of me and he would get my signal, then he would signal the tugboats. What we wanted was to just get the tow moving forward, but not any more than that. We didn't want to have much speed on it because what we were pulling on was a bow piece that I had

worked up to put a hook onto the bow of the submarine. It was like a shackle up there that I had made to hook the towline on, and we didn't want to lose it again, so if we could creep into the yard that was sufficient.

We managed to creep into the yard and got it moored along-side of a dock there. Then I went home. Everybody went home. I probably only got home for a couple of hours and then I came back again the next day, and we put it in a dry dock.

That's the story of the S-51 as far as the boat itself is concerned.

Now appeared a thing that had to do with people, the vanity of people. You see, while the S-51 was out in the salvage area the Navy Department was anxious to have publicity. The newspaper people wanted information. Ernie wasn't a very great guy for publicity.

INTERVIEWER: *No*, I know he wasn't.

MR. NIEDERMAIR: He thought it was a hell of a waste of time. We were out there to work. But Ellsberg was a gifted writer so he wrote a few good articles about the salvage operations for the New York papers, and that seemed to be great so he kept it up. The Navy had asked for somebody to do it, and in addition to all the other things he could write and as fast as he'd fill a page he'd throw it on the deck and write another one, just like that.

So he got the publicity but what happened when we got into the yard was that the reporters all wanted to talk to Ellsberg. Now the commandant, C. P. Plunkett, was left out. I don't think Ernie King liked it, either, although he didn't want them to bother him. He'd put up with a certain amount of hardship, you know, but he could do without it now.

Now Plunkett felt that this spotlight --it turned out that I felt he thought that Ellsberg was a bit insubordinate in this thing. The first thing I knew we were all called together outside of Plunkett's office and he gave Ellsberg a bawling out, a sort of a semi-public reprimand, about paying so much attention to newspaper people when we had all this work to do. I've forgotten just how the thing went, but it probably was along that line.

On the other hand, the Brooklyn Eagle came along and talked to Plunkett, and Plunkett gave them quite an interview. In that interview he talked about me. As I remember it, he didn't talk about anybody else, and he said that I was an unknown engineer when I went on this salvage operation and I now came back and raised this submarine with a lead pencil. I always thought that was a fine public compliment that Plunkett gave me. He at last got the papers to come in to see him, but the Brooklyn Eagle went out of business a couple of years later. I had a clipping with that statement by him in there. Do you know about Plunkett, his background, at all?

INTERVIEWER: Not very much, no.

MR. NIEDERMAIR: When World War I was on they got a big idea that if they put a big Navy 14-inch gun, I think it was, on a railroad car over in France and ran it up, it would counteract the German long-range guns. So Plunkett went over there with a whole train. He was in charge of this operation, to get this whole train with the big gun on it, up to the front lines. I understand that he didn't pay any attention to the Frenchmen at all, and he put a crane at the front end of his train, and any time one of these little French cars got in his way he'd pick it off and put it on the side of the railroad. He went over bridges and everything else, never checking into whether they were strong enough, and he got quite a way along to the front when the French stopped him and warned him that he couldn't go any farther, he had to go back because the bridges and the tracks couldn't stand this weight.

He'd come all this way over any bridges that he had to cross and the tracks already, so he just brushed them aside and kept right on going. He got up to the front, but I don't know whether he ever fired the gun or not.

Later on, his crew got into trouble because it was winter-time and they went around through the village there and stole stoves and one thing and another to heat up their shacks. And the French came and complained to him again. Plunkett told them he didn't know anything about it. All he knew was that

one day it was raining and snowing or stormy or something of that sort --he explained it to them that way --and the next day they had all these stoves here. He didn't know how they got there. He confused the French no end.

That was one of the things he did there.

Now the S-51 was in the yard and in the dry dock and our job was done.

INTERVIEWER: What about your regular duties at the shipyard during these two intervals when you were away?

MR. NIEDERMAIR: Well, they always had other people around and, of course, they got along without me to a fashion before I got there. So they did the best they could except that when any special hard jobs came around or new jobs, as you can see, I always got them. I evidently brought quite a bit of publicity to the yard by accomplishing these things. I don't have it here, but I have a letter from Rock -- oh, here it is, 1926 he wrote that letter to me in which he complimented me on my success and said:

"You came to the yard early, in 1917. You have been there ever since, thus serving with me for a little over four years during my tour as construction officer at the yard. Your name also has come to my attention in connection with one or two other projects since my detachment.

Then he goes on to say that Commander Ellsburg's letter is a fine recommendation, and so forth. He goes on further to say:

"As you would quickly appreciate, it appeals to me (the things that Ellsburg said about me) just as I am very sure, as you would also know it would especially appeal to Commander Ellsburg, the salvage officer, and to Captain Wright, your construction officer. I am delighted with your prospective promotion, which the bureau is particularly happy to recommend, and I hope you will receive also the department's letter of commendation for your services, as recommended." And so forth.

That's the way the S-51 ended.

INTERVIEWER: With a promotion!

MR. NIEDERMAIR: Yes.

INTERVIEWER: Very good.

MR. NIEDERMAIR: Now I became supervisor of the scientific section.

INTERVIEWER: At the Navy yard?

MR. NIEDERMAIR: Yes. I became the boss of the section, which I hadn't been in for all those months.

INTERVIEWER: You were Civil Service, weren't you?

MR. NIEDERMAIR: Yes.

INTERVIEWER: Now you were back on duty in the shipyard?

MR. NIEDERMAIR: Yes, and I was supervisor of the scientific section. By the time that happened, Henry Wright had gone. He went to Washington, D. C., and was with the Shipping Board in connection with duty there. Later on he was relieved by Admiral Tawresey.

Land had his commander, Garland Fulton, write a letter to me.

INTERVIEWER: First, Land was assistant chief of the Bureau of Aeronautics?

MR. NIEDERMAIR: Right. So Garland Fulton wrote a letter to me but Jerry Land handled it by delivering it to the new construction officer because my friend, H. T. Wright, wasn't there any more. I've forgotten his name now, but he had a funny name. He addressed the letter to the construction officer rather than by his name. The thing was that I couldn't take that job -

Q.: What was the job?

MR. NIEDERMAIR: It had to do with lighter-than-air. They wanted me to go down there and get a desk job in connection with the development of the Akron and the Macon lighter-than-air ships.

INTERVIEWER: They had not yet been built?

MR. NIEDERMAIR: No. They were being designed then, and they thought it would be a great job for me. In some ways, it would have been, too.

INTERVIEWER: Probably would have brought your career to a sudden end, though!

MR. NIEDERMAIR: Not necessarily. I don't think so because H. T. Wright had dreams. I got a letter from him in connection with that and he urged me to go because he said that heavier-than-air is coming in and, as he visualized it, heavier-than-air would be going great guns and that would be a great field for me. That's the way he said it, and he said he had warned them that "a person with your talents I'm not so sure would leave New York." He told me all that, but I had to turn it down for personal reasons. I recommended a man named Ray Brown from Michigan. He got the job and he handled it and became quite an expert in handling helium gases. I think this is what caused trouble for these aviators. They used helium as a method of jetting. They had it under pressure and they had it in the double hull, too. It helped to support the inner hull and the outer hull together.

INTERVIEWER: You're talking about the astronauts?

MR. NIEDERMAIR: Yes. Ray Brown got to be an expert in that area, but he never drifted into heavier-than-air.

INTERVIEWER: Which is what you would have done?

MR. NIEDERMAIR: That's what Wright told me in his letter, but he didn't think I would go. They had offered me all they could, according to Civil Service regulations.

INTERVIEWER: What did you think of the lighter-than-air ships of that time?

MR. NIEDERMAIR: I thought they were doing all right, but they made a mistake in the design of those when they cut a hole in the main hull to put a little tiny aircraft in for reconnaissance. I think that weakened the hull structure and I believe it contributed something to the loss of them in the storm, because there was a concentration of stresses where this hole was. There was discontinuity in the strength.

I talked to Ray Brown about this later on. Ray was a naval architect. I said:

“Ray, how do you like all that thin stuff that you've got to be working on on this lighter-than-air?”

He said: "I'm slowly getting used to it but I'm not used to walking on some of these gangways that swing up and down as you walk along and they give as you walk, because this structure is so light. But it's all right if they let her bend the right way. It's like walking on a rope all the time."

I got a nice card from Ray after I got the top ten award, and he died shortly after that. He complimented me on what I had accomplished by that time.

I had to turn this job down. In the meantime, I had to work and get the yard people prepared so that we could use the building ways for a cruiser instead of a battleship. I had to get some special information about launching. Ray had been with Gibbs and Cox and had quit them because they ran into a shortage of work, and he guessed it wrong that Gibbs would have stayed in there and Ray would have stayed in there, too. But he went with New York Ship and from them and through Ray I got all kinds of information on launching that they used for launching heavy ships and so forth. In connection with the data that I got from him and other people, I decided that I could launch the Pensacola on the small slope that was used for the battleships.

I was in London at the time they launched her, and I certainly lost a lot of sleep because I couldn't find anything that told me she was in the water. I had left instructions that they were to iron out the paraffin and everything had to be nice and slick. Ernie Rigg, who was the naval architect for New York Ship, told me later on that he was a guest at the launching of the Pensacola and he went up

particularly to see her stick on the ways because he knew that it only had a half-inch slope. They'd launch at maybe eleven-sixteenths or maybe three-quarters. He didn't know that I narrowed the ways down so that they had the same pressure --the grease didn't know what was on it. It was only interested in the pressure per square foot. If you have a low pressure per square foot, then you have to have a bigger slope. If you have a high pressure per square foot, it has a bigger component on it and it goes down the ways.

They launched her and I didn't find out --I got cards from everybody and they had a dinner on her, but nobody told me. I should have guessed from what they said.

INTERVIEWER: I would think so, yes.

MR. NIEDERMAIR: But they didn't say it. I didn't see any pictures in The New York Times or anything --that it was in the water and that they did it according to my way of doing it. Of course, I was anxious to know I was right, and I was. Rigg told me the ship was very anxious to get into the water.

When I came back from the S-51 I did one thing that was very important. I wrote up a report on getting ready for the next salvage operation. I'd just come back from one, so I decided I'd better make up bill of materials, of all the things that would be needed if another submarine went down on the high seas. I had it all worked out, and the chief draftsman wouldn't let me send it.

INTERVIEWER: Sending it to Washington?

MR. NIEDERMAIR: Yes. I wanted to send it to Washington. H. T. Wright wasn't there any more. Ellsberg wasn't there any more. I could have gone to Plunkett, maybe. But anyway I didn't do that.

INTERVIEWER: Why did he object to sending it?

MR. NIEDERMAIR: He said we couldn't tell the bureau what to do. So by the time the S-4 happened all of a sudden, I had the material in my desk drawer.

INTERVIEWER: But Washington didn't have anything?

MR. NIEDERMAIR: *No*, they didn't have it. But I had it.

The only free period I had for a long time in the yard was from July 5th until December 17th, when the S-4 was lost.

INTERVIEWER: That was in 1927.

MR. NIEDERMAIR: That's the only time that I was in the yard for any length of time. So my next talk will be about the S-4.

I was still at the New York Yard in the interim after the S-51. About a year and a half had gone by since July 5th, when we brought the S-51 in, and during that year and a half I had prepared a report on what we would have to do in connection with the salvage of another submarine on the high seas, if it ever happened. But I was unsuccessful in having that report sent to Washington. In a moment you'll see how handy that was. I put it away in my desk and there it was.

During this year and a half between July 5, 1926 and December 17th, a Saturday afternoon, when the S-4 was lost, I was working on miscellaneous things in the yard. I described before about the Pensacola launching and so forth.

The unfortunate thing that happened on this Saturday afternoon was that just about four o'clock - we worked all day Saturday in those days, the week before Christmas --Admiral Plunkett's aide came in and whispered in my ear that there was another submarine down and Admiral Plunkett would like to talk to me about it.

So we started walking down to see Admiral Plunkett. We were all on the same floor of this building in the Navy yard, the New York Navy Yard in Brooklyn. When we arrived at Admiral Plunkett's office he told me what had happened. His first words to me were:

"What can we do to help the S-4?"

INTERVIEWER: Tell me where she had been sunk?

MR. NIEDERMAIR: The S-4 was sunk up near Cape Cod, just below Provincetown, at the end of Cape Cod, just outside the harbor of Provincetown.

INTERVIEWER: There had been a collision?

MR. NIEDERMAIR: She had been run over by a Coast Guard destroyer. The S-4 was running submerged on a trial trip there, running at periscope depth, I understand, and this destroyer came along and ran over her, and part of the bow of the destroyer was sheered off. There was a hole ripped into the S-4 and down she went with everybody on board.

Quite a few people were able to get into the forward torpedo room and seal themselves off in there. The rest of the crew were lost in various parts of the ship.

All I knew this Saturday afternoon was that the S-4 was down up in New England, in the First Naval District, but just precisely what had happened I wasn't too sure about, and Admiral Plunkett wasn't either.

The problem was that I was the only one left in the yard who knew anything about what to do about this salvage operation, because Ellsberg had gone, and Fletcher had gone --not Fletcher, but Captain Wright, he had gone to Washington. Plunkett knew that I had been connected with the S-51 salvage, as noted in the previous discussion, where he had made the remark to the Brooklyn Eagle that I had raised the S-51 with a lead pencil. So he was fully aware that I knew something about what to do.

Q.: Did he know of your report, which didn't get anywhere?

MR. NIEDERMAIR: No, he didn't know about my report but I made him aware of it in a very short time. I said, yes, we could do a lot because I had this report and we had the equipment in the yard,

standing by for an event like this, but I knew of no preparations that had been made any other way, except that it was on the record that we stored these things in the yard.

I explained to Admiral Plunkett what the situation was, and he immediately said that the thing to do -I should mention here that while I was on my way to Admiral Plunkett's office to talk to him, or report to him, rather, the whistle blew in the yard and everybody rushed out, because, as I said, it was the Saturday before Christmas and everybody was getting ready for the Christmas holidays.

INTERVIEWER: And no one had been informed?

MR. NIEDERMAIR: That's it. It was in late December and darkness came early so very soon it was dark allover the Navy yard, too.

I explained to Plunkett that I had a report in my desk, so he said, well, the thing to do was to go down into the drafting room, we'll get a few desks, we'll push them together in a space in a passageway~ and he would get all the duty officers of the yard together and get things ready. In the meantime, he snapped orders off to his aide to do these things, including the fact that he wanted the captain of the Sagamore at least to come. I'm not sure whether the captains of any other seagoing tugs were available, but at least he got him.

INTERVIEWER: The Sagamore was a tug?

MR. NIEDERMAIR: She was a seagoing tug and had been one of the leading tugs in the towing line for the S-51, so he was familiar with some of these things that we did. He knew what pontoons were and all that sort of thing.

Plunkett sent me down to this desk and he sat on the other side of me. Then he looked at me and said:

"Now, Niedermair, you take over. You give orders. Take over the yard."

So I was in charge of the yard from that minute on. My desk was only a couple of jumps away, so in the meantime I'd gotten my report out and now I started to put it to work, to get the inch-and-a-half hoses out of storage. These poor officers who had to go riding round the yard in the dark on their bicycles apparently did a very good job because all this was to be piled on the Sagamore and another of the big tugs that was in the yard. How they did all this, I don't know, but they did collect all the material necessary in connection with the pontoons and the hoses and the *valves* and the piping and so on that you needed to get ready to raise this submarine. Not only to raise it but also try to save the people in the submarine, if they were alive.

I got into Plunkett's office just a little after the whistle blew, which must have been five o'clock, and I think that by eight o'clock that night we had pontoons under way. I remember objecting to the way the towboat captain was going to tow the pontoons and Admiral Plunkett reminded me that he was the expert on towing. But I told Plunkett that I believed he would get into trouble towing the pontoons in tandem. He wanted to put three in line, or something. I said, "These things are not directionally stable," but that didn't mean a thing. So Plunkett said we'd stay out of that. The captain of the Sagamore said he could do it so we let him do it.

By about eight o'clock the duty officers had scouted the whole yard and all I could do was go back home to Staten Island. In the meantime, he had wired to the New England people, the Boston *Navy* Yard, and told them that I would be up the next day, and they wired back about as fast as they could that they didn't need me. When the time came for me to go home Plunkett said:

"Niedermaier, you go to bed with your shoes on," which meant that I was to stand by, of course.

I wasn't home very long and to this day I don't even remember asking my wife whether I had called her up on the telephone that this had happened. I just got home late. By that time she was used to my wanderings with the S-51 and the Leviathan.

INTERVIEWER: She'd had four years' indoctrination!

MR. NIEDERMAIR: Yes. I don't recall ever thinking about that when I was so preoccupied with this submarine.

I finally got home and by about eleven o'clock r got a telephone call. This was Plunkett, who said I was to get ready to go up to Grand Central Station and get the Night Owl for Boston. There was a telegram in asking me to report out at the salvage area and a destroyer would be waiting for me in the Boston yard. I told the officer who was on the phone talking to me that I needed certain information if I was going. I needed a booklet plan on the submarine, the S-4. We must have some booklet plans around for that class. And stability data, the displacement and other curves, the arrangement plans. The booklet plan, if he could find it, would do all right. Then I gave him some other instructions, but I failed to tell him to bring an adding machine with him. When he got there he didn't have one, so I went out on the salvage area without one. For most of the things that I did out there I used the one that was on the ship, which I wasn't too sure about, but it worked.

I left Staten Island and, as you know, you have to go on a ferryboat and on a subway to get up to Grand Central Station, and you're not going to get there at twelve o'clock. So when I got into the station, everybody on board knew that there was a submarine down and everybody knew that the train was waiting for me. People were waiting to grab my bags and rush me into my compartment on the train, which had been taken care of, and Plunkett's aide had given me my ticket and all. I think the train conductor carried my hand bag, and in I went, and off I went to Boston.

Boston has said they didn't want me but I had sense enough - I've always given myself credit for this - that when I got in the Boston yard the next morning I could have gone in the gate and walked right over to the destroyer and left for the salvage area. But I had sense enough to go up and call on Captain Simms and Commander Enright, and those people, and say good morning to them. They said:

“Niedermair, what the hell are you doing here? I thought we told Plunkett that we didn't need you.”

I said: "Well, but I have a dispatch here from the salvage area, from Admiral Bromby, that asks for my services. The destroyer is up at the dockhead some place."

And they said, yes, they knew about that. I think it was the Mann they sent and they said she had steam up and was waiting for me to go.

So I started off at least by calling on them because I was going to need these people to help me with all the sketches that we took a look at a few minutes ago. It helped a bit but it turned out later on that they weren't too satisfied and they were waiting for a chance to get rid of me, which they never really fulfilled.

INTERVIEWER: I suspect a certain amount of jealousy within the organization?

MR. NIEDERMAIR: It was in their area, there's no question about it. I always tell something that's a flashback that goes back from that point up to about 1939 or maybe later, when King, who now was an admiral, came in to see me and asked why I wasn't out on the Squalus, which was lost then. I told him that I was no longer in that sort of work, that we had trained people for ten years how to do this thing, they had been in and talked to me and they knew how to do it.

King couldn't quite get that idea when I explained it to him. This thing now was ten years from the S-4 and he said:

"Niedermair, that's the trouble with the goddam Navy. When you know it, they don't want you." I never convinced him. He always felt that they didn't want me, they wanted this glory for themselves. But that wasn't true. He was away and he wouldn't know all that, but as it turned out later in many ways he was right to a certain extent, which I'll bring out along the way in this story.

I got aboard the Mann and the weather out there was really terrible. There wasn't a single person in the wardroom to eat because it was too rough, but I ate. I got my breakfast there. I've never been

seasick in my life, so I'm pretty lucky that way - almost, but never really sick, which they found out on the Leviathan, too!

I got to the salvage area quite late. I've forgotten now why that was, but it was late in the afternoon. Maybe it was because of how rough it was. Got out there and everything was covered with ice. I've always said it was a foot thick on everything, from the sea, and that the night before they tried to launch a boat over the side of the Falcon to get the mooring lines arranged. The first try they made the boat was tossed back on board and smashed against the side of the ship. But they managed to get divers down that night.

The first diver down got tangled up in the wreckage - he was from the Coast Guard destroyer. His air line got caught in all the wreckage and they had to send another diver down, Edie, and Edie got a Congressional Medal of Honor for this task. He went down there and he had one hacksaw. I talked to him later on about having one hacksaw for this job. I asked him quite often:

"Edie, what were you thinking when you tried to cut this trash away from the air hose?"

He said: "I was thinking and praying that the blade wouldn't break."

I said: "Gee whizz, you should have really had two with you. "

"I know," he said. "but it was too late. It didn't break so we saved his life."

I was there that day and I immediately got busy and tried to work out a system to get some food to the people who were alive in the forward torpedo room.

INTERVIEWER: How deep was this?

MR. NIEDERMAIR: This was about 140 feet deep, right off the neck of the cape. About 140, I would say.

The storm came up again and drove us away. We had done all kinds of things. I had an air hose hooked on to the Fessenden oscillator. By doing this, I could get air into the forward compartment and get a change of air in there.

G.: How would you get the food in?

MR. NIEDERMAIR: I was going to work it out by having them open up the torpedo tubes, the outside opening, and then we'd shove it in, and they'd open the valve on the inside and haul it in. Not very much water would get into it that way. I also thought maybe that was the way we could get the men out.

I had worked out a system of using inner tubes -they looked like inner tubes to me - and filling them up with water and lowering them down so that they would have fresh water that way. Quite a few schemes of that kind. I had these schemes in mind.

In the meantime, we had worked out a system of communication with the people in that compartment. Two close hammer blows together would be a dash, and one quick blow would be a dot. So we communicated by Morse code. He could read the regular morse code off our oscillator, he could hear it in the water, and it would be transmitted into the boat. People were sending all kinds of messages of hope and so on to them.

INTERVIEWER: How many were in there alive?

MR. NIEDERMAIR: I've forgotten now. They were lying down. They were not moving very much, and they had quite a few bottles of oxygen in there, so they released oxygen on and off.

We were driven away from the place by the storm. We couldn't stay there. It was just impossible. You couldn't hang on at all, so we left - or, rather, were driven away. That's worse than just leaving. I mean just leaving would have been worse, wouldn't it?

INTERVIEWER: Yes.

MR. NIEDERMAIR: When we got back to the wreck we found that all our marking buoys had gone. We had an awful job trying to find the submarine again. We had to pass grappling hooks over here and

there and everywhere, but it was no use. We didn't find it for quite a while. The sea was still pretty bad. When we finally got to them, why, they were gone.

Now, when we salvaged the submarine we found there was still plenty of oxygen there. They died from carbon dioxide. They fell asleep. That was the way that I found the ship.

We tried to work through the whole wintertime because we had worked out a way with the S-51 of getting moisture out of the air, washing the air clean of moisture, passing it over cold water, reduce some of the water in it and have it deposited and it changed temperature-wise.

INTERVIEWER: Yes, you explained that.

MR. NIEDERMAIR: And then we'd heat the air up again so the divers were able to work all winter long. We never had any time off until we raised it on March 17th.

INTERVIEWER: So, with the amount of time required, they wouldn't have lived, anyway.

MR. NIEDERMAIR: In the meantime, though, I found that the Boston yard wasn't keeping up with me in doing my work.

INTERVIEWER: What do you mean by that?

MR. NIEDERMAIR: Well, I sent sketches in to the yard of some of the things that I wanted them to do, like the sketches that you saw. They had to make one or two or three or whatever was needed in connection with all the hose connections or any other kind of connections that we needed. Or in connection with the hatches that had to be put into place, and so on. They had to make some modifications onto the pontoons for us, too, because we had found a way of putting a little pipe on the inside so that we'd know when we had sufficient buoyancy to hold the pontoon up alongside the boat. We'd draw the water out, then we'd let it feed back through the hose. You'd get it so that it would blow

just below the standpipe, the upside down standpipe, and when the water came up to that point, it would go back in through the hose, you would see it. We had to keep testing it. We had a valve in there to test it out.

Things like that they were doing on the pontoons to get the pontoons more modernized. The result of that was that I wanted to go in to the Boston yard to find out what the trouble was. The yard decided then that I was ruining their morale. King had to go in later *on* to salvage one of his officers who wanted to get a special job and King let him do it, but he fell by the wayside. So King was trying to rescue him from being tried by the commandant of the Third Naval District. He wanted to bring him home, which he did. He went in from the salvage area my last day in the yard before going back. He was in the yard. They went to him and wanted to get rid of me.

INTERVIEWER: How were you ruining their morale?

MR. NIEDERMAIR: Because when I got into a yard I didn't bother going up to the office or kowtow to anybody. I'd go around and take a look see how the job was doing because I didn't have forever. I'd want to go back on the next boat. It was because they didn't want me there, that's why. I was from the Third Naval District and they were the First Naval District.

They told my story to King and King, I was told later, would say, "That's exactly what I want him to do." But King didn't know what I wanted to do.

INTERVIEWER: He had that confidence?

MR. NIEDERMAIR: Yes. I wasn't fired. I went out on the salvage job and we raised the boat. I remember the last day. I had written out all the instructions on how to do different things, and King wanted me with him, to leave the ship there - I've forgotten her name - this machinshop ship or repair ship. And so I was standing early in the morning at the gangway on March 17th and King came out, stood alongside of me, and said:

"Didn't we say all boats should be in the water?"

I said: "Yes, I did. That was in the orders."

"What do you call that?" The captain's gig was hanging there. So he called the captain over and bawled him out in front of me, and they had to put the captain's gig in the water because if any accident happened or anybody was hurt in the boating operations out there when the thing came up, there were hoses to be collected - anything could happen. So King wanted that boat in the water and he got it into the water. Then he said to me, as we were going down the gangway:

"Isn't this the goddamedest ragtime ship you ever saw?"

And so out we went to the salvage and I went up on the deck to all the gauges and everything. Then we raised the submarine. The last few minutes were rather trying, but we got it up anyway. We had used the air from a sister submarine there and the people in the submarine thought they had enough air to raise the submarine. They were wrong. It wasn't true. It was high-pressure air, but it wasn't enough to raise the submarine.

Then I took the watch in to Boston.

INTERVIEWER: That's where she was to go?

MR. NIEDERMAIR: Yes, and that's where Saunders found out that I had this mystic way of judging things.

INTERVIEWER: Tell me that on tape.

MR. NIEDERMAIR: During the process of working and getting ready for the salvage operation, Captain Saunders, who was the salvage officer, came to me one morning and said:

"The boss -who was Captain King or Ernie King - said to empty the oil tanks, the inner bottom tanks."

And I said to Captain Saunders: "No, I don't think we ought to do that because I'm not too sure that it would help us any, and I don't believe I need them, so I'd rather not have any buoyancy from the bottom tanks.

"But the boss wants it done-," he said.

I said: "Well, I tell you, Captain" - I hadn't met Captain Saunders before at any time. I just met him on this salvage job for the first time, so I'd only known him a couple of weeks.

I said: "I think it would be a good idea if you went back to Captain King, the boss, and told him that Niedermair said that he doesn't want to have the things pumped, he'd rather not have the oil taken out of those tanks."

Captain Saunders came back and said we wouldn't take the oil out of those tanks, so you can see King agreed with me. Later on, when Saunders took the watch after we got in to the Navy Yard - he took over the watch at the air manifold on the Falcon -and he tested my theory out by trying to push the oil out down low, and suddenly the submarine started heeling over, leaning on the pontoons a bit, and he decided to refill the tanks.

From that time on, he thought that my intuition was something to brag about, which he did. Quite often he introduced me as the person who had this wonderful intuitive mind. If British naval officers came over from the other side or any of these people at conferences or at a symposium and if Savvy Saunders was there, that would be my introduction - the man with an intuitive brain.

So we got the S-4 back and we then recommended quite a few things to do to continue research in connection with the diving bell, to develop further the lung -

INTERVIEWER: The Momsen lung?

MR. NIEDERMAIR: Yes, the Momsen lung, which was an adaptation from a mining apparatus, that's used in coal-mining districts in Pennsylvania. It was originally used for "something on that order.

Momsen and a man named Dobson -or Hobson -in the Bureau of C & R worked on that.

Momsen stayed with the development of the salvage equipment for the future salvaging of submarines. But as the submarines got bigger and bigger and bigger, those things were outmoded. The diving bell is still worked, though. That could still be used at quite deep depths if the submarine stayed whole and they went down in water that was less than their collapsed depth, but it would be almost impossible to raise the submarine.

So I think that closes off my salvage history.

INTERVIEWER: Did you have any recommendations that pertained to divers?

MR. NIEDERMAIR: No, not necessarily. They continued to work on diving training. They had continual training of divers down at the Washington Navy Yard. Momsen probably was stationed in the Bureau of C & R and Hobson was there. The only outstanding thing I remember about Hobson was that he won the first triple race - you know, where you bet on a race horse and you get two or three horses that would win races that day. Well, he won the first big one.

Q. : Oh, he did!

MR. NIEDERMAIR: He was a real clever person. I remember he couldn't get out of the race track. They had to put a hole under the fence somewhere for him. That's how he got famous!

But Momsen's gone now. All the people are gone. I'm about the only one that's left. No, Ellsburg is still around. Saunders has gone. King's gone.

INTERVIEWER: Was Merritt Chapman involved in any way with the S-4?

MR. NIEDERMAIR: No. They were out of that sort of business. The Navy was doing all this sort of thing for itself now.

After I got back to the yard I wasn't there very long before there was a letter from the bureau, from Rock, with the approval of Admiral Beuret, and the Bureau of C & R, asking me to go to Washington. They sent a copy of that letter to Plunkett at the New York Yard. I'd only been in the yard about a week after we came back from the S-4 salvage and Plunkett called me into his office and said:

"I know, Niedermair, that you got a letter from the Bureau of C & R. They want you down there, and you're delaying your reply. You haven't answered it yet, have you?"

"No, I haven't," I said, "I can't make up my mind."

Plunkett said:

"Well, I think you ought to make up your mind to go and I'll give you a suggestion. When you leave *me*, you go out in the office there and you look at all those people in that office and that's what you'll look like if you stay here."

I let another week go by and I then wrote a letter to Washington and said I would report in Washington on the 1st of May 1928. We had raised the submarine on the 17th of March 1928. I got home about the 1st of April 1928, and here I was leaving again on the 1st of May for Washington, leaving my poor wife back on Staten Island.

INTERVIEWER: Was it for family reasons that you were reluctant to go?

MR. NIEDERMAIR: I'd lived in New York all my life and it was a maritime center, and I had the connection with the Stability Committee. But it turned out later when I went to Washington I finally met all the top people in the merchant marine and the design people and the government people, the

steamboat inspection people, and the Navy people. Then I went abroad and so on, but I did go to Washington. I did report in on the 1st of May 1928.

INTERVIEWER: Then your wife had to make plans for moving to Washington?

MR. NIEDERMAIR: We didn't move right away. We didn't move until two years later.

INTERVIEWER: You wanted to find out if you really liked it!

MR. NIEDERMAIR: Because I had to go to Europe in the meantime. A year from that time I was going to be quite busy. I went back and forth to Staten Island once in a while.

One year from the day I got there I was going away.

On the 1st of May 1928 I was in Washington from New York. On about the 1st of May 1929 I was on my way to Europe. That year wasn't the kind of a year to do it. Now I took her with me though, took her over to Europe with me. She was the belle of the show over there. I have a letter here to show it. People wrote in. She met the present queen and met the present queen's father and mother. She had a grand time.

INTERVIEWER: Are you going to tell me about that now or later?

MR. NIEDERMAIR: No, I'm only telling you what's going to happen to Ethel. We're not going to get into that. We're just getting ready for this now. We've ended the venture and I'm getting ready to leave for Washington.

Interview No.3 with Mr. John C. Niedermair

Place: His residence in Stone Harbor, New Jersey

Date: Monday morning, 29 September 1975

Subject: Biography

By: John T. Mason, Jr.

INTERVIEWER: It's nice to see you this morning, Sir.

I think you want to begin by giving me something of a summary of the personalities and people who were important in your life, in the development of your career, as you approached the threshold of your service, your long service, in Washington?

MR. NIEDERMAIR: Well, what I would really refer to here would be the people I met before I got to Washington. It comes to mind that, of course, Captain George H. Rock, who later on was a rear admiral in the bureau, and Commander, later Captain, Henry T. Wright, who I feel was probably one of my greatest sponsors -he noticed something in me that was one of the most important things about my contacts with all sorts of peculiar, odd jobs that I did with him or for him. Towards the end, he became the chief constructor in the yard. Admiral C. P. Plunkett was the commandant of the Third Naval District and the commander of the New York Navy Yard. I met him quite a few times and I believe I referred to him in some of the previous discussions.

INTERVIEWER: You did, indeed.

MR. NIEDERMAIR: He was, of course, a great person in connection with my work at the yard. He received very little credit for it, but I felt the way he stepped in when the S-4 went down in the First Naval District and he had all the equipment in the Third Naval District, and I was the person who made up a list that came in handy when it happened. He took charge immediately when I told him about this list. He had gotten in touch with me almost immediately when he got the telegram. All the people that were left in the yard on this Saturday night when the S-4 went down were assembled. He was seldom mentioned even afterwards, but his motivation to get active on this job - he started almost immediately when he got this dispatch - and he got all the equipment started out to the salvage area. The pontoons were all in his charge and all the hose gear and the various other equipment that they had to have out there - it wasn't the Boston yard that had this equipment. Boston was in the First Naval District and Plunkett was in the Third Naval District.

INTERVIEWER: You're really underscoring his executive ability?

MR. NIEDERMAIR: Yes, I'm doing that, and also the fact that he stepped into it so fast that by ten o'clock that night - I believe it was about five o'clock when he called me in and the submarine had only been down maybe an hour or so - we had pontoons and everything else under way and I went home. Then, later on, I got a telephone call, as I mentioned in the previous conversation. But I believe that Plunkett taking hold of this thing and putting me in charge of the yard and letting me give the orders there was a very swift move to get things going.

That's the way Plunkett got into the picture and that's why I mention him particularly at this point, because he doesn't get into my career in any way later on.

Then there was another person at the yard whom I have mentioned probably only in a sort of a passing way, and that was the assistant chief draftsman, Ambrose M. Merrill. He was assistant chief but

in those days politics entered into these jobs. The chief draftsman and the heads of all the departments like the machine shop and the blacksmith's shop, all those had political connections.

INTERVIEWER: You imply they don't now?

MR. NIEDERMAIR: No, I don't. I'm only pointing out that it also existed then.

Fletcher, who was a very pleasant man, was the chief draftsman. He always liked me very much and he also took great interest in me, but Merrill was the one who really gave me great interest. He was a graduate engineer from M.I.T., a naval architect, and Fletcher wasn't. Merrill appreciated my understanding of these things probably a little better than Fletcher. So I only mentioned Merrill. I only found out some of this information just recently. I didn't know that that type of situation existed between Merrill and Fletcher because they never said anything to me. Fletcher would come to Washington to call on me but he never talked about things like that.

So there is Merrill, Ambrose Merrill, who is over ninety years old and I am still in contact with him. He's badly crippled. He broke both hips and one thing and another. I talked to him as recently as March, maybe.

Then, of course, there's Edward Ellsberg, a naval constructor. At the time, he was a lieutenant commander, a junior officer, and he went off on the S-51 salvage job, but he was no longer at the yard when the S-4 went down. Ellsberg had an outstanding thing to his credit. He gave absolute complete credit to the people who were working with him, one of the few that I've come across in my whole career

who would go all-out the way Ellsberg did. There were others that went along but I could count them on the fingers of one hand. I'm still in contact with Ellsberg and my last letter to him was in about February or so, and you have a copy of his reply to me. He's a year older than I am. He's eighty-three, and I'll be eighty-two.

Then there's Captain and later on Fleet Admiral Ernest J. King. I met Ernest J. King on the S-51 and again on the S-4, and then I continued to meet Ernest J. King in Washington, as he was "fleeting up." Rock used that when I would be promoted into something, he would call it "fleeting up."

INTERVIEWER: Somewhat of a pun in connection with Ernest King, isn't it!

MR. NIEDERMAIR: I'm just beginning to get an understanding of a part of Ernie King's character. I think that if he detected in people who were playing what I call the school tie syndrome because they were either classmates or some other thing and they would have them drifting along doing things with this, that was one thing that I believe Admiral King detested more than anybody that I ever knew.

A seaman gunner who did a good job for Ernie King, as far as he was concerned, was as good as the highest ranking admiral, because he was good at what he was doing. This was a very important thing, and the school tie wasn't the thing that was so important to him. I believe that's why he doesn't very often get much backing.

I mention Ernie King again because my insight is getting better as I'm working on this taped conversation with you.

That sums up in a way, except on the S-4 Captain Saunders, Savvy Saunders.

Q.: What was his first name?

MR. NIEDERMAIR: I believe it was Harold E. Saunders. He never made rear admiral. I was always grieved about that because I thought he was probably one of the best equipped people in hydrodynamics and the theory of naval architecture. He was the author of a book on hydrodynamics. I came to understand later on that the particular detail that he paid to things really hurt him in not making "a higher rank, by being so particular he evidently hurt some other people that might be on the selection board. But he was a very brilliant fellow and in one of the last issues of the *Naval Engineers*, the last president of the Naval Engineers gives a great deal of credit to Saunders and his brilliance.

That about sums up my time at the New York Navy Yard and the people that I met, some highlights that I wanted to get in at this point, because now when I go to Washington there'll probably only be Admiral Rock and King and Savvy Saunders now and then.

Now I've accepted the offer to go to Washington, D. C., and there were certain things about going to Washington, D. C., that I didn't know. I found out when I got there that I had to accept lower pay than I got at the New York Yard. You couldn't go from a field job to a departmental job at the same pay. You could only go at less pay, you couldn't get more pay or even equal pay.

INTERVIEWER: There was a field work proviso, then, was there?

MR. NIEDERMAIR: Well, I was in charge of the scientific section in New York and had people working for me, and all these different jobs that I had when I was at the yard doing my job, but when I got to Washington I found out that I couldn't get that pay.

I think the real reason was that they tried to keep people away from the outside jobs in Washington. When I was in New York, even though you had a good engineering education and everything, there were no engineering jobs available, certainly not at the Navy Yard. I was graded as a draftsman. And that brings up another point.

When I was working on the S-51, Ellsberg thought I was working such long hours that I ought to get a couple of hours of extra pay because of extra expenses at home and so on. Captain Wright was agreeable to this, but I noticed in a letter that I just came across just a few days ago that Wright wrote to Ellsberg and told him that the admiral, who I suppose was Admiral Plunkett, said that draftsmen can't work more than eight hours a day. You're not supposed to work more than eight hours a day. So Wright said that he was putting that request for overtime for me in his safe and when I got back it would be up to me to fight the battle.

And besides that, he said that he had pointed out to the admiral that I really wasn't working as a draftsman, I was working as a constructor. I mentioned this to you before, that I was working just as though I were a constructor in the Navy.

But when I got to Washington I was switching from a draftsman to a naval architect. Now I was entering a professional branch. It made quite a difference. However, when I got there - of course, I'd known Rock at the yard, Beuret wasn't too pleased about the fact that I was coming from the yard. He was chief of the Bureau of C & R. The reason he was unhappy was, as I found out later on, that there were a lot of civilian engineers in the bureau. They thought they could handle this job of getting ready for the international convention on the safety of life at sea, that they were well qualified to do it. I became friends with everybody afterwards, even those who wouldn't talk to me when I first got there.

I got there and I got going, and while I was working on the project for a year, getting ready for the convention on the safety of life at sea, we had to write up the rules and it was all for merchant ships. It had nothing to do with Navy ships, except that these merchant ships would get subsidized and the Navy could tell them where to put the bulkheads and so on. Our proposed rules for the new convention on the safety of life at sea had started about 1914 ever in London after the Titanic went down in 1912.

INTERVIEWER: There was a system of regulations in existence, I suppose?

MR. NIEDERMAIR: No, the 1914 war came on and the only rules that were followed there - there was no convention that had been approved when the 1929 convention came along. They had certain interim things that they had worked on - certain methods, certain ideas. I always felt that the British started this thing, anyway, in 1914 to really get a platform to prove that the Titanic was really a superb ship, and it was. Even with the rules today and if the Titanic was around there'd be very little change you'd have to make in that ship to make her a good ship and up- to-date.

We got going at all that work, and then again I put on the other hat. Beuret would come rushing in and call me out because Portsmouth Naval Ship Yard would be working on something connected

with salvage operations, modifying pontoons and so on. I wasn't a bureaucrat so my behavior pattern didn't suit some of the ways in the bureaucracy.

I remember saying to Beuret one time when I looked at something they sent down and he asked my opinion - I started giving my opinion by saying "Offhand – “ and he cut me short on that. We were sitting with all these people there. He didn't want an offhand opinion.

INTERVIEWER: He wanted a memo on it!

MR. NIEDERMAIR: So I said, "I will give you a considered opinion, which will be about the same as I just said, that this is not satisfactory."

I turned on my heels and I went out.

This was where I got in trouble when I was with Ernie King. He wanted me to do a job and I did it the way I saw it. Afterwards - to jump ahead a long, long time - Beuret learned a lot about me and had a different opinion of me. I think he was influenced because he was having personnel trouble, but he never said a word to me about it, and neither did his people, but I sensed it.

I met quite a few people in connection with this safety of life at sea. There was James Pennypacker, a young M.I.T. man, that the Shipbuilders Council loaned us. Then there was Carol Roundy, who was with the Shipping Board, and John MacMillan, who was the head naval architect for Ferris, Theodore Ferris, who was the leading naval architect in the country at the time. There were many other people connected with this thing that I met in the shipping industry. All the government people who had responsibility in this field. They hadn't done a damned thing about it, actually, which was very aggravating. The only rules that were worth anything at all were the British Board of Trade rules and when we got over to London, at one hearing there they faced us up because we were demanding a high standard.

Rock was the chairman of our group, and they faced him up and said:

“What does the United States use for regulating their ships?”

And Rock said, "We use the British Board of Trade rules." I remember that incident.

Anyway, we got going and in the meantime -Willie Francis Gibbs, of course. I met him on the Stability Committee and now again he was coming in on this. And there was George Sharp. There was the chief of the American Bureau of Shipping, David Arnett, and Ernest Rigg, who was a naval architect for New York Ship. Then there were the people who represented Newport News. I've forgotten who they were. They weren't quite as active as the people I've told you about. Ernest Rigg was one of the out- standing people. He was an Englishman, a previous Englishman, and Arnett was a Scotsman. Sharp, I was never sure whether he was English or Scots. The three of them came over to this country and became very prominent in our business. So the story went.

Knowing all these people later on helped me quite a bit when I'd finished with the convention. My wife was living on Staten Island. I was working in Washington, and in April of 1929 to go to the convention in London, I took my wife along.

INTERVIEWER: How long did this convention last?

MR. NIEDERMAIR: It lasted for a month or so.

We had a congressman who was the political representative - Congressman White. I've forgotten his first name now. I think he came from Massachusetts or somewhere, Maine, up in that area. I hadn't thought of him but now, as I recite the story to you, these names are coming to me.

I remember that prohibition was on at the time and, of course, there were cocktail parties given to everybody by everybody and we attended all these. There would always be liquor over there, but now the Americans were giving a cocktail party and I remember Congressman White passing the word down that all the delegates from the U.S.A. shouldn't really imbibe at this occasion because we were paying for it but it wasn't legal. So we felt we shouldn't drink our own liquor! I remember that and that's about the only important thing that he did, I think, on that trip.

INTERVIEWER: He was obeyed, was he?

MR. NIEDERMAIR: I imagine so. They knew the situation and we'd take some ginger ale and you wouldn't know the difference.

Over there we sat down with the Russians, who were very brilliant in lots of ways, but the odd thing about them was that they were all commoners and we had to dress according to the style. If you went to any night formal affairs, tuxedos were out. You had to wear tails, and they only wore their regular shoestring ties. They hadn't been taught any of these social things. But from an engineering standpoint they were very helpful. I remember one of the most important things that they insisted on. Even back in those days, at the beginning of their problem as the new government or the Soviet Union, when a question came up about the ice patrol, the United States was carrying a big share of that --

INTERVIEWER: The North Atlantic ice patrol?

MR. NIEDERMAIR: Yes, to find the icebergs before you hit them! They insisted at that very time that they were paying almost the same amount of money that we were putting into it. I thought that that was a gesture by these people. Socially they were really very embarrassed in lots of ways, but this was the way the rules were for them, and I didn't see anybody put on monkey suits.

INTERVIEWER: How many countries had delegations there?

MR. NIEDERMAIR: There were delegations from Norway, Sweden, Denmark, Germany, France, Italy, Japan, the United States, Canada, New Zealand, Australia - because each one of the British outposts was rated as a separate unit -

G.: They were dominions in those days -

MR. NIEDERMAIR: Dominions, yes. As I remember it, there was world representation there.

INTERVIEWER: Of the maritime nations?

MR. NIEDERMAIR: Yes.

INTERVIEWER: This convention was to be drawn up under the aegis of what, the old League of Nations?

MR. NIEDERMAIR: No, it wasn't. It was drawn up by agreement between these maritime countries. It had nothing to do with the League of Nations.

I sat across the way from the Japanese delegation, like I'm talking to you here, and they seemed to take a stand against too much safety because it was too expensive. We had certain loopholes in the convention, such as pilgrims making trips down to Mecca and so on, those ships could carry people on deck and they wouldn't be counted as passengers - these migrants. The Japanese were quite insistent that where they were located and so on, the competition - they felt that they didn't want to go as far as we did in this safety business, which was a great thing for me because, later on, I remembered this.

INTERVIEWER: Did it have its roots in the attitude of the easterner to human life not being as valuable, as we place value upon it?

MR. NIEDERMAIR: That might have had some influence. There were all these people around and all these people wanted to travel and they didn't have much money, really. The Japanese were building big ships at the time and they went along as far as the convention went, but we were arguing for more than the standard that had been imposed by the 1914 convention. We went beyond that in our rules and we did get quite a few things accepted, specially one in which I was instrumental. I was advocating searching out the stability of ships, and I was credited with seeing to it that all passenger ships would be inclined so they would know where the center of gravity was, definitely know where it was, and certain other things concerning wing tanks and so on. They were modest improvements that we managed to get into that convention.

I thought we did very well, considering that until 1920 the Europeans and all the other countries thought we were still Indians - until World War I came along. But then after about 1920 a new age got in there.

INTERVIEWER: What percentage of the U.S. proposals were incorporated into the convention?

MR. NIEDERMAIR: I can't recall. I would say quite a bit of it got in there in words, but when it came down to putting down numbers we didn't do too well. For instance, we got the thing in about the inclining test, which was a very good start because later on that led to more and more investigation about stability. Shortly after I got back, I wrote the first paper on damage stability in 1932. I was quite active in that sort of thing.

INTERVIEWER: What proviso was made in the convention as it was written for enforcement of these regulations?

MR. NIEDERMAIR: Each country would enforce them itself, in a way. But the convention here had to be approved by our Congress and it took us two or three years to get the 1929 convention approved.

INTERVIEWER: That was remarkably fast.

MR. NIEDERMAIR: It appeared awfully slow to me! But I learned later on that it really was rather quick. We got it done and I still advocated stability. I made up a formula for what I considered the minimum metacentric height, which until that was put in that shape and made the metacentric height a function of the beam, as a percentage of the beam, it was so simple and yet it had never been attempted statistically to rate it that way. I was referred to by the naval architect at Newport News as 06B, and Sid Vincent, who was a naval architect, argued that it was too high, that it should be 0-5B. When we wrote to each other, we'd

sign "0-6B" and "0-5B."

But, you see, we were getting recognition and discussion back and forth, and I got very good support in the discussions on my paper, which was considered a classic at the time. Sid Vincent never did agree with 06. I never said that they shouldn't have more than that, but I said they shouldn't have less than that. No, I didn't. I didn't say it that way. What I said was that the legal requirement of the metacentric height need never exceed 0-6B plus some other part of the formula.

I did that because I wanted them to get interested in trying to make the ships safe within the limits of 0-6B.

INTERVIEWER: Yes, I understand.

MR. NIEDERMAIR: I also wanted that in because I didn't want some bureaucrat coming along when you'd finished your design and saying that he wanted 0-8B metacentric height. A naval architect should know how far he would be pushed, and if he was wise he would take the upper limit, which turned out later on to be a pretty good one.

What they were worried about was the critical angle of roll on a passenger ship, because all this talk was only for passenger ships.

INTERVIEWER: But you did make the exemption in the case of pilgrims?

MR. NIEDERMAIR: Yes, and dhows. There was a ship that was used in India that was a dhow. I never knew what that was. That was like a Chinese junk, probably.

Incidentally, Chinese junks had watertight compartments in them way back probably to the year 1000. Watertight bulkheads in them.

INTERVIEWER: I'm not surprised to learn that at all.

MR. NIEDERMAIR: They did because they lived on them.

We finished our convention and Ethel and I spent two or three weeks after the convention going over to Germany and France. We came back home at the end of 1929, and we didn't move to Washington until maybe another year and a half after that, maybe 1931 it was - somewhere in there, anyway. I've forgotten.

So now I'm back in the bureau. I was supposed to under- study James L. Bates, who was the top naval architect in the Bureau of C & R. He headed up preliminary design and this is what they were aiming me for. But I still had to wear this other hat connected with the work on the merchant marine. Some of the things that I started with when I got back had to do mostly with the merchant marine and I really didn't get going on the work that Bates was doing until about 1931.

G.: Was he approaching retirement?

MR. NIEDERMAIR: No, he wasn't, really. I don't believe it sat very well with Bates, because he left with Land later on, in 1938. Jimmy Bates was a very brilliant person and he might have been putting on a sort of high hat or superior attitude. Some people judged him that way, the officers who were there. He was very active. He did a lot of work. He wrote some of the best articles I've seen in connection with our business. He was crackerjack at the hull form, the shape of the ship, and so on.

I had this mixed-up background which led people like Admiral Taylor - I'd be working at a regular drafting table, we didn't have any desks - I introduced the desk idea later on. I had a great big 12-foot drafting table, and I'd be working on a little plan on a great big 12-foot drafting table. Well, who would come down but Admiral Taylor. He was the chief of the bureau during World War I, and others would come in to see me - George Rock, who became the chief of the bureau shortly after, would come down and sit next to me and spend an hour or two discussing things, then walk back. Of course, I was supposed to be working for Bates. As it turned out, I really wasn't.

I was not up in basic ship design. I had no access to that sort of data. I was working in the field, doing the things that the bureau wanted and checking it out and seeing how often it didn't come out that

way. This is the reason why I think they wanted me down in the bureau later on, because I knew all the difficulties they had with the machinery and with the cruisers, the Cincinnati class. They had trouble with inner bottoms when they'd go in a dry dock and then they would notice that the supporting structure would deflect. When you go in a dry dock and you sit down on the blocks, the inner bottom floors, which are the vertical girders, would deflect. So I ran tests on it. I'd seen this happen out in the field. For instance, I'd get involved with the ordnance people because the guns couldn't come back to zero when they rotated them. I found that out and they'd have to put in new rack and pinions to reduce the play.

So, with that sort of background, the naval constructors were all interested in me quite a bit. Bates was more of an office man who hadn't been working closely in those things all the time from 1920 until 1930 when I got there. I'd spent ten years roaming all over the place. He never showed any hard feelings to me or did anything to indicate that he was mad at me, but I know he was unhappy about it, because his means of communication was blocked because these people were coming directly to me and communicating with me and he was the top man in preliminary design. It certainly wasn't a good organizational way to do it.

INTERVIEWER: No, that's an understandable reaction.

MR. NIEDERMAIR: On the other hand, I visited in his home and he visited in my home. He met my family, I met his family, and we got along, but I felt that he was really hurt about this thing. Later on I felt this way. I didn't know it at the time, I was so busy wearing these other hats.

It wasn't very long before the Leviathan was getting into trouble again. I remember one day when I was in the bureau and the Leviathan started breaking in two again. You remember I told the story before.

INTERVIEWER: Yes.

MR. NIEDERMAIR: Well, now the thing busted up again. Either Captain Howard or Admiral Howard came to me and said:

"John, I've got another job for you." I said, "What could it be?" and he said:

"I just got a telephone call from the United States Lines." So I took leave. I had been to New York. It was on New Year's Eve I came to Washington because for some reason or other I wanted to be in Washington on the 1st of January. That would have been 1929, I guess, but I was back in the bureau on the 31st of December when Howard came to me and told me about this trouble.

"Gee whizz," I said, "I just came from New York. Too bad that they didn't find me up there. Well, I'll go on leave again and go up there."

So I went up on leave and I was their consultant. The reason that they got hold of me was that the holidays were coming and it was costing them some enormous amount of money to have this ship tied to the dock. It mounted into tens of thousands of dollars. It wound up that they were right. There wasn't anybody available. The American Bureau of Shipping, which was supposed to have inspectors who would come over and help them, they were all gone.

I left Washington on the night of the 31st, was back in New York on the 1st of January, and went right over to the *Leviathan* and went aboard.

INTERVIEWER: Why was it necessary for you to take leave? Was this not an official duty?

MR. NIEDERMAIR: No, this was not official. I was working for the U.S. Lines. It's like when I went back and forth on the Leviathan. I went on leave without pay then. This time I went on leave with pay because I had the leave and I could go off and take an outside job during my leave. That wasn't against the regulations. Howard told me to do it that way. I was reluctant to go and he said, well, they're in a fix. You know, the usual story.

I spent two or three days there and I invented a couple of things for them on how they could drive rivets hydraulically because they were very thick plates. Some of the plating amounted to two inches thickness up in the strength deck. This time she really started to break in two in several places, so I worked out the method and made a sketch of what the trouble was. I transmitted the information to the U.S. Lines and they got in touch with the American Bureau of Shipping. That's what they wanted so they could start talking business right away, and so they repaired the ship and she went to sea. I certainly saved them a lot of time and a lot of money, too. I wasn't too particular about it. It was a very modest price I charged them. I only charged them for my regular time. I wasn't interested in doing any more than that.

I came back again to Washington -

INTERVIEWER: How long did that take you?

MR. NIEDERMAIR: It only took me three days. Within three days I was back again.

This was why they wanted me. They knew me previously when I was on the ship, or they might have kept track of me, where I was to be found. They called up the bureau, of course, and there I was. If they'd called during the week before I wouldn't have been there.

I was constantly busy working on these safety of life at sea rules and trying to get backing to have the convention approved. Then there would be questions coming up that we had to answer, technicalities that were coming up in the language. People in different countries were working on the phrasing of the paragraphs. I would be in on that and I would have to help phrase those things. So I really didn't get going in the preliminary design work until about 1931.

In 1931 I started right off with a few preliminary jobs that I did. They were of no consequence exactly, but I got familiar with the routine in the bureau, which was altogether different from the routine

in the field, because here now in the bureau you were creating a ship, whereas out in the field there it is, and that makes a lot of difference.

I was still busy helping out on things they were doing in connection with the salvage of submarines, the equipment and work on the diving bell. Questions would come up about the hatches and the ventilation valves. There would be constant interference of this type, and the first thing I knew it was 1931, when I made my first start on anything of any consequence as far as the U.S. Navy went. In the meantime I was sort of learning how to do it, you might say, learning where the data were and finally getting familiar with the people who were in the bureau, because you weren't going to get very far if you weren't getting along with the people there.

INTERVIEWER: It wasn't a one-man operation at all!

MR. NIEDERMAIR: No. It wasn't far from that, though. It continued to be a one-man thing because Rock would get in there all the time. And Jerry Land when he got to be chief was the same way. Land was the one who, when I got back from the S-51, wanted me to go with BuAir. These people knew me. The head of the General Board would come down and talk to me. They should have talked to Bates but I guess I had a more public image, for some reason or other. Anyway, Bates and I got along fine.

I very soon tackled the structure of ships. Bates took care of the lines end of it, which I wasn't too familiar with, but I got into ship structure, the arrangements and scantlings, as we called them, and the weight factors. You see, the hull lines and all would just be the outside imaginary watertight shell. Now you had to put structure on all this thing because these ship lines couldn't go to sea by themselves. They had to be hooked onto something, so I got into studies of the ship as a whole, you might say, and be in on the hull form also, because I would always be checking up on the stability of the ship. It might be less resistance with less beam, but on the other hand, I had to have beam for stability.

INTERVIEWER: Did you simultaneously have to have some knowledge of the ordnance that was going to be installed?

MR. NIEDERMAIR: I would follow that up all the time. I would get familiar with everything that went on. In battleships you'll see that I ran into some things there.

In 1931 and 1932 one of the outstanding things that I worked out the weights and centers, the thicknesses of the plating, which we called the scantlings, the strength, and the subdivision and the damage stability. All those things I tackled. I became very familiar with the carriers, which was rather unusual because we didn't build very many carriers as a result of all this.

INTERVIEWER: This was a time when they were beginning to think more seriously of aircraft carriers, weren't they?

MR. NIEDERMAIR: Yes, they had the Ranger and they had the two cruisers that were converted, the Lexington and Saratoga. The Ranger was the first aircraft carrier that was designed from the ground up, but it was a modest attempt.

INTERVIEWER: But the carrier was beginning to come into its own, wasn't it?

MR. NIEDERMAIR: Within that short time that I was there I was already grabbing hold of this thing, because as I looked up my information that I'm giving you now - I had some notes on this. I then finished with this 10,000-ton flight deck cruiser, which came in very handy, as I will mention when we get started on World War II. You'll see the importance of my having this information.

INTERVIEWER: May I ask you a question? Were you, in planning this 10,000-ton flight deck cruiser, limited in any way by the arms-limitation treaties?

MR. NIEDERMAIR: To a certain extent, yes. That's what the 10,000 tons was, you see. The cruisers were limited to 10,000 tons, but the carriers were not. Carriers could go to 20,000 tons, because the next thing I did was study the 20,000-ton aircraft carriers which later on became the Yorktown and Enterprise - a long time afterwards.

This 20,000-ton aircraft carrier study that I made resulted in the Yorktown, CV-5, the Enterprise, CV-6, and the Hornet, CV-8. However, during the same period I studied a 15,200-ton aircraft carrier for the General Board, which turned out later to be the Wasp, which was the CV-7. I don't have the dates when they got in there but it was quite a long time afterwards - after I got going on this thing. When I did these studies I had to look into their arrangement plans and all that sort of thing, too.

INTERVIEWER: Did you take into consideration anything that the Royal Navy had in being at that time?

MR. NIEDERMAIR: We did to a certain extent. I was not too interested in that because the General Board was making those comparisons. The General Board was working on and studying the need for - I put a note here that these studies were made for the General Board. The 20,000-ton carrier was for the General Board at that time. Later on it developed that they became the carriers that I named to you.

INTERVIEWER: Who on the General Board was particularly interested in carriers at that time?

MR. NIEDERMAIR: I don't remember. I was only a beginner, you know, and I wasn't too familiar with these people yet. I have very little recall because these officers would come and talk to me and leave and I wasn't working with them directly very much, so their names didn't stick with me. And the General Board was constantly changing because that's where all the officers who had been to sea and were ready to retire -they were senior officers.

During that same period we started studies of large destroyers already from 1931 through 1932.

INTERVIEWER: Large, what tonnage?

MR. NIEDERMAIR: At that time the Farragut class got in there. She was the first post -World War I destroyer, but according to these studies here, she was not so big. My note says that at that time I was studying large-destroyer schemes, about 365 to 372 feet long.

INTERVIEWER: And that would be a tonnage of what?

MR. NIEDERMAIR: Oh, probably in the neighborhood of 1,400 tons or 1,500 tons. I think we were limited to 1,500 tons.

INTERVIEWER: Under the treaty?

MR. NIEDERMAIR: Yes.

During that same time I started getting into all these things, then I'd come across my interest in safety at sea. That began to pop up every once in a while. One of the things I did during this period was to make a research memorandum on the number and location of airports in foreign and U.S. naval vessels. You know, you put a nice heavy shell plating on a ship and carry it all the way up to the deck and then you cut a lot of holes in it so that people could see daylight down below. I was opposed to this and I took issue about putting air ports into these ships.

INTERVIEWER: And that's the term that describes that, air port?

MR. NIEDERMAIR: Yes, because they would want to open them up and get some ventilation in there, too.

INTERVIEWER: And that lessens the strength?

MR. NIEDERMAIR: No. We could take care of the strength, but when the ship got into an accident the water would run in through these ports. It no longer had a watertight side.

I submitted this memorandum and the same thing happened to me there as happened in New York when I made up a memorandum on plans for a future submarine accident when I got back from the S-51. I was told to file it away, that they couldn't tell the bureau what to do. This time I ran into trouble in the bureau, where they told me to file it away and to bring it up when an emergency arose.

INTERVIEWER: You mean when something happened as a result of an air port?

MR. NIEDERMAIR: Well, yes, but I kept watching it all the time, every chance I got.

INTERVIEWER: How were you going to provide a facility without the air ports? How were you going to do this?

MR. NIEDERMAIR: Well, they had lights in there and they had ventilation systems and everything. They just had to have more ventilation. Now, I understand, they have air-conditioning in all these ships. Nearly every ship is air-conditioned. We struggled along in the days before air-conditioning. But I ran into trouble on air ports. I got worried about it because a warship really expects to get into trouble. *At* some time in

its life it may be called upon to be standing there and helping Uncle Sam out.

I also prepared a paper for Admiral Rockat this time, a lecture it was, on the safety of life at sea, and then a paper on the education of naval architects. I wrote a paper for him on that because he was advocating certain principles that he thought we ought to do something about, telling them what they ought to do about the education of naval architects.

INTERVIEWER: You mean a new curriculum for them?

MR. NIEDERMAIR: Yes, what they should be doing and so forth.

G: Did you do this in conjunction with M.I.T.?

MR. NIEDERMAIR: No. I don't remember whether Rock finally wrote the thing or edited it and had it put in as a paper for the naval architects. I don't know what he did with it, actually. He left the bureau shortly after this, I believe, to become head of Webb Institute of Naval Architecture, where I came from. He was interested in education.

INTERVIEWER: He was going to apply the principles there!

MR. NIEDERMAIR: Yes, he did, and he was a pretty tough egg, too.

INTERVIEWER: Incidentally, may I ask you another question? Were you aware of what the Japanese were or were not doing under the terms of the convention?

MR. NIEDERMAIR: Oh, yes, that's right, too. I'm glad you brought that up. I studied the Japs' attitude and I decided they were either trying to kid us into not being fussy about safety or they really meant it. So every time they published anything about their ships, they'd make plans as a sort of publicity stunt and their regular plans would be copied on a small scale, I would take those plans and work out a scale for them in the technical magazines. I'd manage to make special scale because they would always tell you about the length of the ship, so I could make a scale that would fit that diagram. I'd study these ships and decide that the Japs really meant it when they said they weren't interested in the safety of ships. They (our people) knew that I had done this thing. I had told somebody about it, and they'd come to me and ask how many torpedoes did I think it would take to sink a Japanese ship, and I would say one would do it, or two would do it.

INTERVIEWER: And they were very vulnerable, weren't they?

MR. NIEDERMAIR: Yes, they were. I was right. But you see going to that convention and me being there - there were lots of other people there, but I was the only one who was constantly - evidently, that's one of my traits, to keep digging at these things when I don't know. I'm a great curiosity seeker. I'll search a thing out - I used to, anyway - to the limit, and I always had more time than anybody else because I still only use four or five hours' sleep a day. So I would always have two days to work on.

INTERVIEWER: When you gave that answer to them, how many torpedoes would it take and you said one, you still were not aware of the fact that sometimes the torpedoes didn't work?

MR. NIEDERMAIR: I found out later on that it bounced off, but my having been over there made me aware of the fact that their merchant ships - they put bulkheads in for practical reasons but they weren't worried about safety. So that was a great help. And, of course, that led to other things, my contact with the people in the Pentagon and the military people. I got to be known in the Bureau of Yards and Docks. Cdr. J. T. Reside (USNR) was there and Captain Laycock. Then the people in the Bureau of Aeronautics would come over to see me. I would be in contact with the people who worked on arresting gear. I would individually know all these people who were working in Ordnance. I'd go over there and talk to people -the designer of the 5-inch gun, which was very successful, one of the most successful. Then they would come over to see me. They would want to know what would this do to the ship and I would try to tell them.

Captain Diehl -I don't know whether you ever -

INTERVIEWER: Yes, Walter Diehl.

MR. NIEDERMAIR: He used to come and sit down and talk to me because I got interested in some very complicated methods of stresses in plates and he passed the word around. He'd be fascinated with this thing, and I was always interested in math, which I wish I could get at now, but I haven't had the time again.

You asked the question did I do these things. Yes, I did. I made myself thoroughly familiar, and in the contract design I would know all the people, all the leading men in there. And later on when they came back from the war, I would go and meet the officers who were on submarines, for example, or the officers who were going away would come in to see me. It was really a very happy relationship.

INTERVIEWER: And a very complicated one, I would think?

MR. NIEDERMAIR: It was very complicated, yes.

I mentioned before that I met Ernest Rigg in connection with this thing on safety of life at sea. Now, in a very short time I was running into Ernest Rigg because he was - this was 1932 about - busy designing the Manhattan and Washington, passenger ships. I got involved on the stability and the inclining experiments on those ships.

INTERVIEWER: What was their tonnage?

MR. NIEDERMAIR: Oh, I've forgotten now. They were very big ships, but I couldn't tell you. I could look it up for you. They were really the top ships in the U.S. fleet when they got going.

Rigg was always on my side when it came to stability, but unfortunately for him the Manhattan and Washington didn't turn out too well. They were rather fast rollers. I don't know just why they were troublesome. As a matter of fact, for stability they had to put in "ersatz" ballast, as he called it. It sounded to me that they were running deficient in stability and they had to put ballast in them. A passenger ship isn't going to carry very much cargo down in the bottom ever, that I know of.

Rock got interested in this, too. He was now up at Webb and he'd be writing to me and I'd have to write letters back to him. He'd ask me about the stability of the Manhattan and the Washington. I would know about it and I'd write back and give an opinion. Somewhere I have a letter from Rock.

To give you some idea of how these things worked out, I'm referring to a letter that's dated 1938, when he's still after me about stability:

"Thank you for taking time for me. I knew you would do it, although very busy in the bureau, but as you know I consider you quite the outstanding authority on stability and I wanted your phrasing and your touch in this particular important description."

That had to do with some people who were writing a book, in which they were hesitating to say the right thing about stability, and so Rock got interested in the Manhattan and Washington, because he was up at Webb and he wanted to know how they were doing.

While I was looking for that Rock letter, I came across an interesting letter that Ernie King wrote on the s-51 salvage operation, so that you can see the kind of letter he wrote. Here we were in 1932-1933 and, as I mentioned before, here again I'm working with Lieutenant Commander Edward L.

Cochrane, who was now up in the Portsmouth Naval Ship Yard. I was co-author with him in writing *Bulletin No.8* on sub-division, stability, and construction of naval vessels. This bulletin was sponsored by Admiral Rock. We started working on it and we never finished it until Rock was up at Webb. It got to be quite the thing. A lot of people in the merchant marine, like Arnett from the American Bureau of Shipping - I have a letter from Arnett requesting a copy, he'd heard about this book and he'd like to have a copy of it.

INTERVIEWER: How did Ned Cochrane get to be an authority on stability?

MR. NIEDERMAIR: Because he was with me on the safety of life at sea.

INTERVIEWER: Oh, he was at that. I see.

MR. NIEDERMAIR: He was there and he knew the work I did on there and he knew about the convention. He was very familiar with it, so the two of us wrote the thing. I would put in all the things that I could think of and he would get hold of it and work on it, add what he thought and so on, and we got to be quite well known on this Bulletin No.8. If you want a copy of it, I may have an extra one around.

INTERVIEWER: Yes.

MR. NIEDERMAIR: The next thing that I tackled from 1932 to 1933 - Roosevelt was elected president in 1932 and he was inaugurated as president on March the 4th, as it used to be in those days, so he wasn't there very long before he made himself felt. I have a note here that President Roosevelt was anxious to get work started, so we started on 6-inch cruisers, the Brooklyn class they were.

INTERVIEWER: Still in conformity with the limitations treaty?

MR. NIEDERMAIR: Yes, but we were limited this time to 6-inch guns. They had made an agreement that we could build more of these cruisers. We were building 8-inch cruisers up till this time. Only one of this group, the CVA-45, as I remember, was an 8-inch cruiser and that would be the last 8-inch cruiser. All the rest of them would be 6 inches.

INTERVIEWER: CLs?

MR. NIEDERMAIR: Yes, and that was a good thing. I always felt that Admiral Stark was responsible for that. I always gave him great credit for that.

INTERVIEWER: What makes you say that?

MR. NIEDERMAIR: Because he was head of Ordnance at the time when they developed that fast-firing, 6-inch gun. That 6-inch gun could fire faster and probably couldn't sink any ships exactly, but it could knock the intelligence out, get on target, because it turned out later on, in World War II when we got radar, that when we fought the battles down in the Guadalcanal area, when the Japs almost got through, really the 6-inch cruisers, I thought, were the ones that licked them. Betty Stark got into difficulty at Pearl Harbor, as I remember, but anyway he went to the last arms-limitation conference in London and he was in favor of the 6-inch-gun cruiser, and I personally favored it because it was a fast-firing gun.

INTERVIEWER: That limited the tonnage to what?

MR. NIEDERMAIR: Still 10,000 tons.

INTERVIEWER: Oh, it could be a light cruiser and still 10,000 tons?

MR. NIEDERMAIR: Sure, that's what they all were, down to 10,000 tons.

We got going on the Brooklyn-class cruisers and he (F.D.R.) was anxious to get the work started. I worked on the preliminary design for them, and it was decided to have New York Ship make the contract plans. Here's where my other hat comes in again. We had contract plan people and you would think they would have said to the people over at the contract plan division, "We'll do this at New York Ship." But instead of that they asked me to go to New York Ship and have them figure all the weights and the strength and make the contract plans up there.

I went up there to push those plans and all the weight calculations and all the usual stuff that contract design would do.

INTERVIEWER: That must have caused difficulties within that division?

MR. NIEDERMAIR: I don't think it did because it meant a heck of a lot of work for me and nobody ever objected when I got bombed up with jobs like this because I had to go to New York Ship once or twice a week, and it started in August 1933 and ended in December 1933. And during that time an odd thing happened. You remember that fellow Cord who was developing an automobile? And when New York Ship built the Manhattan and Washington they had saved some money in their treasury, and Cord brought up their stock at a low price because there was a lull in there because of the depression. He bought New York Ship stock and got control of it, and I was there the day that the Cord people came into New York Ship and said that they were taking over.

Metten, who was the chief engineer of New York Ship at the time, finally became president of New York Ship through that performance.

I made these trips each week to New York Ship to speed up the preparation of the contract plans, weight estimates, strength, stability calculations, and so on. And I imagine it was about the spring of 1934 that we built the yard force up to about 4,000 people.

G: There was no change in policy as a result of Cord's taking over?

MR. NIEDERMAIR: No, he was only after the money that was in the treasury. Somehow or other, he bled that out of the place, which is a typical way of doing it.

This experience that I had on the Brooklyn class I was able to do, why, because I met Ernie Rigg. He was the chief naval architect who had to do a lot of this work, and I knew him from the work that I did on the safety of life at sea. It may be that this is the reason why they sent me, but they never explained it. They just asked me if I would do it, and I did it. When I got up there and I knew these people and I had no trouble -Tom Bossett, Rigg, Joe Thompson and Metten. We finished up the hull plans first and I also had to watch the machinery plans at the same time. I wanted to get the hull plans signed as soon as I got finished with them and Metten said:

“No, Niedermair, why don't you wait till we've finished the machinery plans?” So I said, OK, we'll do that. We waited till they'd finished the machinery plans.

When they'd finished the machinery plans, he sent out the word that they were ready for signing, which made it look like he was the guy who finished up first! That didn't bother me too much. Then when I got back and had finished with the Brooklyn class, which came out very handy later on when we worked on the Cleveland class -that comes in up the line a bit, I got to working on the Farragut class of large destroyers.

INTERVIEWER: You had worked on those long-range plans previously?

MR. NIEDERMAIR: I'd been studying them, now I had the job to really work on them. So I started working on it and one of the interesting ideas I had, the metallurgists told me -I can't think of the metallurgist's name, but I went up and talked about the new materials that I could put into this new destroyer, aluminum and stainless steel, so I went to the metallurgist and talked to him about it and he said:

“Yes, John, that's great stuff. We've been waiting three thousand years for this.”

I always wondered why he'd been waiting three thousand years, or two thousand years, for this. Anyway, I got going on this destroyer, and the first time I worked on it I decided that I'd make a study to see what it would look like if I made it out of stainless steel.

INTERVIEWER: These were the destroyers they called gold something or other?

MR. NIEDERMAIR: Yes, those early destroyers. I designed the thing on the basis of stainless steel because that meant that we didn't have to worry about painting it and everything. This is what they told me. They told me what it cost for a pound of stainless steel and it cost quite a lot of money, so I decided

I couldn't build this thing out of stainless steel because it cost too much money and didn't save enough paint. The paint would never cost as much as this ship would cost if I made it out of stainless steel.

And it's a good thing they didn't build it out of stainless steel because it turned out that stainless steel was a prima donna. The people who ran the salt tests made little test samples and set them up in salt spray. However, before they put the stainless steel into the bath, they had to clean this up so they could detect whether any corrosion was starting. They'd clean it up with a nice piece of velvet and stand it up inside there. If you could do that to a ship it wouldn't corrode. Newport News and others fell for this and the people who were interested about gasoline tanks and the carriers that were building - I think the Yorktown and Enterprise were building at that time, they built those gasoline tanks out of stainless steel, and they had holes in them before they could even launch the ships. They had to put holes in the side to take the tanks out.

Why? Because they used ordinary steel tools on them, and these steel tools would leave a little mark on the side of the stainless steel. That would start pitting, start electrolysis. I didn't fall for that one, but I did go along with the idea - I went along with the idea in my preliminary design work putting portholes into the superstructure made out of stainless steel and they pitted.

I also went into a modest amount of aluminum on the superstructure.

INTERVIEWER:: This made for less weight, didn't it?

MR. NIEDERMAIR: Yes. The superstructure, as I remember it, on the Farragut class was the first one. Alloy aluminum wasn't too good at the time, and I don't know just how well we did with that.

INTERVIEWER: Aluminum has an age span, doesn't it? I mean there's a limitation in terms of years?

MR. NIEDERMAIR: A little bit, but we built things out of aluminum later on, and airplanes are built out of aluminum. There was that stretching that you get because they don't really have an elastic limit. That's what it is. Steel has an elastic limit. Mild steel has an elastic limit where you pull on it up to

30,000 pounds per square inch and you let go and it will always go back to its original size. But aluminum, no matter what you do, always comes out a little longer all the time.

Q.: Like rubber!

MR. NIEDERMAIR: So, I got in there and got the Farragut going and that's about where I finished at the end of 1933.

Rock left the bureau in 1932 and Land came in - Emory Scott Land became chief of the Bureau in 1932. He was there then as chief of the bureau until he left to go to MARAD, when he retired from the Navy. So that would be some six years, until 1937, he was chief of the bureau. It was a very active time and it wasn't very long before I got going in connection with battleships, with battleship studies, and the North Carolina and the Washington resulted from these studies.

When I started to make these studies of the weights and the arrangements - the size of the ship usually is determined by - the speed has an effect and all the things you put into it have an effect and create the length, in a way. Then from it all comes the displacement. So this business of casting up the weights, as I told you before, and making up the structure plans and arrangement plans inside of this invisible set of lines that they started experimenting with - I'm not sure whether they got a twin keel on the North Carolina and Washington or not, but I do know that later on they brought that into the picture because we felt that a twin-keel arrangement for the in-board propellers, each one of the inboard propellers would be on sort of a keel so the flow and the lines of the flow to the propellers would be better that way. The outboard ones, then, of course, would be on struts, just like they usually are.

INTERVIEWER: Do I take it that when you first began working on these designs and plans they were to be 14-inch?

MR. NIEDERMAIR: 14-inch, yes. Four 14s are what I used at the time. But in my contact with the Bureau of Ordnance, I finally talked to them about it, I had an idea that maybe I ought to allow on the diameter of the barbets, the cylinder on which the gun mounts would rest, and down below where the

powder-handling was going on and all, would be inside this barbette where you'd sent the shells and the powder up to the guns. I wanted the inside diameter of that barbette to be able to take a triple 16, which was very important, as it turned out later on, and I found out after a certain amount of maneuvering around that if we could put 14-inch guns on there so that we made these turrets four 14s it would come out almost the same as the barbette for the 16-inch mounts, and by some juggling in there they could work it out. That is, the designers of the 16-inch guns could get it into the same barbette that I was putting the four 14s on.

INTERVIEWER: What induced consideration of the 16-inch gun?

MR. NIEDERMAIR: I've forgotten now but for some reason or other it got to be a fetish with me and I chased it to the limit. I think there was some talk about the 16-inch shell being a much heavier shell and could penetrate the armor of some of the other ships.

INTERVIEWER: Was it too early to think that there were rumors about the Japanese and their 18-inch guns?

MR. NIEDERMAIR: I doubt it very much because they were limited by the treaty, too. They couldn't have as many as we had. We could have the same number that the British had.

INTERVIEWER: 5-5-3, wasn't it?

MR. NIEDERMAIR: Something like that. Anyhow, the guns also were limited. They were limited on the size of the guns they could carry.

Q.: But we were beginning to suspect, were we not, that they weren't living up to it?

MR. NIEDERMAIR: No. This was one of my big complaints as far as security went. I don't know just what caused me to do these things. I also checked into other things concerning the side armor belt, why they stopped it five or six feet below the waterline. I complained about that to Ordnance. I asked them

whether they had any trajectories, what was the path of a shell under water, and they said they only had it for a 5-inch gun, and things like that.

I would go down to Indian Head where Ordnance would be running their tests. You asked how I got to dig into these other people. I'd go down to Indian Head where they were firing a 5-inch gun through the ring and they were testing out the powder cartridges with plastic sealers on them. I was standing so close to this firing that when they shot the gun off smoking plastics were falling down on the ground and hitting my feet. That's how close I was to this.

After the firing was all over, we had a conference, and I mentioned this but nobody had noticed it. This would have happened on the ship, and the personnel around would have been hit by all these fragments. I was the one who found that out because it was hitting my shoes. I was that close. I was close to these rings to see how they were getting the velocities of these guns.

0: And when you were dealing with the battleships -

MR. NIEDERMAIR: With the battleships, I would be going over to ordnance in the same way. I would go into it and I would discover or complain about something they would be doing. I would let them in on it. I wouldn't keep it secret. I would tell them right away.

INTERVIEWER: I would suspect that the General Board had a lot of feed-in on battleships, didn't it?

MR. NIEDERMAIR: Yes, they did, and that's an unfortunate thing because look at all the battleships we built and the few airplane carriers we built. The chairman of the General Board came down to me at one time, we were talking about things and he asked about protection around the bridge. I was an advocate of protection around the bridge, and he said:

"You know, Niedermair, the boys sitting around on their desks over there when I talk about protection around the bridge they say oh, no, we don't need any protection up there. Hell, they're not going to sea any more."

I said: "No, you're right. I think we should have some protection up there, weather protection, anyway."

So he went back and talked to the boys. These boys were all about sixty years old and I'm sure they weren't all sitting on their desks. I've forgotten his name.

One of the pleasures I got out of this business that I was in - I always assumed the naval architect was responsible for the whole ship, everything that went in it. That was my philosophy. Somebody had to be responsible for the whole ship, and I felt the naval architect was. When the machinery went into a ship, I always told the machinery people how much room they could use, how long the engine room was, and if anything would happen they'd blame me when they couldn't get at some of the stuff they put in the engine room, and I'd say:

"Hell, if you knew you couldn't get the stuff in, you should have come back and told me about it."

We would fix the engine room length before they had their studies finished.

Anyway, I was getting into these battleship studies, and the Secretary of the Navy created a board to check into our design finally. We worked on these things from 1933 to 1936, and made 77 preliminary studies. I remember the chart that we made up. I remember going in to Captain Chantry, who was a real clever fellow, a fine design officer, and I told him that I thought we ought to make up a table for this board, tabulating all the different schemes that we made up. Chantry said - I think his name was Alan -

INTERVIEWER: Alan Chantry, that's right.

MR. NIEDERMAIR: He said, "No, John, don't bother," so I came out. Jimmy Farron was a young officer with me and Bill Leahy was another young officer, and then Bill Howard. They all became rear admirals later.

INTERVIEWER: Except one became a fleet admiral!

MR. NIEDERMAIR: Yes, but that was Bill's father.

INTERVIEWER: Oh, it was his father.

MR. NIEDERMAIR: Yes, he was with Roosevelt. That was Leahy's father.

When I came out, I think I told Farron. I said:

"Farron, I was just in talking to Chantry. I want this table made but he doesn't want it, but I think I want it. So why not get busy and make up this tabulation?"

They made up a tabulation and it turned out to be a set and columns, all about an inch or so wide, so we came up with a thing that was over six feet long. When it was all done, I took it and showed Chantry what I had in mind. I said:

"I wanted to make this thing up because I want that board to see that we didn't design this ship overnight."

When he saw the thing, he was really amazed at it. He grabbed it and took it in to the chief and for the longest time I never saw that thing again. I almost thought that the board might grab it.

INTERVIEWER: I should think it would have been very useful, however, for this special board?

MR. NIEDERMAIR: Metten was on that board. He was president of New York Ship. And Admiral Strauss. I think he's the one who became head of the atomic energy thing at one time.

G,: Yes. Louis Strauss.

MR. NIEDERMAIR: Professor Hovgaard was on there and so was Willie Francis Gibbs on that committee. There might have been one other man but those are the only ones I remember.

Something happened here. Bates and several people had to appear before the committee. I was with them, when they went. Then when Cochrane and some of the officers had to appear before the committee, I think I went with them, and so on. Towards the end, the committee wanted to see me by myself. That was an odd occurrence, to say the least, wasn't it?

INTERVIEWER: Yes, it was, indeed.

MR. NIEDERMAIR: Everybody had been in talking, now they wanted me to see them alone. So, what did I do? It was now in contract design. The plans were being made into contract plans, you see, and I decided that before I appeared before that board I'd better go to work and study the situation with regard to weights and the trim of that ship - or the ships, the two of them. I did all that work at home at night. I didn't do this work in the office, I'd work at night. My testimony before that board was all prepared at home. I studied it and I decided that the ship was trimming by the stern, and the thing that had to be done in those contract plans was to move all the internals forward at least two frame spaces, which would be eight feet. The center of gravity was too far aft, so you just take everything inside and move it forward, cut eight feet off the bow and stick it on the stern.

Now I had another scheme. My other scheme was that I was not going to appear before that board with my notes. I wouldn't go with any notes whatever, no books, no calculations, nothing.

INTERVIEWER: What was the reasoning back of that?

MR. NIEDERMAIR: Because I didn't want them to take these books and copy them. I was security-minded. I didn't care who this board was. Gibbs was on it and he was a naval architect and all that sort of thing, and Hovgaard. They would all have wanted to see how this thing was done, I'm sure - I was sure at the time.

So I appeared before them without a single piece of paper. I walked in, and I might have had just an empty pad. I wasn't head of the section yet, when I did all this. Bates didn't know that I was doing all this stuff at night, but I finally told him that the thing was kind of heavy by the stern and they'd better move all the things forward two frame spaces. I notified the contract plans people about that, too. Now they had to change all the frames and they blamed me for it. I didn't mind being blamed for that because I'd much rather have the change on the paper than have a ship come out heavy by the stern.

And the other reason I wanted to do that was that I thought maybe the committee might have made this investigation and known it, because the contract design had been out of our hands for quite some time. So I investigated what the contract plans were up to before I went to see the board. It was 1936 now and I was working on it in 1933. In fact, I was working on it longer, because you notice before I mentioned that I was working on it, so I was getting to be quite expert on battleships.

I appeared before that board, and I'm pretty sure that Gibbs knew what I was up to because he'd dealt with me on the stability committee, but I answered all their questions. I wasn't stumped on any question whatever. I just guarded against the fact that if I had a notebook they would like to see how I did it. Naturally, they would want to take it and look at it, I felt. And, you know, it turned out later on that Gibbs did design a battleship for the Russians.

INTERVIEWER: Oh, he did?

MR. NIEDERMAIR: Yes. I didn't contribute to that, although we became great friends and I was his chief consultant from 1959 until about 1968, almost eight years.

INTERVIEWER: When did he design the battleship for the Russians?

MR. NIEDERMAIR: I don't know, about the same time.

INTERVIEWER: As this, in the thirties?

MR. NIEDERMAIR: Yes. However, I guarded against anything like that. And that brings up the point of the things that are appearing in your magazine.

INTERVIEWER: The Proceedings?

MR. NIEDERMAIR: In the Proceedings. I always took the stand that you give a research job out to a laboratory and you spend a lot of money to find out something, and the professors and all these people who are working in the laboratory as soon as the job is done they want to write a paper about it. I never would allow that, not with anything I had to do with. I stopped a paper that was written at Notre Dame by one of the engineering professors out there. He made up this paper. It had to do with ships' motions, submarines' motions, submerged motions. He made it all up from unclassified material that had been published in the United States. Now he put it all together in the paper, and I said now that he'd done this I was afraid that the Russians would get it because now that he'd put it all together they wouldn't have to do it.

The head professor at Notre Dame at that time, in engineering, was Schoenherr. Dr. Schoenherr was the dean of engineering at Notre Dame, and I'm sure - a professor always has to write a paper, you know - that he suggested that he write a paper like that. He did such a good job that I classified it. Now that's an odd thing, isn't it, but there is such a thing as putting all unclassified, isolated material together and it's getting too close to what we know about the motions of a submarine we were going to have maybe faster-running submerged bodies in these submarines, and I wasn't going to let it go.

INTERVIEWER: All the blocks begin to fit together!

MR. NIEDERMAIR: It was that sense that I had then when I came before the committee. I was fighting that battle of security.

It's just about this time, you'll find, that ships' data books that they used to publish by public printers was stopped. I have a 1934 copy of it and I wish I had a later one. I think it was about this time

that I managed to get people to do something about this, because they could pay fifty cents for this thing and find out all about our ships.

INTERVIEWER: What about Jane's Fighting Ships?

MR. NIEDERMAIR: Well, up to a certain point, you've got to be careful about that, too. But I think that it finally reaches a limit. I never was in too much favor about it. Once a ship is in existence, maybe it's all right because really we never found out anything. My objection was the Japanese potential enemy, or we were their potential enemy, whichever way you want to look at it, and I never could find out very much about what they were doing. They were very good at keeping their own stuff secret, very good, and so I felt that I didn't want them to know in the early days - in the later days, when this submarine thing that I just told you about happened, was after World War II.

About this time, the Morro Castle caught fire, going up the ocean coast, off Atlantic City somewhere, and I think about 1,0 people lost their lives on there.

INTERVIEWER: This was September 19,4.

MR. NIEDERMAIR: Yes. Now I got involved again. You see, 19,4 was only just about five years after I'd been over in this other thing, so I got involved in this thing.

One of my first involvements in this Morro Castle thing was that the steamboat inspection technical stuff was very bad, so I was designated as a person to go over there, put this other hat on, and reorganize the technical division of the steamboat inspection service.

INTERVIEWER: Before it became a part of the Coast Guard?

MR. NIEDERMAIR: That's right, yes.

I went over there, and I wrote to Webb and I wrote to M.I.T. and I wrote to Michigan, and I wanted to get to the top people among the young naval architects who were coming out. I got two from Michigan, two from Webb. I don't remember who I got from M.I.T., but the two particular people that I

got from Webb were J. J. Henry and Charlie Murphy. Charlie Murphy became a rear admiral in the Coast Guard, and J. J. Henry is head of J. J. Henry, naval architects. I got them their first job. They didn't really know that because we sent a telegram up to Rock, and Rock, of course, called them in probably said; "I've got a job for you." I asked for the best he could get.

In the meantime, I had talked to the Civil Service about this thing and the trouble I was in. I had to get good people and have some inducement to get the good young people from 'the colleges. I prevailed upon the Civil Service to let me give anybody that I approved of one grade higher than the grade that was officially called for by the regulations. If they came in on the grade P 1, professional grades at that time, I could give them grade 2, so they would get more money, as though they had at least a year's experience. I was the only person who could do that in Washington. They left it up to me. If I put my initials on it, they'd get this extra higher grade.

That's where I got tied up with the Morro Castle. I did reorganize the technical duties over there and I brought in my friend Carol Roundy. The man who headed up the steamboat inspection was Hoover's brother, Hoover from the FBI. Now in my going around and checking on who all these people who were working there - I found one man sitting in a corner that no one would ever lead me up to. Finally, when I came back, I said:

"Tell me, who is that person in the corner that you never introduce me to."

"Well, he's a presidential appointee."

The next week when I came around he was transferred to another department. This stuff was going to wind up in the Senate of the United States, you see, where it wound up later on. But I never knew that man's name. They wouldn't tell me what his name was.

INTERVIEWER: And that was J. Edgar's brother?

MR. NIEDERMAIR: No, J. Edgar's brother was the head of steamboat inspection before the Morro Castle accident, but he was removed and now there was a new man who headed it. That's kind of a mix-up and a very interesting mix-up. And who was chief of the Bureau of Ships? Jerry Land. He was a

good guy and he didn't mind anything I did about these things. He never even asked me what I was doing and I never had to report back to him. Very seldom did I have to report back to these people. They let me do what I wanted and then they wouldn't be responsible for it! All through their lives they finally learned that they never got in trouble.

INTERVIEWER: How did steamboat inspection get involved with the Morro Castle? As a result of that?

MR. NIEDERMAIR: Because this thing was supposed to be inspected by them and all that sort of thing, and the rules and regulations were so ridiculous. They did all kinds of things. They were really criminally liable in lots of things, according to the law, but they did everything by committee, so you'd have to look up the whole committee. But the committee would agree and there'd be a general approval, and you could never lock up a group like that. There'd be a difference of opinion.

For instance, one thing that they knew very accurately was the number of matches that a lifeboat should have – the exact number of matches. If it carried that many, it was legal.

Anyhow, I worked that out and then the next thing I knew I was on a committee and Rock was on it, and so on. I was on this committee to come up with Senate Report 184, which was approved by the Senate in 1936. Rock was the chairman, and I got my stability formula and other things into that report.

INTERVIEWER: Had the Senate conducted an investigation?

MR. NIEDERMAIR: Yes. Senator Copeland was the head of the committee –

INTERVIEWER: Royal Copeland.

MR. NIEDERMAIR: And we were doing our work for the Senate. I have a letterhead that says "U.S. Senate." Maybe you ought to stick that in my file.

INTERVIEWER: Did the Senate committee conduct an investigation of the Morro Castle accident itself?

MR. NIEDERMAIR: Well, we in a way were doing it because we were coming out with new rules. We found out that the steamboat inspection was lax in its attention to these technical details. For instance, their fire drills, the training of the crew. One of the worst things that happened on that ship was the fact that the crew got a couple of boats over the side and they landed up here in Brigantine somewhere, on the beach, and they were mostly filled with crewmen. So there was the matter of seeing that their training was done properly, and the equipment wasn't in very good shape. Fires don't happen every day, so the valves don't work, other things don't work, or the pumps don't work.

As a matter of fact, the fire started in a writing room or something like that and in a matter of a very little while they sent signals off to warn all the passengers. The crew went up forward and the passengers went aft, or something like that. Some of the signals didn't work, warning them, to wake them, you know, to come out. A lot of people lost their lives on that ship. There were a lot of things like that. There was a lot of talk that there was subversion involved in it. I don't know whether it was or not. Somebody could have left a cigarette.

I rode on the Queen Mary and you saw signs all over "No Smoking" below because it was full of wood. It had been waxed and polished and waxed and polished for many years. If it ever caught fire - well - the Queen Elizabeth caught fire and she was a goner.

Anyway, I got involved in that and that took up a lot of time, working on the regulations to govern the subdivision and stability, fire-resistance for merchant shipping. It had nothing to do with the Navy, in a way.

G: Senate Report No. 184, was this enacted as a resolution of the Senate, or what?

MR. NIEDERMAIR: It became the law for steamboat inspection, and the Maritime Commission used it in building the merchant ships.

INTERVIEWER: I see.

MR. NIEDERMAIR: It became a regulation. It was more drastic than the 1929 convention. When we did this one we got things in it that later on were put into the later convention.

INTERVIEWER: As a result of that - I mean it was more drastic, you say, than the convention of 1929 - did other nations take similar action?

MR. NIEDERMAIR: No, they didn't have to. This was strictly for our own ships.

INTERVIEWER: Yes, but did they go and do likewise?

MR. NIEDERMAIR: No. Look what happened not so long after to the Andrea Doria, when she went down. Everybody's been trying to salvage her ever since. I told them the day she went down that they couldn't do that. It's obvious that you can't lift a ship like that.

Anyway, it wasn't very long after I got through with that 184, which in our own country was controversial all the time because they were fighting that battle about my stability formula. They still said that 05 should be the maximum that they could go to.

INTERVIEWER: You mean the shipping companies were concerned?

MR. NIEDERMAIR: No, naval architects. It was a judgment on my part. Professor Lewis from M.I.T. said that my reasoning was too obtuse!

INTERVIEWER: Not flexible enough!

MR. NIEDERMAIR: Well, I had formulas that I put in the paper - later on I wrote another paper in which I expanded on this sort of thing and I put this stuff in it again and assumed certain wave equations and put them all together. Frank M. Lewis was in the class ahead of me at Webb, so we knew each other. He said I was too obtuse. I didn't mind that, that's all right, as long as he read it. I was always thankful that he read it, otherwise he wouldn't have known it. Besides, it wasn't his specialty.

Oh, yes, I notice here "On further developments in stability and rolling of ships." I presented that before the Society of Naval Architects and Marine Engineers in November 1936.

INTERVIEWER: Was this something that you generated on your own, or were you requested to do it?

MR. NIEDERMAIR: I was asked to do the first paper and I think I got the idea that I wanted to make some changes in what I wrote two years before. I think I initiated this one. The first one, I think Rock was the president of the society and he asked me to do that, or the secretary would ask me.

Anyhow, now the time came, about 1936. As you notice, I still had to do all these things for the Navy ships, and yet here I keep talking about what I'm doing for the merchant marine, but that's the way it went.

I have a note here that says that on February 1st 1936 Jerry Land called me in and said he had another job for me. He wanted me to be a go-between between Gibbs and Cox and Newport News. They were fighting a battle for the design of a new ship for the U.S. Lines, which finally became the America. Newport News thought that Gibbs and Cox, prismatic coefficient was too low. They wanted

to design a ship full of body and so forth, and they never got together. Newport News wanted to design the America. They wanted to be able to say that they designed the ship and built it.

INTERVIEWER: So they were seizing on this issue?

MR. NIEDERMAIR: No. They could do it, they were pretty capable people. I knew Sid Vincent down there. He's the 05 fellow. And then Comstock, who was his assistant. I knew all these people.

INTERVIEWER: Yes, but was this at the root of the disagreement between Gibbs and Cox and Newport News?

MR. NIEDERMAIR: No. It seemed that they couldn't get together. They finally wrote a nice letter and they mentioned me in it. I've got a letter where they mentioned me about that Senate Report 184 - I was on that committee, and so forth.

They apparently got in touch with Jerry Land and he didn't tell me who asked him. He just wanted me to go up there and get these people together. He said:

"They're at loggerheads up there, Niedermair. You go up there and pull them together."

And so we talked about it and then, with that, he said: "I'm sitting here waiting for a telephone call." I said:

"What for?"

He said: "Well, I feel like a goldfish in a bowl with the water pumped out." I asked him why, and he said:

"I'm waiting for a telephone call to tell me that the Senate approved my appointment to the Maritime Commission," or whatever they called it at that time. That's what he was waiting for the day that he called me in.

I remember turning on my heels to start towards the door and before I stepped out I thought of something. I turned around and said to him:

"Is there any agenda to this?" Because, here, I was getting this and I thought that maybe he might have something I he wanted me to do particularly, or not to do. He said:

"No, nothing, except don't have it built in a Navy yard." Little did I know that he evidently knew then that these people up there, maybe it was Gibbs or U.S. Lines, had gotten the New York Navy Yard to make an estimate to build this ship in a Navy yard. I didn't know this. All Jerry said to me was, "Don't have it built in a Navy yard." He didn't tip me off that this had been done. I only found that out a couple of months ago when I was going through my notes. I hadn't even remembered it.

INTERVIEWER: How could it be built - it was a commercial liner, was it not?

MR. NIEDERMAIR: Yes.

INTERVIEWER: How then could it be built in a Navy yard?

MR. NIEDERMAIR: It could be.

INTERVIEWER: It could?

MR. NIEDERMAIR: Sure, because we subsidized those things.

INTERVIEWER: I see, and it was a potential troop carrier?

MR. NIEDERMAIR: Yes, it did. It did a great job. It became the West Point, I think. Yes, it was the West Point.

I got them together. I got up there and I stayed at the Waldorf Astoria. I'd come down every day. They paid my expenses up there. The first day, I got them in there and I put them both to work. I studied their material, and I decided either that day or the next day, that I was going to put them both to work, give them each a job to do. I had touched on something to find out and I put them to work. I've forgotten now just how he did this, but I did get Gibbs to work on something, and Newport News had to work on something, and they both had to report in the next day or so.

INTERVIEWER: You were the government arbiter?

MR. NIEDERMAIR: Yes, but it wasn't done by mail or anything. There's nothing on the official record that I know of. Jerry was the one who told me. The only restriction that I found out when I went through the data and the material was these weight estimates made by the New York Navy Yard. They didn't tell me when I was there, but the raw material they turned over to me had it in.

INTERVIEWER: If it had been built in the Navy yard this would have taken it out of the hands of Newport News?

MR. NIEDERMAIR: Yes, it would. New York state would have been tickled to death because it would have put people to work up there. This was in 1938, the depression years. You've got to remember that, too.

Anyhow, that's all Jerry said to me and off I went. The usual thing. They had no restrictions. I did my stuff and got them together, and I faced Newport News up with the fact that they were trying to fit that ship into their dry dock. Now, that's a hell of a way to design a big ocean liner. If you had a small dry dock and you would design a ship to fit a dry dock and the ship wants to be bigger or different, and it won't fit in, that's not the way to design a ship. You'd have to dock it somewhere else, wouldn't you?

INTERVIEWER: You mean they did not want to go to the expense of having a bigger dock?

MR. NIEDERMAIR: Well, I don't know what. But they actually designed the ship and increased their coefficient because the thing would fit better into their dry dock, where if they built it according to the Gibbs line, which was a lower prismatic coefficient because that would be less resistance and less fuel oil to drive it and so forth, it wouldn't go into the dry dock. I never checked up to see whether it would or not, but this is what they said. I did face them up with the fact. I said to Vincent:

"It looks to me like you were trying to fit this ship into your dry dock down there."

And he said yes, and I said:

"I think, really, what it's coming down to now is that you want to build this ship and Gibbs is designing it, I guess for U.S. Lines, that's another story. Now it's up to you two people to come to some kind of an agreement, and then have the ship built."

The next day I came in and they had agreed. Evidently, what I told Gibbs to do and what I told the Newport News people to do, they got together and decided not to fight each other any more.

INTERVIEWER: What was the solution?

MR. NIEDERMAIR: The solution was that they took the lines that Gibbs had.

Q,: And what about the inadequate dry dock?

MR. NIEDERMAIR: They didn't build it in there. They built it on the ways. They didn't have to have a dry dock to build it. They launched it. They didn't have to build a dry dock.

G: But they wanted to?

MR. NIEDERMAIR: They wanted to fit it into the dry dock. I guess they wanted it to come down and dock in there every once in a while, then they would definitely have the repair work. There are all kinds of reasons why people want to do things and they don't tell you all the reasons. But I sensed the fact that that was the difference and that wasn't a good way to make the lines. I caught them at it.

I put them together and I came back and I told Jerry that they were all happy and the ship would be built in Newport News. Fine, said Jerry. Gibbs designed it in the first place, anyway.

INTERVIEWER: How many millions were involved? Do you remember?

MR. NIEDERMAIR: I don't recall that. I guess maybe 40 million. That ship went in as a troop ship almost immediately, and it ran all during the war. Maybe it did fit into the dry dock, the way it turned out, but anyway it went back to Newport News when they went down there to convert it back to a passenger ship. They lifted the heads off the turbine engines and looked at the turbines, put the thing right back again and pulled them up. Not a thing had to be touched. They were perfect, and they'd run all through the war. Gas turbines cannot do that. They may run for maybe a year.

INTERVIEWER: Who had built the turbines?

MR. NIEDERMAIR: General Electric, I guess, but Newport News had to put them together down there.

That was a great thing in favor of our engine-builders, though.

So that's that story.

By April 1st 1937, Admiral Land retired shortly before his nomination to the Maritime Commission on February 1, 1938. You see, at the time I was in to see him and he was in the fish bowl, he wanted to be nominated to that post, I guess. But by 1938 he was out of it.

INTERVIEWER: The Maritime Commission was not created new at that point, was it?

MR. NIEDERMAIR: No. I don't know. All I know is that he thought he was going to be appointed back in 1936, you remember I told you, but apparently it didn't happen until one year later. It probably took that long to get through the Senate.

Now we're coming to a climactic point here because Bates resigned about March 1938 and he headed up the design division at the Maritime Commission. Jerry Land was there and Admiral Vickery was there, too.

INTERVIEWER: Vickery was the deputy, wasn't he?

MR. NIEDERMAIR: Yes, and he took Jimmy Bates with him. He wanted Jimmy over there. And now I was heading up the basic design, preliminary design.

INTERVIEWER: Who became chief of C & R after Land?

MR. NIEDERMAIR: I guess it was Dubose. Admiral Dubose became chief of C & R right during that period in '37 and '38 when Jerry was getting adjusted to go.

In the meantime, of course, we were doing a lot of work on airplane carriers, the 45,000-ton armored carriers. You remember those? The Midway and so on. The Midway design came in there. Chantry was the officer in charge of design, and I came up with the sloping armor there.

INTERVIEWER: Talk a little about that, sloping armor.

MR. NIEDERMAIR: That trajectory that I mentioned previously, we had determined that you can't arbitrarily with these high-angle guns -you see, before when you were fighting a battle like in the Civil War, you didn't have to worry about this trajectory under water because they were horizontal trajectories.

INTERVIEWER: The range was short, you mean?

MR. NIEDERMAIR: Yes, and now the battleship armor was only five or six feet below the waterline, but if you missed the ship short the shell would come down and have a trajectory under water, and it could go through the ship below the armor. To my surprise, when I took this matter up with Ordnance at the time, they didn't have any information about this, except for a 5-inch shell. Because of the gradual change in the trajectory of these guns, they began to shoot at higher angles, so they'd get a longer range. And then you would get what they call plunging fire through the decks.

Anyhow, we were still working on this carrier during that period, and Chantry was very intrigued. He really sat down at the drafting board, working with our people in preliminary design working up this Midway carrier.

INTERVIEWER: What new ideas were being incorporated into the new designs?

MR. NIEDERMAIR: He was the one who wanted the boilers to be moved outboard, and we didn't have torpedo protection of any consequence in there. We had some. But he thought if you put the boilers outboard you were getting extra spaces in there, and another longitudinal bulkhead, in your regular engine room - you don't have this longitudinal bulkhead. So he put the boilers outboard, and the machinery then would be inside this other inboard bulkhead. This is the way those ships were designed.

INTERVIEWER: Was that greater protection?

MR. NIEDERMAIR: Yes, against an underwater hit, torpedoes and so on. It would furnish a certain amount of added protection. And the deck was also thicker. It had heavy armor on the deck. I've forgotten just how much armor we put on there. It had side armor and it had a very heavy flight deck.

INTERVIEWER: Was there a new concept on arresting gear?

MR. NIEDERMAIR: A certain amount of arresting gear was getting in there because the planes were getting heavier and they had to work on that quite hard. They started about that time. They really didn't have it yet. In fact, they were continually working on arresting gear all the way up to the Forrestal, because planes got heavier and heavier, and the angled deck got in there.

INTERVIEWER: That came from the British, didn't it?

MR. NIEDERMAIR: Yes, the British thought they did, but that's not altogether true. They really got it from us because when we designed the United States we had an angled deck on there, and our Bureau of Aeronautics missed the point. We had an angled deck on the offside of the island to let the fighters go off independent of the bombers. We had one angled deck where the fighter planes could go off, just fly off, and then had the catapults down the center.

I think the British saw that and they decided that you could land on an angle, too. They just flipped it over 180 degrees and now they had the angled deck, but we really had that on the United States. The United States had other things, too, that got in there, but I remember working on that angled deck, but we didn't sense the idea that you could land at an angle like that.

INTERVIEWER: So that was original with the British?

MR. NIEDERMAIR: Well, also we were in another box and that had to do with the control of the planes as they flew off at the bow. The Bureau or Aeronautics wouldn't allow us to fill in the ship

forward. It didn't make sense to have that flight deck going all the way forward and then supporting it on columns. Later on,

some of the Essex-class columns were knocked loose by the waves and the flight deck collapsed forward, and the bow was filled in. The reason why we had to leave the structure open below the flight deck forward was that the air flow forward was interfered with by filling in the bow. It would create a low pressure forward of the bow, where the air would be parting company around the hull. And so, afterwards when catapults became improved, and the British came up with the steam catapult. That was their idea, I remember that, and that changed all this to a certain extent, because then when you shot the planes off they had enough velocity to get passed the bow and you could close the bow in.

Diehl was in Aeronautics at that time and I think he went along with that idea, too, that they had to have the clean flow, especially when the little planes were taking off in the old days. But they started getting bigger and bigger on the Essex, which we'll talk about at some later time.

INTERVIEWER: In the Midway design, was there any change in elevator structure or location?

MR. NIEDERMAIR: Not particularly, no. We still had the inside elevators, cut big holes in the deck. The angled deck didn't come in until later on. The oo class had the first angled decks.

That angled deck, really, was promoted by a friend of mine named Ferris. He was the one who kept pushing everybody into an angled deck. They don't have his name tied to it. I don't have his name here but I will find it for you.

INTERVIEWER: You mentioned him once before.

MR. NIEDERMAIR: Did I? He was really the fellow who kept coming in with this design part of it. He was a very good structural man.

Just about this time, Dubose got in. He was now chief of the bureau. Chantry got through and we got through with the Midway. The Midway was rather an unfortunate design because it was a very

big carrier and we tried to make it protected and all that, but it wasn't the kind of a ship you could bring out in mass production, like you could the Essex. It was ahead of its time, really. After that, other things changed and that design didn't become very popular.

I had a lot to do with the Essex and I see in your last publication they give the Essex a big salute. I was glad to see that, although the design isn't mentioned. It simply says it's very good. And that brings one thing up about designs. When you design it wrong, you never can correct it afterwards. It has to be a good design and that lends itself to a long life, a useful life, because we didn't have to use ersatz ballast, as my friend Rigg called the ballast they had to put into the Manhattan and Washington, you know, in those merchant ships. You built it to the philosophy that you used for that design. I'll get to that later.

INTERVIEWER: Well, they might well praise the Essex because I think the Essex class had a lot to do with victory in the Pacific?

MR. NIEDERMAIR: Yes; but those nine cruiser conversions also did their bit. You go and read the history. They were about all you had. When you read the history of all these ships, you'd think I was on all of them. I have in that little bunch of stuff over there at the New York yard all the battleships I worked on, the West Virginia, and Idaho, and there were several others that came in, and all the cruisers. The Tennessee, the New Mexico. I thought at one time I was the only person alive that had entered every compartment on the ship in one day or two days, not quite that.

Now we're going to get ready here for the battle between two chiefs, the chief of the Bureau of C & R and Admiral Bowen, chief of the Bureau of Engineering.

Up to this time the Bureau of C & R always had strong chiefs, and so what happened, appropriations on the Hill and everything were handled by the chief of the Bureau of C & R. For years that happened. Taylor was a very well-known chief. He was the chief of the Bureau of C & R during World War I and he was the sort of person who would have a team pulling a load. Held keep the traces tight but the reins loose. From Taylor all the way down to and through Jerry Land, they were all people who could appear before Congress and all and really pound the table and so on, and people would like it.

Now Debose was unfortunate in having Bowen who wanted to do that in the Bureau of Engineering. He didn't want to be passive, he wanted to be top dog. And so it happened that at that point there was public debate about the stability of destroyers. Their center of gravity had gone up, and blame was being handed out right and left and argued about in newspapers, whose fault that was.

INTERVIEWER: Was there an incident that caused this to arise?

Mr. M.: Yes. This ship was built and the destroyer had its center of gravity go up. The truth of the matter was that the Bureau of C & R was not at fault at all. I took this matter up with Chantry. There came the day when now the chips were down. Debose was going to be taken out of the Bureau of Ships and Van Kueren was going to step in. I think that's the way it went. Yes.

Chantry and I one Saturday afternoon were left. We had to write a triple bureau letter, Bureau of Ordnance, Bureau of Engineering, and Bureau of C & R. It came time to draft the letter and say why the stability, the center of gravity, went up. So the two of us were there, working out the letter, dictating back and forth. He did most of the dictating.

INTERVIEWER: To whom was this to be addressed?

MR. NIEDERMAIR: It was being addressed to the Secretary of the Navy. Charlie Edison was the Secretary of the Navy.

We were writing along and explaining all this sort of thing when I said to Chantry:

Chantry was now being transferred to Philadelphia. Bowen was staying where he was and Ordnance Chief was staying where he was, and our people in the Bureau of C & R were being transferred or quit, like Dubose. And I said, "It's really not our fault at all. I know where the fault lies. I checked it up. The fault is that the ordnance weights went up and the early estimates for the machinery had their center of gravity too low, even though that center of gravity is below the waterline. When you move that center of gravity up, it moves the center of gravity of the whole ship up, and the ordnance went up, so the whole lost vertical center of gravity is caused by engineering and the Bureau of Ordnance."

Chantry said:

"Now, look, John, let's not get into this. I'm leaving. Really there's more to this than this little talk about where the center of gravity is."

INTERVIEWER: He meant politics?

MR. NIEDERMAIR: Yes. Alan Chantry said that to me. He's gone now. He later on made rear admiral at the Philadelphia yard. That's what he told me, "Let's not bring it up."

I said: "But I don't feel good about it when I see you going and all these -" Chantry was such a brilliant person. I met him later on at the Philadelphia yard and he was very happy there, but I wasn't very happy at what had happened.

That was the story. They moved out. Van Kueren became the chief of the bureau, and the two bureaus were not being combined.

INTERVIEWER: Let me ask you one question to continue the center of gravity idea, the basis of the argument. You say the ordnance was moved up-

MR. NIEDERMAIR: Their weights were heavier. Their weights were high and they were heavy, so the center of gravity. The moment of those weights above a certain point moved the center of gravity.

INTERVIEWER: Why were they heavier?

MR. NIEDERMAIR: Because it just so happened that the things that they put up there were heavier than they originally said they would weigh. When they put them up there, they were heavier.

INTERVIEWER: They were adding something else, then?

MR. NIEDERMAIR: No, they just didn't estimate their weights right.

INTERVIEWER: Oh, I see.

MR. NIEDERMAIR: The weights were more than they had said they would be.

INTERVIEWER: That was the issue as publicized?

MR. NIEDERMAIR: Publicly they said the stability was bad. I was hoping I might be called up before Congress because I was going to go before them and tell them that they weren't qualified to judge that technical matter and that we were as pure as Ivory soap. That's the way I was going to put it, 98 per cent pure, or whatever Ivory soap said. But I never had the chance.

INTERVIEWER: And you did discover that politics were involved?

MR. NIEDERMAIR: Chantry said to me, and I did find later on, but Bowen became a good friend of mine later. I have somewhere a book he autographed for me. He and Kettering from General Motors wrote a book and I praised that book one time when I was at a meeting, and he was so happy that the next thing I knew I got a copy of the book in the mail and he thanked me and it had his autograph.

INTERVIEWER: Tell me what was involved as the idea went forward to amalgamate the two bureaus.

MR. NIEDERMAIR: Well, they thought it would work better that way, to combine the two bureaus, to have one head of the two and then have assistant chiefs. They alternated the chiefs of the bureau.

INTERVIEWER: It changed the status of the naval architect, didn't it?

MR. NIEDERMAIR: The engineering officers felt second best all the time with the situation before and the machinery almost cost as much as the ship sometimes. But I never had any trouble with any of those people from engineering. I always knew almost before they knew what the weight was going to be. I could tell them the horsepower, the number of propellers, the diameter of the propellers - I would give them all that information because I also had to figure out the resistance and I practically decided what the machinery was going to be. I knew it would be steam. I kept track of all that.

I remember one day when Captain Logan McKee was head of design and he called up and gave me the weight of some cruiser machinery and I said:

"Have you got a margin in these weights?" He said, "No, I'll go and see my people and find out. I'll call you back." So he comes back a little later and says: "No, no margin." I said, "I thought so."

And Logan said:

"John, why do you want us to do all this figuring and then you ask me have we got a margin and you know we don't have a margin when we give you a figure?"

I said, "I ask you to do it so the next time I get a job I know what it is. Then I can guess the next step. Costs the same way."

I'd hear them talking about the designed cost. I designed to the cost all the time. I could make the cost estimates and had the curves and everything else in my files, and I'd make them up based on the costs of previous ships. Cost estimators would work it up, but I knew what the cost was going to be, and I'd give them hell too, and often would tell them, "You can't build it for that much. It will cost you more money."

I was doing that when they built the Mohole project down in Houston. I knew damned well those fellows were low on their cost estimates.

There was quite a bit of controversy about the Bureau amalgamation. Some people were in favor of it and some were against it. I was swayed to a certain extent in favor of it because I felt a lot of our good construction officers were being held back by their promotion system that existed under the existing staff officer position. Probably some of the best people that I met in the Navy were old time construction people.

INTERVIEWER: Some of the smartest ones, weren't they?

MR. NIEDERMAIR: They were all the heads of their class and all that sort of thing. Van Kueren was a particularly close friend of mine. Now Cochrane and Mills were the working team, the two guys who had to put the thing together. They were the underdogs. They were both captains.

INTERVIEWER: Captain Earl Mills?

MR. NIEDERMAIR: Yes, and Captain Ned Cochrane. They had to work for the Secretary of the Navy.

Admiral "Mike" Robinson was a former chief of the Bureau of Engineering. He'd been retired for quite some time and he was called back into the bureau when this happened. It looked like the war was coming and that had something to do with it. He was the head of the committee, really, and Captain Cochrane and Captain Earl Mills were his assistants. I had never met Robinson for a long time after this

happened, so I didn't know what kind of a person he was, but I was told by Bates and other people what a fine design officer Robinson was. He was one of the few engineering officers that they talked about as being a good design officer.

INTERVIEWER: What was the task of this committee?

MR. NIEDERMAIR: This committee was organized to bring the two together. That meant there would be certain supervisory positions that might be competing with each other, and there would be consolidations all down the line. They had come to me quite a while before when they were getting ready to do all this thing. They came to me and tipped me off that I didn't have a thing to worry about. They said Charlie Edison gave the group clear go but he said, "Don't touch Niedermair." I don't know whether we should put this in, but this is what they said.

I had not much contact with Edison but apparently he knew about me. Of course, he would know my record of why I got there, too, I guess. Maybe that had some influence, but he did tell them. I guess he told them that because he didn't want them to go dilly-dallying around. They had to have good reasons why they'd do things like that.

INTERVIEWER: I take it that Edison was very much in favor of this whole process?

MR. NIEDERMAIR: Yes, he was, and he was a good friend of Bowen, actually, as it turned out. Bowen impressed him quite a bit, and he was quite an active guy in lots of ways.

Anyhow, there was a lot of back and forth. As I said before, a lot of good officers - I remember Heberle. At the end of World War I he was a commander and I think by the time World War II came around he was just a captain. That was as far as he ever got - as far as he could get. Or maybe he was a commander and didn't get to be a captain until this bureau was combined. I don't know, but I remember

that the war was on and a lot of people got higher rank, but Heberle didn't get it. After all these years he was still in that one single rank.

INTERVIEWER: Did this mean that there was a great deal of attrition? I mean men went out into private -

MR. NIEDERMAIR: Yes. I think a lot of good young people left because there wasn't any progress for them. And, as a matter of fact, their pay was low. I remember when Ernie King became fleet admiral he had \$8,000 a year, believe it or not. Somewhere I have a note on this, because I was surprised, because by this time I got more than that.

Now, I have a note here that Julius Furer told me that he didn't favor the consolidation. Furer was one of the old-time rear admirals who was a real great officer and he worked with the historian, Morison, and so on in working up the history. Furer used to come to me and discuss these things with me, and asked me what I thought about the thing. I told him just like I told you that there were some things in favor of it. I don't think they have to change their staff position to do better. They should rearrange this thing so that pro- motion can happen to staff officers. But they apparently decided they couldn't do that because they couldn't become commandants of the yards, commander of a shipyard, and so on, which they did. I don't know what they do now.

I talked to Van Kueren. We were very close on this matter and other matters because I knew Van a long time and he knew me very well. I think I met him in New York, I'm not sure. Before he came on this job here, back in the bureau, he was head of the naval research across the river up there, and they were working on radar. They noticed the phenomena of radar but they hadn't gotten along with the use of it like the British did.

So they went ahead and they got reorganized, and for a little while Mike Robinson was chief of the bureau.

INTERVIEWER: Just to get it going?

MR. NIEDERMAIR: For a little while, yes. After that Ned Cochrane became the chief of the bureau. We're getting closer to the war now.

INTERVIEWER: Did the amalgamation work smoothly at that point?

MR. NIEDERMAIR: Yes, it seemed to. It worked in the beginning all right because the same quality of people were still running the show, actually. There were people like Charlie Brand. Charlie Brand, to my mind, was one of the greats. He became a rear admiral in charge of the Boston shipyard. He came to the bureau, and I met him when I was getting ready with certain stuff on landing craft and so on. I will mention that later on.

About this time the Essex started to be born, about 1939 to 1940. We've talked about the Essex. The design of that carrier got into the picture. The Cleveland-class cruisers were getting into the picture. We first attempted to use all the plans for the Brooklyns in the Cleveland class, but we decided very quickly that that wouldn't work. We'd better develop new plans because in lots of cases you needed a little more room and so on. It was a good thing because it made them better ships for carrier use.

INTERVIEWER: I take it there was feed-in when the plans were being developed from the operational fleet?

MR. NIEDERMAIR: To a certain extent, but not too much. There really wasn't not yet, no. There was no war on. Nobody was dreaming about these things yet, but fortunately we got the Essex going before the war was on. I had to do quite a number of odd things in these ships.

In the first place, the flight deck was all designed and I remember talking to Captain Les Kniskern, who was our design officer, and a real great friend or mine. Some people had gotten together and sent somebody to relieve me if anything happened to me. And so Pat Ryan came down to be my backup from the New York yard. He was standing there at the drafting board, Kniskern was at the

drafting board, we were looking at it. Kniskern had just come over to tell me that the weight of the planes had been increased. The plane that was going to be put on the ship was heavier than the one that we designed the flight deck for.

INTERVIEWER: A new type plane coming in, I suppose?

MR. NIEDERMAIR: Yes, something or other. I pondered that for quite a while. I looked down and then I walked away from them- or, they told me later I did. I walked down to the end of the room with my head down, and I came back to Pat Ryan and Kniskern and I said:

"We'll change the steel to high-tensile steel," which would change the strength of the steel by 20 per cent, or whatever it was. From 60,000 to 80,000. So we made the deck high-tensile steel, and that took care of that without adding any weight.

Then I ran into trouble because they couldn't weld - the strength deck which was the hangar deck. We still had expansion joints in the flight deck. Now the question was what to do, because it had to be about two inches thick for this big ship, just for the strength. So I decided that it was really pretty thick stuff to try to weld, and also pretty thick to rivet. But I wanted to weld it. I got the idea that the thing to do was to put two layers of one-inch plating on it. You'd alternate the butts (the transverse ends), you would weld them, then put the next. You'd finish the bottom layer and you'd put it all on, weld it all up, and then you come in and lay the top - another inch on the top. You put holes in the top layer, and you fill up the holes with welding material and weld the butts alternately. You wouldn't put the top butts over the bottom butts. You'd just keep skipping them.

INTERVIEWER: And that would be equally strong, would it?

MR. NIEDERMAIR: We did that, and that was it. We never had any trouble with that.

Some of the Essex ships were built in the New York Yard, so was the Franklin, I think. We had designed the Essex class I from the bottom up.

INTERVIEWER: You had discarded the design for the Midway? I mean you didn't use them?

MR. NIEDERMAIR: No, no. They couldn't fit this thing at all. The displacement of this ship was about 27,900 tons, the standard displacement, I think. Her standard displacement was 27,100, not 45,000, and you can see the big difference. They were a great success out there during the war, and you could build them in quite a short time. Some of these Essex ships were built in twenty months or something like that. This was one of the big things. Also, all this armor and everything else indicated that. You can't build that sort of ship in a hurry.

The horsepower was a lot less, too. I think the horsepower of the Essex was way down. The Midway had a horsepower that was quite high. It was probably something like 200,000. Here it is. The Midway's horsepower around 200,000, standard displacement about 45,000. Essex had 27,100 standard and the horsepower was 150,000. And the length of these ships - I don't remember now how long the Coral Sea was, but she was about 900 feet long. Well, the overall length of the Essex was almost 900 feet, 890 feet. So you got almost as long a flight deck, and that's why everybody was so happy with this ship.

INTERVIEWER: Yes.

MR. NIEDERMAIR: These numbers that I throw together here at one time and another, the Midway. Yes, oddly enough, the Midway with all its weight was only 968 overall. It was just about 90 feet longer than the Essex. Now the beam of the ship was another thing that you had to worry about. The beam of the Essex was quite a bit less again. Her beam was 93 feet and the Midway was about 136 feet. With a monster like that you couldn't build her in a hurry.

I don't know how far you want to go with this but I think maybe we ought to hold it.

On the Essex they really did a great job, and one of the problems that they ran into was the kamikaze situation. I think they invented the kamikaze to get these Essex myself.

INTERVIEWER: The Japanese did!

MR. NIEDERMAIR: The Japs really knew that they were finished. They had a few carriers. They were ahead of us for a little while, but it's amazing how we got in there. If we hadn't had this design of the Essex timed the way it was, you would never have been able to get all these carriers out there. The whole Cleveland class would have been airplane carriers. They did a good job but they certainly couldn't have done it like the Essex class. The Essex had a real weakness where the ready rooms were, up under the flight deck.

INTERVIEWER: And that's where there were some casualties.

MR. NIEDERMAIR: Yes. I went to New York to look at the Franklin. She got hit by a kamikaze and they couldn't get out of the place, couldn't get out of the ready room.

INTERVIEWER: Ship designers in the U.S. could not have anticipated the kamikaze?

MR. NIEDERMAIR: No. I think there was an error in their arrangement. The one thing in preliminary design we can't do - do all these things and take care of little things like doorways, exit doors, and so on. You would depend on your field people to take care of things like that. Those are everyday things, but actually I came across a funny thing about this door business, because I think on the Franklin, as I went on it, I believe that I discovered there was only one exit from that ready room. I never went back. I had no time to go back and check on it, but I was quite upset about the fact that the ready room only had one way out. That was the only thing I could find. I never checked up to see whether that was so. But you know, some people I know built a \$100,000 place up near Leesburg, where they bought a house that was ready cut. It would be delivered and they'd just put it together by some big company. But there was no way to get in the bathroom! There was no door there. They forgot to put the door on. When they put the thing together, no door.

I understand that's what happened down in Brazil when the architects built one of the buildings down there some place. They had restrooms but you couldn't get in them.

INTERVIEWER: This was Brasilia?

MR. NIEDERMAIR: Was that it? You can't blame the naval architects all the time. It isn't funny, though, when people lose their lives like that.

INTERVIEWER: No.

MR. NIEDERMAIR: When it came to the next class that I got involved in, which was the Forrestal-

INTERVIEWER: Yes, but by that time there was feed-in from the operational boys?

MR. NIEDERMAIR: Right, but surprisingly it's not always fed in. To mention a point ahead of time that I'll mention later, when I got into the design I decided that I'd better start putting an escalator into the ship. The Forrestal had an escalator. I put that in there primarily so that the ready rooms could be below the hangar deck, and when the flight crews came up they would come out down below the hangar deck, or at the hangar deck, and they could walk over and ride up the escalator. I think they've come up with a faster way of doing it, but I put an up and a down escalator in there, as I remember it, on the starboard side. I just put it in. Nobody asked for it. But when I put it in nobody took it out. I went down and rode on it myself and I decided it was too slow. So you just have to plan a little ahead of time, but it's better than being directly under the flight deck with a kamikaze.

Here we are talking about the Essex but the Cleveland- class design got in here and just about 1940 or so we finished the Cleveland class. I remember trying to make them all out or the old plans, and, gee whizz, we had trouble with the machinery spaces. The machinery was the same as in the Brooklyns, but we did change the hull form. We fixed it up so the Cleveland class was thought of just in good time so that we were able to get the Princeton and those things out by 1942.

INTERVIEWER: One last question for today. With the development of the Essex class and the Cleveland class, was there any indication that FDR himself was interested in these new designs?

MR. NIEDERMAIR: No. What FDR would do was go on a cruiser and then make sketches about how to modify the cruiser. He would then say, gee, why don't we put a flight deck here, and he'd make sketches. I'd several times want to keep the sketches. Jerry would bring them down and let me look at them, but he held them close to his stomach.

Anyway, the Cleveland class came in and the Fletcher class came in just about that time. They were 2,100-ton destroyers.

INTERVIEWER: They were sort of destroyer leaders, weren't they?

MR. NIEDERMAIR: Yes, they were very, very good. We got into this class before the war. The 445 was the lead for all these things and the continuous flush deck and no portholes, by the way, were on the side. I told you a long time ago about my interest in portholes.

INTERVIEWER: Yes.

MR. NIEDERMAIR: You'd be surprised at all the people who claimed that they were the ones who didn't want them.

INTERVIEWER: They had foreseen the problem!

Interview No.4 with Mr. John C. Niedermair

Place: His residence in Stone Harbor, New Jersey

Date: Tuesday afternoon, 9 December 1975

Subject: Biography

By: John T. Mason, Jr.

INTERVIEWER: Well, John, it's delightful to see you again on a winter day, this time, because it is that.

Last time, you talked about the Essex-class carriers in great detail and your contribution to the Essex class. Now you have various things to add before we launch into the war period itself.

MR. NIEDERMAIR: Yes, that is right. I want to take a flashback on a few of the important things that were worked on before the Essex class got into the picture.

There was a considerable interest in PT boats and submarine chasers as soon as Franklin Delano Roosevelt got into the White House. He brought Starling Burgess in to our group for a while in case he had any input because he was the designer of the yacht that competed with Sir Thomas Lipton's Shamrock and so on. FDR, being quite a sailor, felt that anyone that could design a boat to beat this British boat might be of some help to us.

INTERVIEWER: Was Burgess in uniform?

MR. NIEDERMAIR: No, he was not. He was a civilian. He was a difficult man in lots of ways because he didn't like to work in the office with other people. He liked to take things back home or to the hotel with him, and his wife would make all the calculations and so on there. He was particularly concerned with working on the submarine chaser boats - the 110-foot submarine chasers - for which we did make up some designs, and he tried to compete with us in designing a better submarine chaser than we did. But he was soon phased out of our section because he didn't stay with us and he didn't gather some of the important things that we would consider in connection with the design of a war vessel. However, he did get in with FDR's uncle later on.

INTERVIEWER: Delano?

MR. NIEDERMAIR: Delano - in designing and working on what they called the bridge across the Atlantic. This is what they tried, and they brought the design in for my criticism. This carried on for quite a long time because there were several years between the time that Starling Burgess had worked on the submarine chaser and this bridge across the Atlantic.

INTERVIEWER: Tell me about this proposed bridge across the Atlantic.

MR. NIEDERMAIR: Starling Burgess came up with quite a few radical ideas. He attempted to provide a power plant by using a sort of exaggerated motor based on an outboard motor that was placed into wells that he had put into this ship. He also worked on some odd ideas in connection with the steering of the ship, and the end result was that Starling Burgess had ignored all the evolution, as far as I was concerned, anyway, of where merchant ship design stood after all the years of its development up to that time.

INTERVIEWER: This was a merchant ship he was working on?

MR. NIEDERMAIR: Yes.

INTERVIEWER: High-speed, I take it?

MR. NIEDERMAIR: He tried to come up - and he did -with these ideas, and they built one or two of them down in Texas. INTERVIEWER: What speed were they?

MR. NIEDERMAIR: Oh, I've forgotten now. They weren't very fast. Maybe in the neighborhood of 15 knots or something like that -maybe less. My recall isn't good on that.

INTERVIEWER: What was the principal virtue, then, of this?

MR. NIEDERMAIR: Well, this is what happened. Since he had not paid any attention to what had happened in the design of merchant ships up to this time, the result was that when they launched the ship and it went on its first trials, it turned out to be almost a complete failure. Franklin Delano Roosevelt's friend was in the bureau, Loring Swasey.

INTERVIEWER: Was he a civilian also?

MR. NIEDERMAIR: He was a captain in the reserve. He was a person who had a lot to do with the design of the original World War I submarine chaser. The 110-footers were very successful. But Loring Swasey's partner, who was in business with him, was the designer really of the submarine chaser as far as the hull form went, but they were yacht-builders and so they worked it out together as kind of a team. And now Swasey came back and handled small craft. He became a friend of FDR because he was at M.I.T. when FDR was at Harvard, and he designed a racing shell for Harvard that was so successful - Swasey did.

So now Swasey came to me and told me that now that this Delano bridge across the sea had turned out so badly - I had turned it down before they did anything with it -Swasey told me that FDR - these were

Swasey's own words: "FDR asked me to come over and talk to you and find out whether you could do anything about this Delano vessel."

Delano was a banker in New York. I said no, I couldn't do anything about it.

INTERVIEWER: The Delano vessel was the merchant one they were building?

MR. NIEDERMAIR: The one that was to become the bridge across the sea.

INTERVIEWER: I don't understand the bridge across the sea. What was it?

MR. NIEDERMAIR: Well, they were going to build so many of them and build them so fast and it almost would be a bridge across the ocean. It was a fantasy, you might say.

So, Swasey brought in a lot of other friends of his and he tried every which way to get me interested in helping them out if I could, and I finally had to tell them that no matter how hard they tried I couldn't help them with this vessel. So it became a complete failure.

INTERVIEWER: What did you find wrong with this vessel?

MR. NIEDERMAIR: It couldn't steer properly. This idea of using outboard motors in these tubes lined up inside the vessel, you could raise and lower them and they were located in four places in the ship. There were so many things that were not in line with good ship design.

INTERVIEWER: What tonnage was this?

MR. NIEDERMAIR: It wasn't very big. I've forgotten now - probably several thousand tons. But the main point was that Swasey and FDR thought that I could help them out, but I couldn't do it, so that was the last I ever heard of Starling Burgess. I knew his brother very well, who was in the Bureau of

Aeronautics and was a pretty sharp fellow. It was too bad that I couldn't help them, but I just couldn't do it, so that was the end of that story.

However, at the same time, we got into the design of PT boats, motor torpedo boats, and in investigating them one thing led to another and it was finally decided that we would have a design competition to find out what the industry would have to offer, and so we made up a set of specifications for two types of motor torpedo boat. One a small size, maybe somewhere around 50-feet long, and then another one 60,70, or 80 feet long.

As a result of that competition, Professor George Crouch, who was my professor in naval architecture at Webb, designed a small PT boat, and Higgins was the award-winner on the big PT boat.

INTERVIEWER: Higgins from New Orleans?

MR. NIEDERMAIR: Yes. Higgins won the prize, and the prize was quite sizeable. I think we awarded them a sizeable prize of some \$25,000 or \$50,000, or something of that sort.

INTERVIEWER: Was this from Navy funds?

MR. NIEDERMAIR: Yes.

INTERVIEWER: What year approximately was this?

MR. NIEDERMAIR: I would say somewhere around 1936 or 1938. It was before the war. We weren't in the war yet. By the time the war came along, we had the PT program pretty well settled.

INTERVIEWER: Let me ask you a question at that point. Was the program ever modified or changed because of the performance of the German E-boat?

MR. NIEDERMAIR: No, it was not. Scott-Paine, a British designer, had developed a very successful PT boat, and Sutphen and his son, from Electric Boat Company, were in Bayonne at that time and they got the American rights to build the Scott-Paine boat.

INTERVIEWER: The British called them MTBs. Motor torpedo boats.

MR. NIEDERMAIR: I imagine so.

The small design that Crouch developed didn't turn out that we could use this small vessel to do the things we wanted to do. We tried to keep it down and find out what the small one could do, but we soon settled down to make the PT boats about the size of the Scott-Paine boat.

INTERVIEWER: What were the intended usages?

MR. NIEDERMAIR: They carried torpedoes on them and they were to patrol the coastal waters. Kennedy was on PT-109. They would run along the coast for coastal protection.

INTERVIEWER: And what kind of speed did they have?

MR. NIEDERMAIR: They had a speed running up sometimes as much as probably 50 knots, pretty good speed. In the meantime, we had the model basin working on these different hull forms - the Taylor Model Basin, and we had the Stevens Institute of Technology, which had an experimental towing tank, working on the theoretical part in connection with the best forms for a PT boat.

This report that I have in my hand here was EMB, Experimental Model Basin, Series 50, which was for V-bottom motor boats, and there were twenty of them tested. They had resistance curves something along the line of Admiral Taylor's resistance and propulsion curves, contours of total resistance, and plotted them out on various speed/length ratios and displacement/length ratios, and so on. So we did enter into this PT boat program.

We had a small boat section in the bureau, but they didn't handle this because this was more sophisticated than a small motor boat. These were very-high-speed boats that had plenty of horsepower and so on.

Q.: Was Swasey involved in these?

MR. NIEDERMAIR: Swasey was the type desk that handled these.

INTERVIEWER: How large a program was contemplated? How many did you intend to turn out?

MR. NIEDERMAIR: President Kennedy was on the 109 and I imagine that we got up to some pretty high numbers -say 500 or more of these boats.

We kept them even after the war and developed aluminum - we were building PT boats out of aluminum. The idea of having these small boats around that could get out there and protect your coast. But I believe that has fallen by the wayside with the modern things that have happened.

That I should say gives you some idea of how we entered the war in connection with PT boats, and, of course, Jack Kennedy made PT boats pretty famous because he rescued some people when the Japanese destroyer ran him down or somehow or other wrecked his PT boat. He did some very great work in helping to rescue his crew.

Then, the war had started over in England and in Europe and a demand came along for a wooden minesweeper, a minesweeper that could stand the shock of the mines. It had to be built of wood because they attempted to make them safe against magnetic mines, mines that would be influenced by metal, because the influence on these mines if you had a metal ship the magnetic field would be concentrated in the metal ship, and that concentration of the magnetic lines would set the mine off.

INTERVIEWER: Was this as a result of British experience?

Hr. N.: Somewhat, but we knew about this before the British. This is what I'll tell you here. Captain Cochrane and Lieutenant Forrest were over in England during the blitz, going over the design organization of British construction and all the material and information about what their ships were like. Captain Cochrane came back with a wooden minesweeper that the British had developed.

In the meantime, while he was away, I had come up with this minesweeper that I developed.

INTERVIEWER: A wooden one, also?

MR. NIEDERMAIR: Yes. In order to make it sturdy, I had to come with a new idea of how to build the frames for that design, because you had to have bent oak frames. You couldn't bend a 4-by-4 oak satisfactorily because when you would bend it in a steam box the inside of the curve would be in compression and the wood would be weakened that way, and the outside was in tension. So between the two of them it would work against you in trying to bend this big thing.

INTERVIEWER: It bent, but it wasn't very practical when it was bent.

MR. NIEDERMAIR: So I came up with the idea of making the frames out of two 2-by-4s back to back - bend a 2-by-4, which you could do.

INTERVIEWER: Of what wood?

MR. NIEDERMAIR: Of oak - and lay them together, glue them or fasten them together. This was before the days of laminated wood and the gluing of wood.

INTERVIEWER: Why wouldn't you with 2-by-4s have the strain and the weakness, also?

MR. NIEDERMAIR: No, because the depth was less. The horizontal dimension was four inches and the vertical dimension was only 2 inches, and the curve, of course, that we gave the boat favored the curves not being too small. They made a good Mae West shape on her.

About the time that Cochrane came back on the King George V into Annapolis and he brought in all the plans of the British design, including their details concerning their design organization, the make-up of their construction corps and how they did their work. That was all brought from Annapolis into preliminary design. It was stored in preliminary design because we were under lock and key. They had me in a cubbyhole there.

INTERVIEWER: Under lock and key!

MR. NIEDERMAIR: Yes, well, we were not a big group. We were a group of top engineers and when we would need extra help we'd borrow it from other parts of the bureau or bring in people from the Navy yard to work on it.

Then Cochrane came in with a roll of these plans of the British design under his arm and told me what he had, and I said:

"Well, Captain, we developed a wooden minesweeper while you were away. You know what's in this English wooden mine-sweeper, so to save time why don't you look at our minesweeper, and if you like our minesweeper, we don't have to look at the British minesweeper."

So Cochrane went over and examined our design, the one where I had developed a special wood framing and structure and he was thoroughly pleased with it. He walked away with the British plans under his arm and I never did see them. So we'd saved time.

INTERVIEWER: Theirs were not in being yet, either? They were just planned?

MR. NIEDERMAIR: They were plans but they were designed according to the old-fashioned way of building a wooden ship. It was put together with partial frames and so on. You see when you had to

double a 2-by-4 type of frame, when you crossed the keel amidships, part of that inside frame could ride over the keel blocks and you could widen the space between the frame, which would be close together as you went up the side, and it would widen out as you came down, and weld fill it in with a spacer, so that you had a good, solid structure of good oak.

There's a booklet out on the wooden boats where they refer to this design that I got up at the time as being the most advanced type of wooden construction.

INTERVIEWER: What tonnage was this minesweeper intended to be?

MR. NIEDERMAIR: I've forgotten now what their tonnage was. I could add those numbers for you later on in this text. I can look it up if I have the data. But just a few hundred tons.

These minesweepers were used in Italy and in the early hitting of the underbelly of Europe those minesweepers were over there.

INTERVIEWER: They were easy to turn out, then?

MR. NIEDERMAIR: Yes, they were.

INTERVIEWER: Who built them?

MR. NIEDERMAIR: Different yards. They would be built up in all the little yacht-building yards. Luders, for instance, up on Long Island Sound, would do it. They could build them over in Annapolis.

INTERVIEWER: And then were they convoyed across the ocean?

MR. NIEDERMAIR: I suppose so. I don't know, but they got over there. They were fairly big boats. They were about 135 feet long.

INTERVIEWER: That was the intent of my question.

MR. NIEDERMAIR: Yes, they were rather big. When we got into gluing these things up, we could make these wooden boats longer, and the next class of minesweepers were bigger. That was the post-war type.

These minesweepers got over there, into the Anzio landings, and I saw a dispatch that was sent over by either Captain or Admiral Haeberle, who was over there at the time. He was a constructor and he sent a dispatch back saying that the only ships that were doing the job they were designed for were these minesweepers. But I disagree with him because I round out that the LSTs, which I'll get into in a little while, were there also.

So that's the story of these minesweepers. They were very successful.

In that same period, the Bureau of Yards and Docks was busy looking ahead, and Captain Laycock, who was the head of the design department, War Plans Section, in the Bureau of Yards and Docks, and Reside, who was a commander, and finally, a captain in the Naval Reserve - yes, he was a Naval Reserve captain when he left, when he retired. But in any case, he was the creator of these portable, sectional dry docks. He was responsible for putting them together, but I'm sure that he was in contact with the big floating dry dock people. I think the Moreell Company was pretty big in floating dry docks.

INTERVIEWER: Is that Ben Moreell's company?

MR. NIEDERMAIR: No, this was another Moreell. Ben was head of the Bureau of Yards and Docks. He went into the steel works. He worked for United Steel or something like that.

I was aware of what Reside was up to and, at the same time, we were working on the design of battleships during that period, so I could tell Reside the size of the battleships, which were then the biggest things that he would be called upon to handle.

INTERVIEWER: Was it the Iowa class you were working on?

MR. NIEDERMAIR: Yes, the Iowa class was coming along, and there were a couple of others that preceded it. I can't think of the names now. I don't have a list of them here.

He knew that we were working on this thing and so I was in contact with him, just as I was in contact with the people in the Bureau of Aeronautics who had to do with catapults and everything else. I made it a point to reach off into all these places, including the Bureau of Ordnance. For instance, I talked about the minesweepers. I would go to the Bureau of Ordnance and talk about them.

Incidentally, I went there in connection with minelayers, which we were working on, also, around this time, and, to my amazement, they didn't bring up the matter of magnetic mines. I called them on that. I said, "What have you got?" I asked for a model. I wanted to see a model of the latest mine, and they dusted off a thing there and I looked at it and said:

"Is this a magnetic mine?" No, it isn't, so I said: "Well, what does a magnetic mine look like?" And I never did see what it looked like. I finally got some dimensions and we went ahead and designed the minelayer.

What I'm doing now is show the kind of field work that I often got into.

So then in connection with the work that Ordnance was doing on the 5-inch gun, which was a very successful gun, probably one of the best in the world - it could beat any of the guns that the Army was testing down in Texas, because the clearances and all were very carefully worked out, so there was very little play and they were very accurate in their gearing, which was very important.

I went down to Indian Head - I think that's what they called the place - where they were testing these 5-inch guns and I tried to get as close as possible to the gun so I could observe how things were operating. They fired the gun and all these hot pieces of material were falling down at my feet. I didn't think too much of it at the time. Then, when we got into conference after the test was finished and we talked about our experiences and what we thought of it, I mentioned the fact that these pieces of plastic that were still smoking from the shot were landing at my feet. Up to that time they didn't know that these pieces were falling around like that. If you were firing that on a ship, these things would fall all over the deck.

They then redesigned the plug they had on the end of their container.

Now, I have one more person I want to bring in here, and that's Captain Laycock, who was working on a little module, a little box, that measured 5-by-7-by-5 feet deep. Now, the 5-by-7 is a very good number because you multiply those two together and that's 35, 35. And 35 cubic feet or so of salt water is equal to one ton. So when these little modules would go down in the water one foot, you'd know that it was displacing a ton. It was almost an automatic calculation. If you had ten of these in a row in there and they'd go down a foot, it was 10 tons you put on there.

INTERVIEWER: Unless you used brackish water instead of salt.

MR. NIEDERMAIR: You could allow for the density. Anyway, he put these things together. The idea was that you could assemble them to make barges and storage tanks and use them when the Marines got captured down on an island in the Pacific, why, they used some of his barges to store gasoline or to bring it in. And, later on, in landing operations we used those boxes all assembled in the roadways, which would work out. We'd put the Seventh Fleet transversely and put two next to each other so you'd have a roadway 14 feet wide. We'd make them any length we needed.

The Seabees, the construction battalions of the Bureau of Yards and Docks, were the ones who would have to work on the landing operations and get ashore in order to do the shore work with bulldozers and all that sort of thing.

Laycock would come in and talk to me about this and come up with ideas of using them as gunmounts -assemble them and put a gun on them. The Germans ran into a lot of trouble with trying to put their guns in for their landing operations along the coast, but Laycock was thinking about it for these little barges that he was coming up with. It turned out there were thousands and thousands of these little things made. I'll bring this up again, about how we used them when we got into the landing craft program.

So, there's Reside and there's Laycock from the Bureau of Yards and Docks. I brought in Ordnance.

Time is going on and now it appeared - the war was on now, the end of 1941, we were getting closer to it. The British had been in it since 1939, I guess it was, and we had gotten into it around that time. The big thing about it was that FDR managed to get lend-lease passed, and that happened somewhere around January 1941. So when we got into these building programs, and that also meant that he removed any tonnage limitations that were in effect. He had removed that long before lend-lease, as a matter of fact, because we were working on the big, 45,000-ton battleships.

INTERVIEWER: You mean those limitation treaties were abrogated at that point?

MR. NIEDERMAIR: Yes.

In 1941, according to a table that Admiral James made up in his paper, we had very few aircraft carriers. We had seventeen battleships in 1941 but only seven airplane carriers. We had no escort carriers. We had 166 destroyers, about 200 auxiliaries, we had no escort ships in 1941. We had only 47 submarines, and mine craft we had only 14, and landing craft we didn't have any - zero. This is large landing craft. That was the situation in 1941.

INTERVIEWER: The concept for some of those types had never been developed, had it?

MR. NIEDERMAIR: No. We started working on the escort ships and the British destroyer, which we called the BDE -we designed the BDE for the British. They were right there, working with us.

INTERVIEWER: Was that a small type?

MR. NIEDERMAIR: That was a small escort vessel. It finally became the DE, our DE -

INTERVIEWER: And corvette?

MR. NIEDERMAIR: Maybe it was called a corvette but we called it the British DE, BDE. There was a Commander Cole who spent a lot of time in our section. He was with us right from the beginning. We worked very closely with all the British people. Before we got into the war and during the war, and I was still in contact with them after the war.

In 1941 we got busy and by the time 1945 came around we had twenty-three battleships, twenty-six aircraft carriers, sixty-four escort carriers -those were the merchant ship conversions. I don't know whether Kaiser's were included in that sixty-four.

INTERVIEWER: They must have been.

MR. NIEDERMAIR: Yes, they must have been there. These were all in the Pacific. We had 323 destroyers, 52 cruisers, as compared with 37 that we had, and the auxiliaries, they represented a lot of merchant ships that we took over. We had over 1,000, or 1,066, according to Jimmy James.

Submarines, in 1941, we only had forty-seven, and in 1943 we had 181. You can see our shipbuilding

capacity was pretty well filled up. Minecraft we had 160. That included minesweepers, minelayers, and the 14 minecraft that we had here in 1941 - we probably had a couple of minesweepers - but they were mostly minelayers. Then, zero landing craft grew up to 2,783 and about 1,000 landing craft, which are the ones I'm about to tell you about.

The reason I'm bringing this up is to show that when the war hit us – I've always referred to this situation when the war hit us as being as though we were in the middle of a volcano. That's the way it was.

Shortly before December 7th, a very special day arrived which was November 4th 1941, when Captain Cochrane came in with a dispatch from the British outlining in a very brief manner the need for landing craft - large landing craft that could be seagoing.

INTERVIEWER: They had nothing of that type?

MR. NIEDERMAIR: They had designed landing craft and they were here in this country. We were building some, and some of them were called Winnies, named after Churchill, and so on. But their drafts were too high. They certainly couldn't be used for anything so they weren't very good.

The total weight of the military load, as I remember it, called for was 500 tons and they would carry the biggest tanks. Some of the tanks that were getting into the picture at that time weighed somewhere around 30 or more tons, so you couldn't carry them on these little landing craft any more. In our LST that we were going to get into now, the landing ship, tank, with 500 tons allowed for at least ten of these big tanks and other equipment that had to be put in ahead of them in order to get onto the beach and prepare the roadway, or any guns that might have to be there.

In any case, Captain Cochrane recited the story and the British specified a design to go on a beach whose slope was 1 in 100, 1 foot in 100. I listened to that and then I started thinking and apparently, according to what Captain Cochrane said and others said later - but he particularly because he was there, and I understand that Lieutenant Evans was there because he mentioned it in a recent

letter he wrote to the Naval Institute Proceedings. I think it is in the November '75 issue. He said he was there, but I apparently was concentrating so heavily on what Cochrane was telling me that I don't remember anybody standing there.

I got busy and made a few passing sketches on an envelope - I don't recall that I did this, but they said I did it. That seemed to be the way to do it. It had to have two conditions: one, it had to be able to cross the ocean and have enough draft to be able to get there; and then, when you got to the landing area, you could pump the tanks dry and you could go on the beach. Instead of taking the 1 in 100 slope, I decided that to make this design successful you have to design it to 1 foot in 50 feet, and that's the way we designed it. It turned out that that slope probably could satisfy 70 per cent or the beaches in the world, except those around Europe.

INTERVIEWER: Did you have a particular knowledge of beaches in your background?

MR. NIEDERMAIR: No, I didn't. Because I could trim this ship, you see, with the tankage that I had in it, I could make it 1 in 100 by simply moving the ballast forward and increasing the draft. But that meant that the forward draft would be greater than 1 in 50.

Later on, it turned out that we started to use these modules that Captain Laycock developed to make the barges, the 5-by-7-by-5 modules. We put those together to make road-ways 200 feet long, 14 feet wide. And later on, we carried them on the sides of the LST and just let them flip off, the supporting angle bars. But that's getting a little ahead of the story.

Cochrane was satisfied that I had a solution. It seemed odd that we were able to do it so quickly, or that I would be able to do it so quickly because the British hadn't been able to hit on this scheme. But I did it.

Then I went home that night - and worked on it in my study which had a drafting board in it - I drew the original sketch in the office that afternoon in a matter of a couple of hours on a scale of 50 feet to the inch, which I think you have seen - this sketch.

INTERVIEWER: Yes.

MR. NIEDERMAIR: That's the full size. That's roughly 6 inches long and 4 inches deep. That scheme that you see there was never changed except that the ship was lengthened to somewhere around 300 feet instead of 280 feet and the beam was increased a little also, because the weights went up, and we were a little afraid of using quarter-inch plating on the sides and on the deck. We increased that to three-eighths of an inch, and to take the weight, we added a little to the beam and something to the length, but the machinery would be located just as you see it here and the bow would be like this with a ramp on it, and the details had to be developed.

This sketch was finished on the same afternoon that Captain Cochrane came in with the dispatch. Then that same night I took it home and made a larger drawing, one-sixteenth inch to the foot, and brought that in. They made copies of that and flew it over to England, and a short time afterwards the courier officer flew off with the plan to England. That was their way of getting secret material over in a hurry because they didn't want to talk about it over the air.

INTERVIEWER: No, and the courier slept with his dispatch and all the rest of it!

MR. NIEDERMAIR: Yes, so it got over there. Then Admiral Darling and a team came over and they worked with the bureau in the development of the detailed plans.

Now, what happened was that, as I remember it, we had a scheme here where the Dravo Corporation, Neville Island, Pittsburgh, Pennsylvania - that's where they were at that time, became the prime yard. They were the leading shipyard to build this type. Gibbs and Cox was their design agent.

Then we in preliminary design got busy and worked on and made a complete design study and more detailed plans. We finished our study by some time in January. Mind you, all of this was started on the 4th of November 1941. Sometime after January 1st we had a preliminary design finished, and instead of taking those preliminary plans and turning them over to our contract design section, we turned them over to Gibbs and Cox to be developed into contract plans. They developed the details and the ventilation system that had to be put in there because the tanks had to be running inside the ship, and the ramp that was on the forward end had to be worked out. They made contract plans parallel with the detailed plans. Part of the detail plans were a set of plans that worked right in with the contract plans, and so the shipyards that got the job to do would get the contract plans and the detail plans were already ready for them.

INTERVIEWER: This was all a kind of telescoping process?

MR. NIEDERMAIR: Right.

As a result of that, by October of 1942, that is a little less than a year, an LST was finished. Then it wasn't very long after that when there was an LST available down at Norfolk Naval Base. It was cold winter weather, so I suppose it was either in early January 1943 or in December of 1942.

I went down there and Commander Holdsworth, who was a construction officer in the bureau and worked in preliminary design. At that time Captain Cochrane was the officer head of preliminary design, and Commander Kniskern was his principal assistant. Holdsworth came down with me so it could have been the latter part of 1942.

The reason I'm bringing this in is because when I went down to Willoughby Spit, Virginia, there was an officer who had been sent up from Texas, Captain Royal, and I think it was Forrest Royal but I'm not sure. It appears to me that that Forrest was his first name because I found some records on him later on, the only one who would have been connected with this landing stuff by the name of Royal. He later on lost his life in the Pacific.

I met Royal there and we went out to the naval base. Holdsworth was already there and the LST was there. We started loading that LST. We put a big crane in it and it seemed almost like magic that we had picked the size of hatch that would allow that crane to be lowered down in it without taking it apart, which was a very good thing because it could go ashore without having to be assembled.

It was very cold weather. I remember seeing the ice and calling attention to a couple of people who probably would have frozen to death if I hadn't found them down there, a couple of youngsters in the Army. I reported them and they went down and brought them back. They were soaked. They were on guard duty on a bunch of little barges off the end of a pier. Anyway, we finished that job in Norfolk-

INTERVIEWER: That was a loading experiment?

MR. NIEDERMAIR: Yes. We ran some tests down there with sandbags and so on and tried to work out a method to get ashore. We weren't really practicing a landing operation, but we were practicing using the ramp location at the naval base there and then trying to drop sandbags over the end so that you'd have half a chance of getting a bulldozer ashore or something of that order.

We came back to Washington and it wasn't very long before I started going up to Quonset, up in Rhode Island, and also up to the Boston Navy Yard. The first thing I did during those months, the early months, I guess, of 1943, was to run a test.

Schuyler Pyne was on this test. The first landing operation we were going to make there, and I was there -

INTERVIEWER: Where? At the Boston Navy Yard?

MR. NIEDERMAIR: We took the boat out and landed on some beach - I don't know where they picked the beach -but it was very rough weather and an interesting thing happened at that time. I was down inside, going through the great big tank compartment, and all this ship motion was going on, the waves were hitting the bow. They were testing a 50-mm gun up on the deck and I was in this great big football

field trying to listen to whether the ship was working in the seaway, the structure. I wasn't very successful in hearing anything because of all the racket.

During that racket Schuyler Pyne came down to me and said: "There's a gestapo aboard representing the Secretary of the Navy and he says this ship is unseaworthy. Come on up and talk to him."

I said: "No, Schuyler, I don't want to meet him. It's too late to argue. You tell him when you see him again that if he has any complaints to make about this ship to write a letter to the Secretary of the Navy and tell him what he thinks of this ship."

It was a very prominent naval architect of New York who was representing the Secretary of the Navy.

INTERVIEWER: And his name?

MR. NIEDERMAIR: I can't think of it at the moment (Eads Johnson). He's dead now. I might be able to fish it up. He died a long time ago. He, incidentally, is the naval architect Starling Burgess tried to get to help him work on the Delano project, and he condemned it after he was with it for a little while.

I didn't want to see him, that's right, and Schuyler was really worried because he was a junior officer then, going and telling off a representative of the Secretary of the Navy, but I said don't worry about him, or something of that order, "Just tell him the best thing to do is write a letter and put all your complaints into a letter because we can't argue about it here."

Now we were getting ready for the landing operation and ready to make the drive to the beach when everybody wanted to know how fast to go to hit the beach. They came to me and wanted to know how fast they should hit the beach, and I said full speed. So they hit that beach full speed.

INTERVIEWER: That being what?

MR. NIEDERMAIR: About 10 knots. That's a pretty high speed and most captains don't like to hit a beach like that. I wasn't worried about it. I was standing up on the deck, at the side, and they had wire

rope between the stanchions as rails so you didn't fall overboard. And now I was approaching the beach and now that speed of 10 knots began to get faster and faster and I began to look around to see what I would hang onto when we hit the beach!

Well, we hit the beach and it was just a gradual stop. It wasn't any problem. So it was quite successful. We didn't do any operational landing at all, we were just testing it.

I had made the plating under the bow I-inch thick. The rest of the plating on the ship was three-eighths, but right up at the landing area, at the keel and around on the bottom in that section I had specified one-inch plating. I was always very glad I did after I saw some pictures of what happened to some of these LSTs landing on the Normandy beach, on top of rock and all that sort of thing.

Then I came back to Washington and, of course, as soon as Ned Cochrane heard that I was there he came down to see me and ask me about it, and I told him what would happen. I said: "The Secretary of the Navy had a naval architect on board," and I gave his name, "he'll be writing a letter telling us where we're wrong on this thing and that it's unseaworthy," which he did. Then Cochrane came again with a letter from the Secretary, from this naval architect, and we discussed what to give him. Ned wanted to give him certain things and I said: "No, no, let's not do that. Let's just give them plans of the completed ship. We won't give them any of our calculations. We'll give them our structural plans. We'll tell him the stresses that we figured, but we won't tell them how we figured them. We won't give them our work books because they may find a couple of 'ts' we didn't cross in there. So let's not do that. He's a naval architect. We tell him the principles on which we designed the ship, here are all the plans, and he can work from there."

We never heard from him again.

It wasn't very long after that, March 1943 arrived, and we had to make our tests for a real landing operation in Narragansett Bay. The Combined Chiefs or Staff were there. We worked up a roadway something like 200 feet long, 14 feet wide, that we towed alongside of the LST that I was on because I was going to handle that part of it.

INTERVIEWER: Was this to bridge the beach?

MR. NIEDERMAIR: Yes, because the beach was very flat. We knew that, somewhat similar to the proposed landings in the Mediterranean. We already knew that there were going to be landings there, but they didn't tell us where, but they would be in the Mediterranean. I always thought it was Malta but it turned out to be Sicily.

We made this roadway and the Combined Chiefs got onto my boat. There was another LST there. The one that I was on was Number 348, I think - Yes, 348 was the one I was on, and the Army had 359. The Army was to build a pontoon bridge when the LST hit the beach. They were going to put up their regular pontoons, a bunch of boat-like things that they have. They had a tank in their LST. I had a tank in my LST, but I had designed this roadway with studs on the side to hold it so that the roadway couldn't slip away from us in a wind or something.

Now I found that in order to do this I had to modify the ramp, in order to put a fair lead in there so I could get a line from the winch down through a fair lead that would go to the roadway that we were towing alongside. That line would go to the after end of the roadway. When we hit the beach, the LST would stop and the roadway, of course, would keep on going, which it did and hit the beach right on the nose. And that's how I met Admiral Brand, who was head of the Boston Navy Yard, and he sent a limousine so that I could go to the Boston yard from Quonset to tell them how I wanted to modify this ramp and the fair lead and things or that kind, and the yard would get these all ready and their mechanics would come down to Quonset and install the fair lead that I wanted.

INTERVIEWER: This meant that the roadway had to be moved laterally –

MR. NIEDERMAIR: Pulled over.

INTERVIEWER: Yes - in order to mesh with the landing ship.

MR. NIEDERMAIR: You put your fair lead in the center of the ramp and then the line would go down and up to the winch that was on the deck overhead and back to the after end of the roadway. And this worked like a miracle.

Here were the Combined Chiefs of Staff on the one I was on. Now the point of that was that Royal was there, too, Captain Royal, and he said to me:

"John, I'll take the bridge and you take care of the landing operation. You take care of the tank and the ramp and all the rest of it. I'll be up there and I'll see that we get the LST in. The rest of it will be up to you because you know how to do it. "

So I did. I hit the beach and the ramp kept on running and hit dead ahead on the beach, ahead of my LST. We had the ramp down a bit and we pulled the roadway over, dropped the ramp on it. The beach was so perfect that I didn't have to do any ballasting in the roadway to bring it down solid on the beach, because it was flat on the beach. They got my studs down into the sand. They were simply like pipes with a pointed end every so often.

When I got the report from the Seabee people -we had another ramp on the end of our roadway that had to be lowered -

INTERVIEWER: Why was that?

MR. NIEDERMAIR: Because it was up too high off the beach. The tank had to have a ramp so it could ride right off onto the beach.

I gave the signal to the tank man to bring the tank down; then I discovered that the ramp was about a foot thick, and behind the tank was a towing rig in the back there. I didn't understand how clever tanks had their own roadway and that, no matter what happened to that tail end, that tank would keep on going. I stopped the tank before it got off the ramp because I was afraid that this thing that stuck out the back end was going to hit the ramp and then the tank would get stuck.

It didn't take very long, it took about a minute, but in that few minutes when we hit the beach, as we hit the beach, I was standing down on the roadway when Royal's aide, I guess, came down and said that we'd lost the anchor. There was a stern anchor they had to drop off aft and they dropped it too soon and all they saw was the bitter end of this thing and the wind was blowing broadside to us. What to do?

Here I was trying to figure out what to do with the tank. I told them instantly, though, just to push full speed ahead. Not quite full speed I understand that was the standard procedure, they always kept the propellers in motion after this. I read somewhere about that.

Then I let the tank come down, so I got the tank ashore in seven minutes, with all this happening. From the time the LST hit the beach and we pulled the roadway over, lowered the ramp, checked the roadway to see whether it was resting properly on the bottom, got the studs down, or the spuds, as they called them, I called the tank down, the captain asked me what to do because the anchor was lost, I got the tank going and it hit the beach in seven minutes.

Ernie King was there and all the Combined Chiefs were tickled to death. They knew that this LST could make the landing all right. And so nothing was ever held up by anything that we did.

The LSTs were very successful in the Pacific, in the Atlantic, the Normandy landings. They not only brought the tanks ashore, they were used as temporary hospital ships. The wounded were brought back onto the LST before it was backed off the beach and went back home. And it brought all kinds of supplies. We used them on special occasions to carry a top secret scheme for laying pierced planks on Pacific islands for landing fields. That was all done in preliminary design in a separate little room that

we called - they had a code name for this. I don't know whether it's still top secret or not. I wouldn't think so. It was "Gold Rush." We can always just wipe it off.

The LST certainly proved itself to be a great thing, and it was all done in that short time. It never was really changed. Evans tells in his report that it always looked the same as what he saw that day. I wrote a letter to him and told him that in addition to that I had made a bigger plan that night.

INTERVIEWER: That's quite a story.

MR. NIEDERMAIR: That put the LST on the map, but oddly enough it was so successful, like anything else that's successful, like a big movie that's successful, a lot of other people try to take the credit for it or make a copy of it. A lot of people claimed that they were the inventors of it. In fact, Jane's Fighting Ships called it the British design.

When I was in Washington last Christmas, I got a telephone call from someone who worked for the Maritime Administration and he said he was helping historians and he said that the Maritime Administration designed and built the LST. But they didn't. The Navy did the whole job.

Then it wasn't long before we got going on other projects. The next big one on landing craft that was very important was the LCIL, landing craft, infantry. That was a very interesting thing to develop. I, incidentally, got the idea early in the game, including the LSTs, too, that we had to keep the number of pieces and the number of plate thicknesses and the number of shapes down in all these ships - not too many sizes of things. There would be a small inventory, see, because you didn't want to have to go hunting around for this angle bar or that angle bar. I used to tell them that you can't have any more than you have fingers on your hands in shapes, plate thicknesses, five of each.

Also, welding came in pretty good at that time, so the LSTs were practically all welded, and diesel engines were put in there.

I must give credit to the engineering department, the marine engineers in the Bureau of Ships, because they worked wholeheartedly in getting engines for these ships.

Then Mike Robinson, Admiral Robinson later on - he was admiral already when he retired - he was a former engineering officer and head of the Bureau of Engineering, and he came back into the Navy when the war came on. He managed to get into this business of organizing the production end of it. There was a Captain Irish involved in the production department. He worked in New York, up at Gibbs and Cox. Gibbs was a great organizer, too, and he worked at this thing.

Gibbs was not only working on this sort of thing, he was also handling a lot of things for Maritime in connection with the "ugly ducklings," as they called some of the first merchant ships and later on Victory ships - I don't know whether he got in on those or not.

In the meantime, we were still struggling with modifications to destroyers and so on. The Fletcher class got in there. All the following destroyers were patterned after the Fletcher class. It was a flush-deck design, no portholes in it, and all that sort of thing.

INTERVIEWER: 2,100-tonner?

MR. NIEDERMAIR: Yes.

The LCIL, however, got in there. There was a demand for this small infantry landing thing, so I got busy on it and I studied it quite a bit myself. I used to work two days every day, you might say. I could do that because I only need four or five hours' sleep. I guess I inherited this. My father was the same way.

One of the things we did here was to try to design the LCIL in such a way that there would be very few parts in it, that the shape would be such that it was developable - so you didn't have to furnace any plates that you put on.

I talked to Tom Bossett from New York Ship. He was the manager of New York Ship. I talked to him about this boat that we were coming up with, and I suggested to him that he build the first one in his yard.

INTERVIEWER: Why did you select New York Ship?

MR. NIEDERMAIR: Because they were a big yard, and it was going into a small yacht-building yard. This was going to be a steel ship and I wanted to test it out in a ship yard that had good naval architects and draftsmen. And Tom said:

"Oh, John, where would I put it?"

"Well," I said, "find space in between the cruisers. You've got plenty of room there. There must be plenty of room for this little fellow. Just build one. Build the first one and then somebody else will get it."

I think they already had the yard picked out - Lawley's from Massachusetts was the prime yard. They built these.

So the hull form was developable. We developed the hull form, we sent the rough sketches. I got Captain Saunders in. He was head of the Taylor Model Basin. And Schoenherr came in. I wanted to talk to him about it. I wanted the self-propelled tests run and finished within a week. Could it be done? Towed tests and self-propelled tests.

They went away and we set up a paper model of it and tried to see whether we were getting it developable. We sent it down and the model basin finished all their tests on the LCIL in one week.

INTERVIEWER: This was admirable speed. Had you been told that these ships were needed for a particular operation coming up?

MR. NIEDERMAIR: Well, yes, we were told it was to carry the infantry and they put the two little bicycle ramps on the side. There would be no berthing.

Oh, yes, that reminds me. I put contour seats in these boats. I used to ride the Staten Island ferry a lot and I managed to get hold of a sketch or the design of the contour seats in the Staten Island ferries. I think I got it out of Simpson's handbook-

INTERVIEWER: All the comforts of home you wanted in it!

MR. NIEDERMAIR: Yes. I used to sit on those benches all the time and I knew they were comfortable, and so I went to work and did this. Thousands of these seats were built and they were very successful. These infantrymen who were supposed to go down the ramps had bicycles. I imagined they were going to be raiders going to different places and ride around and get confidential information from the natives in the places they would go to. And then also they were used on the Pacific coast. LCILs were used here on this thing, I think, and the LSMs were in there, and landing ship, docks. That's another thing we worked on around that time. The landing ship, dock, which was a great big ship originally designed to take two barges, maybe 150 feet long each, and then float them out. Then they could land ashore on a shallow beach. They never did carry the thing they were originally designed for.

That design was almost completed by the British. They did have a good design developed, but the stability was poor and we modified the lines of the ship, changed a lot of it, and adopted it for our own use. That's the same type that was built by Litton after five years of design work and building - LHG, or whatever they called it. They put decks over it, I think. These were like great big docks with no deck overhead. We used to sink the whole ship down. The water would be inside this dock and you'd haul the barge in and then you'd pump the water out again. There was quite a problem in stability but we worked it out.

INTERVIEWER: Is it true that once the principle of these landing ships had been established with the LST, the others came along much more readily?"

MR. NIEDERMAIR: Well, they did, but they were all different. They weren't really related, but we were more aware of what it took to get on a beach because we'd already been having landing operations. I'd been there, anyway. I always was out in the field with somebody.

INTERVIEWER: Did you witness any landing operations in North Africa or the Mediterranean?

MR. NIEDERMAIR: No. That brings up another thing that I did in connection with the LST.

After I came back to Washington from the trial landing operations attended by the Combined Chiefs of Staff - quite a lot of these LSTs had now been built and the British were to get the first fifty. They were coming in to New York and leaving New York for Europe. I came back to Washington and got the group busy on writing up an instruction book. I wrote up some of the particulars in connection with the landing, and they wrote an instruction book within the week. I arrived home probably on a Saturday or a Sunday, Monday they got started, by Friday the instruction book was written, and we sent fifty or so copies up to New York to leave with the LSTs when they left for Africa.

But I did something there that my guardian angel who I always carried on this shoulder tipped me off that I'd better tell somebody that we had these instruction books around. I may have given one to one of the Seabee officers that I knew very well - the Seabee who was the head lieutenant or whatever it was of the group that was going over to Africa. I told him about these instruction books and I probably gave him a copy and explained it to him. When they got over there -

INTERVIEWER: In Morocco?

MR. NIEDERMAIR: Well, all I can say is that it was Morocco then. There was a big landing place there and Admiral Kirk was there. He was in charge -

INTERVIEWER: Probably Rabat.

MR. NIEDERMAIR: It might have been. It was very good that I had told this Seabee officer about this and he knew then how the ships had to be trimmed down by the bow to land at Sicily. They were getting ready for this landing operation in Sicily. He walked up and down the pier and he reported back to Admiral Kirk that they were not trimming the LSTs properly, that there must be instruction books around somewhere to tell these people how to do it. They hunted around. They hadn't given any instruction books out. They got lost somewhere but they found them packed away, I guess in a store room or somewhere, and they gave the books out, so all the LSTs that were going in to Sicily were properly trimmed to land on this beach. I'd been told how flat it was and the beach that I landed an up in Narragansett Bay was to simulate the beach that they expected to land on over there. That's how it went.

As I told you before, this was a kind of mixed-up story because there were so many things coming in there about these landing craft and, in addition, we had questions coming up in connection with the destroyers and escort vessels that had to be worked on and developed.

INTERVIEWER: And the cruisers?

MR. NIEDERMAIR: Well, we got in next to where the cruisers came in. It wasn't very long after the creation or getting the idea and the plans ready on the LST when Pearl Harbor happened, December 7th, and by the end of the month, or course, as history has recorded - we were badly hit then - and by the end of the month a conference was called at the White House where Mr. Metten, who was president of New York Ship attended, and Admiral Howard, who was head of design. He was really Captain Cochrane's senior at this moment, but Cochrane and I were in the same boat together all the time.

I wasn't at that meeting because I was busy on some project. I don't think anybody else from the Bureau of Ships was there but Howard. We were running pretty thin with people. Howard came back that evening close to quitting time. I was the only one who was left. In the meantime I had gotten a

telephone call from Tom Bossett at New York Ship asking me what I knew about converting the cruisers into aircraft carriers, because the Cleveland-class cruisers were being built at New York Ship and it was the lead job there: I said:

“I know quite a bit about it,” that's probably the way I put it because I didn't know the whole story, but we had done some work on converting the cruisers to carriers. I told Tom that I knew what to do, and he said: “When could we come?” Now it was New Year's Eve so I said:

“What about tomorrow morning? Why can't you be here tomorrow morning?”

He said, fine, “We'll be there tomorrow morning.”

A few minutes after I got through talking to Tom Bossett, Admiral Howard came in and said:

“John, I've got another job for you.”

I said: “It couldn't be converting the cruiser to the aircraft carrier?”

And he said: “How do you know?”

They'd had this top secret meeting over at the White House but evidently they called Bossett up right away to get ready and get in contact with me. Howard was coming in to tell me, I guess, that Bossett was going to call me up and so forth. Instead of that I told him, and he was surprised that I knew. I said:

“Well, Tom Bossett called me up and asked about this thing and I told him I knew what to do and to get his team ready. I told him he could be here tomorrow morning.”

Admiral Howard said fine, then he turned on his heels and left. That's all he said.

The next day that team came in and they worked with my group. We hauled out our material and we turned it over to them, and they turned those ships into airplane carriers.

INTERVIEWER: How much of a job was this?

MR. NIEDERMAIR: It was quite a complete job because, after all, they became full carriers. The guns had to be left off, there'd be no gun foundations in them. The machinery was the same, but we had the study made and he knew what to do. The main deck was left, they had to change that to a hangar deck.

INTERVIEWER: They had to install elevators, I suppose?

MR. NIEDERMAIR: Yes, they had to have those. They worked it out all right. This was on the 1st of January 1942, and about the middle of January 1943 the Independence was finished, she was commissioned.

INTERVIEWER: That was just about a year?

MR. NIEDERMAIR: Yes, and the Princeton was commissioned in February of 1943.

In connection with that job, I don't remember any problems that they had at all because as time went on New York Ship finished all nine of them in 1943, and they got out there and into the battle area. The Princeton is the one, I think, that had the most thrilling experience, but she lost her life in it around Manila there, Leyte Gulf. She was hit by a kamikaze and set on fire. The surprising thing about that was that she had a bad explosion but she didn't sink from any of the things that happened to her by the kamikaze or the fire. They had to go in and torpedo her and sink her. We had to knock her out ourselves. That was to me the sad thing about that.

When these ships got out there and in operation, for their part they were called light carriers. They had pretty lucky lives. I think the Princeton was the only one we lost of that group. Up until that time we lost others one after the other. We lost the Hornet, the Wasp, the Yorktown, the Lexington.

INTERVIEWER: Of course, the Japs concentrated on our carriers.

MR. NIEDERMAIR: Yes, they did, but I think that the big job that these carriers did was to trim down the aviation force of the Japs. Towards the end, they didn't have the flight crews any more to come in and sink them. So that's the reason, I think, that most of our aircraft carriers survived.

Also, the battleships played a part in there of being strong and well protected and really covered with all kinds of anti-aircraft. They stayed close to the Big E, the Enterprise -that is, the original Enterprise.

INTERVIEWER: They, in a sense, served as escorts to the carriers.

MR. NIEDERMAIR: Yes, they did, and they provided an unsinkable island there. As a result of that, the record really doesn't give these young aviators a high enough place in the story about the Pacific war. I notice that when you read about it you find that the Enterprise would send out its flyers and half the crew would come back - half of the flight crew would come back. They really went out and did their stuff. This is a remarkable thing. People have written about the submarines and the individuals and we refer to the submarines as the silent navy. I think the flyers who were out there were the silent people in the Navy because I haven't seen the aviators getting as much historical comment.

INTERVIEWER: Tell me how these converted cruisers of the Cleveland-class differed from the Essex.

MR. NIEDERMAIR: They had the same speed but they didn't have the room in them and their decks couldn't handle the same size planes. The Essex could carry the largest planes available at the time. One of the last things we had to do was to provide a means of strengthening the flight deck of the Essex, which we did by calling for stronger steel, higher tensile strength steel, for all the structure. Later on, they even took heavier planes and they stiffened the decks up some more. The Essex had a weakness forward. The forward end of the flight deck was propped up by stanchions because the planes were flying off the deck. The Bureau of Aeronautics wouldn't allow us to fill in the sides of the ship, but it

was obvious that it would be better to fill in up to the flight deck but as a fighter would fly right off the ship the air currents that were formed around that forward end of the flight deck would be different if you filled it in.

INTERVIEWER: Why did they object to filling it in?

MR. NIEDERMAIR: There would be eddy currents of the air and they were afraid that the flyer - because he's reaching a point where he's got to have complete flight capacity, lift, and they were afraid he'd lose that. And, of course, what would happen as he went off into the space -they tried to keep the air over the flight deck just about the way it would be just forward of the flight deck. They didn't want them to nose down because that's what would happen, especially if the weather was a little rough.

INTERVIEWER: Was it not true that this extension of the deck was damaged in some of the typhoons that ships got in?

MR. NIEDERMAIR: Yes, but they really collapsed. They knocked the props out and the whole forward end of the flight deck fell down on the deck below. It would just bend down.

INTERVIEWER: Yes, but it was vulnerable in that sense, wasn't it?

MR. NIEDERMAIR: Right.

All during the time that we were getting these things ready and they were building, we were coming along with the modified destroyers. The Fletcher-class destroyer we kept modifying that class right through to the end. They were destroyer leaders in the beginning, but the succeeding Fletchers that came along that were strengthened would be the leaders. Quite a lot of changes were made.

INTERVIEWER: Did they maintain the same tonnage?

MR. NIEDERMAIR: No, they had to go up some. They changed the lines as they came along.

INTERVIEWER: These changes that were made as you went along through the years, were they a result of feed-in from battle experience?

MR. NIEDERMAIR: I would say so, yes, because I imagine that the first Fletchers that went out were probably wetter than they wanted them, and some o, the arrangements of our super-structure, you know - a destroyer depends a lot on the arrangement of the superstructure because their main deck is so close to the waterline. I was always surprised that they were able to do what they did. It was really tough going.

With the battleships one of the big things that always distressed me was the fact that before the war we went to work and built all these battleships and we only had a few airplane carriers. That was the big problem. Here, we had seventeen battleships and only seven aircraft carriers in 1941.

INTERVIEWER: Yes.

MR. NIEDERMAIR: What kind of thinking was going on there, I don't know. The Yorktown and the Enterprise were very good carriers. They were 20,000-ton carriers, and the Essex was about 27,000 tons.

INTERVIEWER: Wasn't the emphasis on the battleship a carry-over from earlier on, and some of the battleship admirals were still in the saddle? Is that not perhaps an explanation?

MR. NIEDERMAIR: Of course, that's right. That's true. The bomb came along later and thinking about the take-off with these bombers and everything, we were playing around with airplanes, seaplanes. I remember talking to aviation about it. They would develop these seaplanes, they built a few, and they folded up. Remember the wind currents. They must have reached that critical -

INTERVIEWER: Speed of sound.

MR. NIEDERMAIR: Yes.

I think I should fall back here and explain a few points on those LCILs, which we mentioned before. I just had a thought that we ran into a considerable amount of trouble in getting engines for these little LCILs. We had trouble getting pipes and plumbing for them. The yards and the manufacturers were pretty well saturated by that time, and this was early 1942.

INTERVIEWER: This was just adding something.

MR. NIEDERMAIR: We were adding a bunch of new ships and they kept telling me the steel mills couldn't do it. And the same way with the LST.

In connection with the LST and these other craft, the LCIL, we started using the steel that they rolled for automobiles with the fast rolling mills that they had for that purpose. That steel was not considered very good because often you would get folds in it. The steel would be going through the mills and it would fold under ahead and there would be an overlap in it. The edges of these plates that they made were rather weak and they didn't think they could use sheet steel at first, but then they finally did use it by trimming the edges of all the plates that were rolled for this sheet stuff. The LSTs, LCIs, LSMs, LSMR, and LSD, I imagine, but I'm not sure about that because that was a big ship.

Then the plumbing. We couldn't get any plumbing to speak of. Just a few odd lots of plumbing on the LCILs. We had the fuel tanks in the ships all right, but we had to run hoses -we were able to get suction hoses, so suction hoses would be led to the manhole over a fuel-oil tank. They'd shove it in there and they'd pump the oil out of the tank into the reserve fuel tanks for the engines. Of course, you would have a certain amount of plumbing to get that fuel oil to the engines.

As far as the engines went, we had to use Gray diesels, little Gray diesels. We put four of them on each shaft. They had two shafts. We packed them well together and geared them to a shaft, and that's the way we engined the LCILs.

INTERVIEWER: What had been your original plan for engines?

MR. NIEDERMAIR: That was the original plan. We knew how much horsepower there was and then we had to try to get the engines, and the marine engineering people would have to go hunting around to see what they could do, and they came up with these Gray diesels. We put four on a shaft and it worked all right, and I was told later that anybody who had duty in that engine room couldn't hear for the longest time after he got out of it. It was this sort of short-cutting and cutting of red tape that made it possible for us to get all those ships that I recited here that Admiral James had put together, this column of ships for 1941.

INTERVIEWER: Isn't that an American characteristic, the ability to adapt in situations where it's demanded?

MR. NIEDERMAIR: Yes, I think it was that way. I'm afraid now it isn't that way. I'm afraid that we're losing a certain amount of genius and I believe it's because we're depending on automation and the machine to do everything. So a large number of us are more and more robots. This is the way it is.

I just wanted to bring that in at this point. We've recited the story about all these landing craft, I believe.

During this war period, Admiral Beuret, who was a former chief of the bureau and was chief when I got down to the bureau in 1928, was now retired and he was on the Inventors' Council with Vannevar Bush. Bush was the former president of M.I.T. and he would sort out the inventions and suggestions that were coming in that were related to shipbuilding.

INTERVIEWER: I suppose they increased in number during the war years, did they?

MR. NIEDERMAIR: Yes, there were quite a few, enough to have a regular department that did nothing but that. Vannevar Bush, of course, was an idea man, too, so he felt that we shouldn't fail to be respectful to ideas.

However, Beuret would come to me about twice every week and this contact with him brought the two of us rather closer than we were when he was chief of the bureau. He didn't seem too satisfied with the idea that I came in from the field. I think I know why. Because it didn't sit too well with a lot of the other people there for engineers like myself to pick off a choice berth. But he finally decided that I had a pretty good way of getting at this thing. He told several people who later on came in to see me told me what Beuret had told them what my method was.

I'd say: "Let's see what's good about this." He thought that was pretty clever because most of the other people that he went to would always start from the other end of the scale to find out what's wrong with it. But I was short of time and I'd like to find something good first. I was never aware of this, so Admiral Beuret found that for me, and I was very glad to know that we had something that would bring us together.

INTERVIEWER: Did anything good come out of these schemes?

MR. NIEDERMAIR: That's the next point I want to make. Quite a number of ideas came along and some of them wound up being surface - effects ships, for instance. The idea of that came along at that time. A couple of British people came in and talked to me about the surface ship. They didn't really know what to call it at that time, but they had an air bubble that they'd talk about. I always wondered just what they did with that bubble. I couldn't see the use of it, and it seemed to me that we couldn't afford to stop at this point and take a long time to develop it to a useful thing, and the war was no time to do it. Later on, it did come in and, you know, they're still working on it. It's something like the hydrofoil. Bell thought of it around 1900 and we still haven't got a hydrofoil that is much bigger than

maybe 250 or 500 tons. I don't believe we've got anything over 250 tons. There's a limit, I believe, to the size the hydrofoil will ever go to or beyond.

Oddly enough, my first contact with this was with Vannevar Bush in connection with a hydrofoil. Then later on with Ken Davidson from Stevens. Ken came in and was promoting a hydrofoil. He thought that a 3,000-ton hydrofoil would be the thing. We investigated that and found that we didn't have any engines, in the first place, that could be put in the hydrofoil. We had to have engines of 5 pounds per horsepower, or something on that order. And then if you had anything that could work, it could only carry the fuel oil to get there. It wouldn't have enough capacity to do anything else but carry fuel oil. I didn't realize at that time that 3,000 tons was almost impossible, and I realized then that we couldn't do it.

But, in connection with that, Vannevar Bush got the idea to force our hand on hydrofoils, and so he had his chief assistant coming around about hydrofoils. Now I'm touching on some postwar events.

INTERVIEWER: Yes, I know.

MR. NIEDERMAIR: But I think it's suitable to get there because I mentioned Vannevar Bush, and the war was nearing its end and we weren't adding any more ships. In fact, we were stopping the building of ships in the yards. We stopped one battleship that I know. She was building down in Norfolk, I guess. I think it was called the Kentucky.

INTERVIEWER: Stopped the Illinois, too, I believe.

MR. NIEDERMAIR: And others. Somehow, Vannevar Bush tried to force the chief's hand to go into hydrofoils because he built a hydrofoil and hooked it into a little sailing vessel that he had. He managed to ride on a hydrofoil for a little while that way.

He sent his chief assistant, who had done a great job in working out something on a heat-transfer job that they ran into in connection with some of the bombers that they had during the war. He solved that special problem for Vannevar Bush. This aide came to me to talk to me about the hydrofoil and tell me about the lift to drag ratio that he thought we could get. He said that in a hydrofoil we certainly could get a lift to drag ratio of 250. I said:

"250? I don't see how you could ever get that much. Where did you ever get that from?"

He said: "I got it from a propeller." I think it was a propeller on one of our ships, maybe a propeller on our airplane carriers or something. It was a very good propeller, and a propeller blade works like a foil and it works exactly like an airplane wing. The lift is bigger than the push. I said:

"No. If you got 30 I think you would be doing well." But, no, he didn't want to listen to me, so they dropped me and the bureau and went out to the West Coast to hunt up people out there and get them interested in a hydrofoil. And they bumped into some people who knew me. Vannevar Bush's assistant was out there talking to them and they said to him:

"Why don't you go back to Washington and talk to John Niedermair?" where he had been before he went out there. Then he came back again and they took me out to dinner a few times. We finally settled the thing by the chief of the Bureau of Aeronautics, I think it was, and the chief of the Bureau of Ships -they have a certain amount of ready money that they can use for something experimental.

INTERVIEWER: A contingency fund?

MR. NIEDERMAIR: Yes. They put that together and gave Vannevar Bush a contract to build a hydrofoil over in Annapolis. And they built a hydrofoil.

In the meantime, they were also interested in a hydrofoil that an Englishman had built and they were running it in Annapolis. They wanted me to come over there to see it and I didn't want to go and see it.

INTERVIEWER: Why?

MR. NIEDERMAIR: Because I didn't think much of it, and I thought that they were out after publicity. In other words, this Englishman got Vannevar Bush to look at it in Annapolis. Now they wanted to bring it to Washington and run it and show it to me down there, but I put a condition on it. I would go down and watch it, provided they wouldn't mention my name in anything in connection with it, that they wouldn't tell anybody that I went down to see it.

And, behold, it wasn't very long after I went down there to see it - a lot of people were anxious to ride on it, but I wouldn't go on it. I just watched it. I got a letter from a man over in France where they had told him that I was there watching it. I never even answered the letter.

So the hydrofoil has had quite a struggle. Bell discovered it in 1920 and they're still struggling with it. It's a highly sophisticated piece of equipment that has to have special treatment. You've got to get special steels, special procedures so that your ship is light, and it's pretty tricky on the foils. You've got to keep it clean. We lift ours out of the water in the Navy, lift the wings out, then we can run on the clean foils.

The Russians are using them on rivers, but on rivers you can use a surface-piercing foil, and it doesn't bounce around too much. But a surface-piercing foil when you get out into waves will chatter and knock your teeth together.

INTERVIEWER: They're using them commercially, the Russians, are they not, and also the Scandinavians?

MR. NIEDERMAIR: They've developed it, but they're in limited size. They're still not very big. They're around 250 or 300 tons. The smaller ones they're using now for ferries in the Hawaiian Islands. I think Boeing is interested in that development. They learned all they know about it from the Navy contract they had.

We've been talking about the hydrofoil and I've mentioned Vannevar Bush and his hydrofoil.

INTERVIEWER: What ever became of his?

MR. NIEDERMAIR: This is a sad thing that happened with his hydrofoil. It didn't do too well, and they were lifting it up out of the water one time or putting it into the water and the crane collapsed and the hydrofoil collapsed, and, as I understand it, that was the end of that hydrofoil. They didn't go back in it any more.

INTERVIEWER: And this was the collapse of Vannevar Bush's enthusiasm for it?

MR. NIEDERMAIR: Well, I guess he was getting old, too. He's gone now. He's not here to protect himself. The last time I met his assistant was down in Houston when I was working on the Mohole project down there.

This is now getting us into the postwar period, and in all our talks we haven't said a word about submarines.

INTERVIEWER: No, we haven't!

MR. NIEDERMAIR: There's a good reason for that, because we worked on submarines for a long time, the salvage of the submarines S-51 and S-4 that I talked about earlier in these tape recordings and that illustrated certain weaknesses that we had in our submarines. There were things that needed to be done. Especially after the S-4, we -not we - I wasn't concerned in it, I was off on other things - they developed a diving bell and lungs for saving people in submarines. I think all the ventilation valves and other valves were made so that they would be proof against the pressure inside the hull.

We had people like Captain Cochrane who was at the Portsmouth submarine yard up in New Hampshire. Then we had Andy McKee in submarines, Admiral Morgan, who was a captain then and was in submarines. We had a lot of good dedicated submariners.

In about 1937 or '38 I got one young fellow in, a Webb graduate, which I am also, Ralph Lacey. He came in and worked in preliminary design, and somehow or other Ned Cochrane sensed something in Lacey about submarines. Lacey had just graduated from Webb and worked in our group for a little while when Ned Cochrane came to me and said:

"I think every once in a while we ought to send some of our young people out into a yard where they can get some yard experience." And I said:

"Oh, no, I don't think we need to do that," and so forth, but he kept after me. Then he came up and said it again about Lacey. He said:

"I think we ought to transfer Lacey up to the submarine yard in New London and get him busy in submarines."

I said: "No, if you get him up there, we'll lose him." I tried to talk him out of it and he said:

"You're a fine one to be talking about not sending these young fellows out to the yards. Where did you come from?"

So I said, "Yes, I guess you're right."

So we sent Lacey up to New London and he hadn't been there very long when the war started and we didn't get him back into the bureau until the war was over. During that time he'd probably ridden in more submarines, different submarines, than anybody alive.

G: He went into the submarine service, did he?

MR. NIEDERMAIR: No, he was up there working in the design department and the hull department but he was still on the Navy payroll but working as a civilian naval architect.

We lost him during the war but after the war, all of a sudden, I heard that Lacey was working in contract plans in the bureau. He never came in to see me. So I got hold of the officer in charge of contract design there and talked to him about it. I said:

"You've got Lacey over there and he really belongs to me. I don't know how he got in there. We sent him up to New London to get this experience."

Then he gave him up. He let me have him, and I got Lacey back into my group, and he's been in submarines ever since. He's there yet. All the postwar submarines he was working on and he rode in a lot of them up at Electric Boat. Then he came down to the bureau and he was connected with the development, as I said, of the postwar ones. Particularly when we got working on trying to use the hydrogen peroxide-catalytic system, where we could get a catalyst to break down this rich peroxide mixture and get superheated steam out of it. So Ralph Lacey is a product of the war. We made him into a person who is still with the Navy. Look at this Trident that they're talking about, and he's still at it.

INTERVIEWER: Did he work on the original Polaris?

MR. NIEDERMAIR: Yes. The Polaris came along about 1956 or '57. Captain McQuilkin came to me and told me what was up. It was a big secret, this Polaris thing, and he said:

"We've got to get a team together to design a guided-missile submarine ."

So we got our heads together. Who would we pick to start if off? I said:

"Well, we'll put Lacey on it."

Then Captain McQuilkin told me we'd put Captain Jackson on it. He was a Michigan graduate, who was a naval officer. He was a reserve officer at first but I guess he was in the regular navy afterwards, and so we picked Jackson.

Then we gave them a free hand to pick whoever they wanted in the bureau to help them, to go over with Red Raborn and work on his team to develop the Polaris submarine. Red, McQuilkin, and I talked that one over, and I said to McQuilkin:

"The thing we've got to do is - they don't know anything about submarines. Any design development that Lacey and Jackson manage to work out should always come back to us here in the bureau for approval."

That is, Raborn's outfit wouldn't have anything to say about whether it was good or bad. They would try to work the thing out and we would approve it. That's why I always thought Raborn was a pretty smart fellow. He let us do that, because he really had the use of the bureau, too, when we said that.

INTERVIEWER: He was head of Special Projects.

MR. NIEDERMAIR: Yes, and that's what I wanted. I ran into trouble with Rickover on the business of developing these nuclear-powered submarines because I drew up an organization diagram and, of course, I wanted the nuclear-powered submarines that he was talking about always to come back to us for approval. But I never saw that organization diagram again.

INTERVIEWER: You mean he didn't send it back?

MR. NIEDERMAIR: No.

INTERVIEWER: He made the decision himself?

MR. NIEDERMAIR: Yes. I don't know why.

At this point now, as long as we are sort of putting together the beginning of the postwar period, some parts of it and some of the aggravations that came into it. We worked with hydrogen peroxide. Of course, the bomb had been dropped on Japan and the argument about nuclear power came up. Cochrane left the Bureau of Ships and Earl Mills was the chief of the Bureau of Ships.

And they had an Atomic Energy Commission. I guess they called it that from the start.

INTERVIEWER: And did, yes.

MR. NIEDERMAIR: Strauss was the head of it.

INTERVIEWER: Lewis Strauss.

MR. NIEDERMAIR: Then Mills decided that Rickover should do this.

INTERVIEWER: Should do what?

MR. NIEDERMAIR: He picked Rickover to go over and be liaison between the AEC and the Bureau of Ships, and Rickover didn't want to take it. He really balked.

INTERVIEWER: What was his objection?

MR. NIEDERMAIR: I don't know what it was, but I know that he didn't want it. I never was told the complete story. But Mills more or less forced him to do it.

INTERVIEWER: I didn't know anybody ever forced him to do anything!

MR. NIEDERMAIR: Well, he did. I think Rickover was a dedicated Navy man in his own way. Maybe he was playing hard to get because he knew how he was going to do it, so he probably knew that if he resisted it then they'd have to take him the way he was, which is a fact. That's what he was. He was Rickover.

Q.: He wrote his own terms.

MR. NIEDERMAIR: And Rickover one day during the war came to me and said:

“Niedermair, could I ride in your car, with your driving group?”

I had a choice parking space in Washington.

INTERVIEWER: You had a car pool, did you?

MR. NIEDERMAIR: No, I didn't really have a car pool but I took people, anyway, and he asked me if I had room, and I had room all right, so I said:

"Yes, that's OK with me. I think so. I go down Connecticut Avenue. Where do you want me to pick you up?"

He said he'd be standing on a certain corner right across the street from where I lived, and he said:

“I'll do it on one condition, and that is if you're coming down Connecticut Avenue and I'm in the middle of Connecticut Avenue and I'm not across the street standing there waiting for you, keep right on going. I don't want you to wait for me ever. If I'm not there, that's my fault.”

INTERVIEWER: He said that?

MR. NIEDERMAIR: Yes.

INTERVIEWER: What was the reasoning back of that?

MR. NIEDERMAIR: He didn't want to put me out. I thought that was very good. It was a condition he was putting on himself. He wasn't putting any conditions on me, in a way. That settled it, and so for a long time during the war I took him down.

I used to go down Connecticut Avenue lots of time when Rick wouldn't be around, because I would go to work at two o'clock in the morning quite often. I got a ticket one morning, going to work at two o'clock, in Washington.

INTERVIEWER: Suspect!

MR. NIEDERMAIR: Yes. For driving too far to the left.

INTERVIEWER: Did you get to know Rickover pretty well?

MR. NIEDERMAIR: Fairly well, yes. He confided in me about a number of things that he did and he'd always be so happy about what he was doing, but as the war came along it changed what I was doing. I was preparing myself already with regard to personnel and then when the rules were changed I still fitted in and Rick didn't. Now he had a hard job to keep his people. I already had faced the problem.

Rick wouldn't hire anybody under thirty or something like that, and I took whatever I could get - if I could get the star, the top guy, I'd take him if he was only twenty-three. I didn't care how old he was and so I had whatever hardship there was to give. So it wasn't a problem for me.

INTERVIEWER: You mean you had a postwar personnel setup?

MR. NIEDERMAIR: Well, some good people were available and I didn't make age one of my requirements. Women, I had women.

INTERVIEWER: How large a staff did you have?

MR. NIEDERMAIR: Oh, I don't know. We never exceeded forty, in my knowledge. But that reminds me of another thing that happened on December 7th 1941.

Before December 7th, I had complained no doubt to Ned Cochrane that the people who were working on the theoretical damage conditions of ships -

Q. : Damage control?

MR. NIEDERMAIR: -in the damage-control section would work these things up and I discovered that they didn't send them out to the ship, didn't give the ship the information that they would find out about the number of compartments that might cause the loss of the ship or how to save it.

INTERVIEWER: So the damage-control officer on the ship wasn't informed?

MR. NIEDERMAIR: He wasn't informed, and they said to me:

"We can't do that because we can't boss the captain around." It was so silly, and I evidently told Cochrane about this.

December 7th was a Sunday, just like it was this year.

INTERVIEWER: Thirty-four years ago!

MR. NIEDERMAIR: Yes. I got in the office and Ned Cochrane was there early in the morning to see me and he said:

"John, you're going to be handling damage control," just like that.

We were going to develop the damage-control group, damage stability, and all that sort of thing, on December 7th or December 8th.

INTERVIEWER: Timely!

MR. NIEDERMAIR: And I didn't take a single one of the people who were in the old damage-control group, not one.

INTERVIEWER: Your reasoning?

MR. NIEDERMAIR: Well, to start it off, I turned the job over to Ted Sargeant, who was a very clever fellow from the University of Washington -Theodore Sargeant. He was really good, and he worked up stability and all that sort of thing. He's written quite a number of papers on this sort of thing.

And another thing, in our preliminary design group there, we didn't use the Navy filing system. Our files were different than the regular filing system. And the way we marked our filing cabinets, you had to have the code to get in them.

INTERVIEWER: Oh, I see, it was for security reasons?

MR. NIEDERMAIR: We didn't tell anybody. We did that ourselves, and when the Secretary of the Navy got his engineers in from Chicago, efficiency engineers, to investigate all the Navy to see how prepared it was, getting ready for the war -

INTERVIEWER: When did he do this?

MR. NIEDERMAIR: He did it just about the beginning of the war, and they're still in Washington. They came into Washington then and the company is still there.

INTERVIEWER: Is that Boos Allen?

MR. NIEDERMAIR: Yes. Boos, Allen, in the first place, gave us a very good report and they were very interested in the way we did this. I had broken down our first few studies - in the first few studies you'd

only do a few things. I already had a bracket in which you would do this. Then the next step, I'd have a few more things you had to do. The final stage would take in the whole study. They were always interested in these things. I turned this job over to Ted, and they gave us a superb statement in which they said that you had to be internationally famous, or something like that, but I was the only fellow that they could say that about. So they applied it to all the rest of them.

INTERVIEWER: In the field of damage control, this became of paramount importance with the operating forces?

MR. NIEDERMAIR: That became a very big thing. Bob Gooding, who is head of design now - he heads up the Navy design department and he's trying to move the gang over to Crystal City from Hyattsville. They'll be going over there next March. He was in the war-damage group. He came in and worked in our section. The last time I saw him, he said he didn't know whether I was working for him or he was working for me. "I never could figure it out," he said!

G.: Tell me about the development of this whole subject of damage control.

MR. NIEDERMAIR: The thing is, of course, you have to investigate the stability characteristics of the ship itself and find out how many compartments you could take without being lost. You made all these calculations and you'd make a report on it. It was a very long extended investigation which more or less indicated what it took to sink you.

INTERVIEWER: And this varied, of course, with different classes of ships?

MR. NIEDERMAIR: It also varied depending on which part of the ship you got hit on. If you got hit in the bow or hit in the stern or hit amidships, and you'd make these thorough investigations. But they also investigated all the damages that were done during the war. They were there during the war and ships were hit and worked on.

Then, after the war was over and the nuclear bombs were dropped on ships, the damage group went out there, when the cruisers and other ships were bombed. I went out to the West Coast and went down to the San Francisco yard and went on board to see what happened, and went through a cruiser that had radio-active water and the stuff that was in it with geiger counters and one thing and another in special suits. Then I went up to Puget Sound and went through a destroyer that was up there, not a destroyer but a cruiser that had been hit by an atomic bomb. There were all radioactive parts in it and the dust was radio-active. We had to wear gas masks and all that to go in.

INTERVIEWER: Tell me, did this section studying the whole problem of damage control in ships, did they go into the necessity for taking various spare parts and equipment and what have you when a ship sailed for the war zone? Was this a part of their study also? Did they help the damage-control officer on a ship in this way by advising him what it might be necessary for him to take with him?

MR. NIEDERMAIR: No, I don't think so. They might have talked about it just like I talked to the damage-control people in the field. I'd give them lectures about it. I gave some lectures on the history of damaged ships, merchant ships, and all that sort of thing. I lectured up in the Philadelphia yard and I gave the history of that up till 1950. Then they wondered whether I wouldn't write up for any future ships. I haven't done it, but maybe I'll give you a copy of that as part of your files. Another one I put together had to do with the history of keeping the Navy seagoing from 1800 and something up to 1900 and something.

Interview No.5 with Mr. John C. Niedermair

Place: His home in Stone Harbor, New Jersey

Date: Monday, 9 February 1976

Subject: Biography

By: John T. Mason, Jr.

INTERVIEWER: John, I'm delighted to see you, a picture of health, today.

MR. NIEDERMAIR: Yes, I feel very good, too. I try to keep myself in shape. I've had trouble with colds and everything, but this is the season for it.

I want to answer the question with regard to damage control.

We really didn't actually issue information to any of the captains, except we did this one thing. At Philadelphia we had a training center and any of the damage-control officers who were going off and going aboard ship would be trained at the damage-control center, where we would have not only damage control with regard to flooding but also primed them with regard to fires. So they would be pretty well primed by this. For example, the publication here that I showed you a little while ago. This is dated February 1944 and it consists of probably sixteen or eighteen lectures that went on by Richard Mandelkorn, a commander, U.S. Navy. He did it in collaboration with Robert Danse and Sol Kaufman. Kaufman was a naval architect and Danse was a lieutenant in the Naval Reserve and later on Kaufman was in the Naval Reserve also. By 1945 he was.

At the Naval Damage Control Training Center, Philadelphia, the damage-control school. In connection with that Admiral Cochrane was very much interested in this damage-control work and he came across the idea that the New York Fire Department was using fog nozzles to put fires out. He brought that into the Navy and had the people at Philadelphia who were working on the fire risks and the control of fires to get busy and become familiar with what the New York Fire Department was doing.

Incidentally, I tried to find out whether Sam Morison ever talked about Admiral Cochrane, who contributed so much in our naval construction and all the ships that were out there fighting the war, and I found that the only mention he made of Vice Admiral Cochrane in his history was that he had gone and made contact with the Fire Department in New York City and found that they were using fog nozzles to put out fires. And I was a little disappointed. That is one of the problems in this history. I checked up a number of things. I saw the fine Essex paper in the Naval Institute Proceedings recently, where they talked about the Essex class and really praised it for all the things that it was able to do and continued to do. But no mention was made of the basic design. The reason that they were able to use that Essex class and continue to use it for such a long time was the fact that naval architecture margins had been put into that ship, by design engineers.

I recall one of the things I did to provide the damage protection. I was afraid that maybe we would be faced with mine damage when the Essex class came up, and I did something that was a controversial matter and debated quite often later. I put two inner bottoms into the Essex class. I don't know whether they got eliminated later, but the original design had two inner bottoms. My idea was that it was the only thing you had between you, if you were in the engine room, and the water outside were two thicknesses of plating, maybe not more than a half-inch or an inch thick, and that was it, and a gap of probably 4,5, or 6 feet of the inner bottom depth. I knew that a direct hit or a direct explosion

right over a mine, there wasn't any kind of structure in there that would save you. But these magnetic mines could be set off if you were riding alongside of them, so I felt that this explosion would only damage the shell and the second inner bottom - the first inner bottom, I mean, the one just above the shell, and then the inner bottom above that would still be intact.

INTERVIEWER: A precautionary measure.

MR. NIEDERMAIR: So I put that sort of a safety feature into the Essex class.

There were many other things that got going but, towards the end there, the ships that were doing the job, the Essex class they were able to handle the big planes that we had at that time and they were ready. In fact, I don't know how many of them were finished by 1943. We had all the ones that were converted from Cleveland-class cruisers, the Independence class, all nine were ready, and probably nine or ten of the Essex class were ready.

These particular specific things are put into the ship and I find that fault of non-mention of the design input goes on throughout our industry, so that the Navy isn't the only one that doesn't do it.

INTERVIEWER: I suppose, in defense of Morison, one might say that he was dealing with operational things, an account of the operational activities of the Navy in World War II, and made no pretense of going into the background?

MR. NIEDERMAIR: That is true, but he had people on his staff like Admiral Furer, who was a naval constructor, and he was investigating management concepts and all that sort of thing. They did in a way deal with it but they didn't get it into the main history because, I guess, it's like anything else, it's a passive thing, it's not an active thing, you might put it that way. Really, you win the war with people and ships and command is very important and that's what you deal with, I suppose, when you write history.

We talked about this bridge across the Atlantic and I brought in the Delano-Burgess team. I mentioned that they had a private naval architect as an adviser but I couldn't think of his name. I have the name now. It's Eads Johnson. He was a naval architect from New York. He isn't here now, he's gone. He was an adviser to them and then he quit when he found that the concept was really way off base, and he made a public statement about it.

Then I mentioned that there was a naval architect who represented the Secretary of the Navy up at the first trials in Boston with the LSTs, when Schuyler Pyne came to me and said that there was a Gestapo on board and he was finding fault with the LST. It so happens that Eads Johnson was this same person. When I was talking the last time, I couldn't catch that name, but now we have it in the record. He was quite a prominent naval architect. Of course, I went on to say later how we handled him, so we understand who the person was.

We are now practically through the war. The bomb, I would say, had been dropped and so forth, and Admiral Spruance was one of the great advocates for getting busy to build a new carrier. Because of war experience, he felt we needed a larger carrier, and as a result of his early efforts we got busy very early in the game after the war in collecting information, and the General Board and Ships' Characteristics Board were busy collecting information on what the future carriers should look like. We wound up, of course, with the one that had the keel laid in 1950, I believe it was, and Johnson, who was Secretary of Defense at the time, stopped it. But Spruance was the one who really got busy very early in the game to do this. Admiral King, Ernie King, was still Chief of Naval Operations and he was the one who advised the idea of creating a ships' characteristics board made up of younger officers than the officers that generally were on the General Board. The General Board officers originally were people who were getting ready to retire. They were rear admirals who were not going to sea again.

He did that and that meant that we had a great deal of contact with the various officers who had been to sea not only on the carriers, but we got into the submarines because submarine commanders had

reported on some of the difficulties they had out in the China Sea area, off the Japanese coast, and how they fired their torpedoes and they bounced off the side of the Jap ship and didn't go off.

Also, in our last talk, we touched on submarines but didn't talk very much about them. I mentioned that the submarine was pretty well developed and standardized, beginning very early in the thirties, so that by the time the war came along we had very good submarines ready, especially in structural work. There were two or three civilians who were prime movers with regard to the structural strength of submarines. One was Charley Anderson, who was in the Bureau of C & R and in the Bureau of Ships for a while. He handled the structural strength problems in connection with submarines. Then there was a Dr. Wendenberg at the Taylor Model Basin, who was the research end of the deal. That was quite a team, a great creative team.

We had Wendenberg in the laboratories researching it, and Charley Anderson, the naval architect, who was interested in the structure. He became the specialist who went out to sea and actually took stress readings in the submarines as they went down. Wendenberg and Charley Anderson worked together on this thing. So due to their efforts, the structural side of the hull was pretty well worked out. There has been a lot of praise put on by commanders in the way of depth bombs and one thing and another in the war area, because they really praised the structure of the ship which saved their lives. I've mentioned some of the other officers who were connected with it. There was McKee, and, of course, Cochrane was also a submarine man. He was a submarine builder. And Morgan, Then there was Admiral Leggett, who was later on chief of the bureau. When I mentioned McKee and Charley Anderson and people like that, I was talking about hull but no mention of the machinery. A submarine is very dependent on machinery.

INTERVIEWER: Yes!

MR. NIEDERMAIR: That's why I'm bringing up Admiral Leggett. He was an engineering man, so was Earl Mills an engineering man. They're a different breed altogether, and I always got along very well with the engineering people, the engineering side. I tried to keep myself well informed in their area, too.

Leggett had been to sea in submarines in the engine room in his early days. Later on he was in charge of the work on diesel engines at various ports on land. Then he became the chief of the bureau. He succeeded Admiral Wallin as chief of the bureau. I knew Admiral Wallin from about 1924 or 1925 at New York Navy Yard until he left the Navy. He was a trained naval architect. So there's the team that we had with Leggett and Wallin.

Wallin was quite an expert on welding. He wrote one of the prize papers. He and Commodore Shade wrote one of the prize papers about 1930 in connection with the welding of a structure, a barge or something, and it was well publicized in those days because welding was just getting into the picture. The one thing that brought welding in more than anything else was the treaty limitations that we had on displacement. Welding led to being able to build a lighter hull because we eliminated rivets and seams and overlaps and so on.

INTERVIEWER: Were the other participants, the other signers of the treaty also involved with welding?

MR. NIEDERMAIR: I don't know how the other people did it, but we had people like Wallin and Shade and so on, who got into this thing very early in the game.

INTERVIEWER: No, but I meant the Japanese and the British and the other signers of the treaty, were they also using welding?

MR. NIEDERMAIR: They were coming along. I think we were ahead of them, though, for quite a while. I never knew too much about whether the Japanese were or not because we never could find anything out about the Japanese. We told them everything we did in one way or another, but I never

was able to find any good concrete information about what they were doing. So you asked the question what they were doing, I say I don't know. They never told you anything. But we did. As a matter of fact, we told them all about it because when Wallin and Shade wrote the paper for the Lincoln Electric Company, they really told the world how we did it at the very beginning. It was a good idea, though, because they got busy then to get proper welding equipment.

You can talk about welding, but it was the backup stuff like the nozzles and so on and how you handled the air and one thing and another in order to weld. That's where the great techniques came in. Also the kind of rods that you used. If you didn't use the proper rods, the welds would become brittle, for instance.

Wallin was at Pearl Harbor when it was hit by the Japs, and he's the one who really did great work in salvaging and floating quite a few of the ships that were badly damaged out at Pearl Harbor. As a matter of fact, he sent a telegram into the bureau asking the bureau to send me out there about the day after the 7th of December. But the bureau didn't do that. They decided that they'd keep me in Washington.

Welding came in very well in connection with our submarines later. Most of our submarines were welded later on, but it was a gradual process. Even when we designed the Essex class, I had to do some dodging around, as I mentioned before, in connection with connecting up the strength deck. The hangar deck was the strength deck on the Essex and the flight deck was not the strength deck.

That gives you some background of the sort of things that I was thinking about. I'm bringing that in because after Pearl Harbor Wallin did come east and he worked on the salvage and getting a ship that ran aground down in Norfolk, one of our big ships that had to be gotten off a sandbar or something. He was down there in Norfolk at that time and he handled that project. I don't know whether you have had a chance to talk to Wallin or not. He's out on the West Coast, up in Seattle.

There have been some articles about his salvage work in the Naval Institute Proceedings, so you could look him up that way to see what he did and what his reports are like.

As I said before, Spruance got us going on the carrier, but at the same time problems began to come up in connection with submarine designs. There wasn't very much talk in the beginning about nuclear power for submarines. What we were looking into more than anything else was the hydrogen-peroxide catalyst combination. The catalyst would get mixed up in there and the oxygen and the peroxide and so on would let go and you'd get superheated steam from that combination.

We worked on that and the first submarines were designed strictly in line with conventional diesel engines. I shouldn't say "conventional" because it wasn't very long before General Motors came up with the idea of what they called the "pancake engine."

INTERVIEWER: Pancake?

MR. NIEDERMAIR: Pancake, yes. Instead of the cylinders being in a horizontal line, they stood the thing up and piled one over the other.

INTERVIEWER: And the advantage?

MR. NIEDERMAIR: You didn't need so much length in the engine room. You had to have a certain diameter to carry the weight in the submarine, so you made the engine vertical and it was less long. That was one of the primary reasons for doing it because diesel engines, in order to get power, have got to have very long engines. So the pancake engines came into the picture and the first postwar submarines were based on using diesel engines and we put pancake engines in them. But they didn't turn out to be successful.

INTERVIEWER: Why?

MR. NIEDERMAIR: Because of lubrication problem. They seemed to use up a lot more oil than a regular diesel engine. You can imagine trying to get oil in the top bank of these cylinders and it wound up that they had the wrong piston rings in there and they took the engine apart at the engineering

experimental lab at Annapolis and set it up. Finally, they solved the ring problem, but it didn't solve all the other problems that they got into with these engines in the way of valves and so on. Probably, cooling was also a thing that was bothering them. They phased out and then Fairbanks Morse engines had to be put in. So the General Motors pancake engine was replaced by the Fairbanks Morse.

I've talked about the hydrogen-peroxide idea and the reason is that these investigations to try to build in more submerged endurance. By using the hydrogen-peroxide and the catalyst, you could run the engines submerged because the hydrogen-peroxide was furnishing you with the oxygen that you needed, so you could run the diesel engines submerged, especially in the higher powers was the idea.

I made some investigations in the early days in that connection, and I came up with a figure of about 15,000 shaft horsepower for the early classes of these early submarines. The Albacore finally got into the picture around 1947 or 1948 or something like that, and that had General Motors diesel engines in it. That had a 15,000 shaft horsepower in it.

INTERVIEWER: Was this known as a fleet submarine?

MR. NIEDERMAIR: No, the Albacore was a test submarine, an experimental submarine. It was testing out a hull form, an airship type of hull form. That's what it was testing out.

There's an interesting thing about that hull form. I was being bothered by quite a few people. Ken Davidson from the Stevens Model Basin, Ken and I were on a very friendly basis and what I mention wasn't a belligerency on his part, neither was it on mine. He suggested the streamlined hull form to me and to others just as though we had never thought of it. So in the process of following up this influence of Ken Davidson, one thing he did anyway, he got the top guys to listen to us about this streamlined hull form. He did that, all right. But it's interesting to know, and I went up to Electric Boat Company about that time when I was under pressure, and I talked to the president. I was in the president's office at Electric Boat in Groton and I noticed a model there of the Plunger. It was in a glass case and I said to him:

"Could you send that model to me down in Washington? I need it. I want to put it in my office and when these people who are coming in to sell me on a streamlined-form submarine arrive, I would like to have that model and point to it to show that we already know about streamline."

He said: "No, I can't do that because this is a very valuable model of the Plunger. I'll do the next best thing. I'll take some pictures, photographs, and I'll send you a whole set of them."

I looked this up for you and I have here a set of those photographs. In that connection, I have a note here that those photographs, and I think there are four of them but I'm not sure -U.S. Plunger (A-I). That was a model that the Electric Boat Company made. These pictures were prepared for me, at my request, by the president of Electric Boat.

The interesting thing about this little model, as it turned out, was that the length over beam ratio, which is a critical ratio that you use in connection with these airship-type forms, came out equal to 5, because the length of that little boat was 22 feet and its beam, or diameter, was 4.4 feet, so that ratio is

5. While we were working on the Albacore, I went down to Langley Field and I talked to them down there. Since we were using an airship type, I thought it would be a good idea to turn around and build the submarine and have it tested in the air tunnel first. First, have a nice smooth hull and test the resistance of it in there, because the only difference between air and water is the difference in density. So they did that, and they came up with the idea that you didn't have any holes or appendages on the hull, holes in it like we have to have in a submarine to get the ballast water in, why, these field tests indicated that the best hull form had a ratio of length over beam that was equal to 5. I didn't know that and I don't think Electric Boat knows it to this day, but I checked it out. I ran across one of my notes and I thought you would like to hear about this.

So about 1950 - this little submarine here, I don't know whether they have a date on there -

INTERVIEWER: 1903.

MR. NIEDERMAIR: 1903, so I tested it about 1953, fifty years later, and I found that it came out the same ratio, L over B was 5, fifty years later. And you know, every once in a while, you see somebody mention that the proper length-to-beam ratio is 5. I thought you would like to know that and you can have this note that I made up for you.

INTERVIEWER: All right, Sir.

MR. NIEDERMAIR: The Albacore was our research vehicle. It had no military equipment in it. It was done strictly to find out how that hull form would perform, and, of course, you had to learn how to control it for diving and so on, turning under water, and these things. Also, it only had one propeller on it. Up to that time nearly all submarines had two propellers, but now we only had one, which put the propeller directly in line with the nice streamlining. So the Albacore, the test vehicle, had one propeller and its horsepower was about 15,000. I keep emphasizing that 15,000 because submarine after submarine after submarine that went on to be built with nuclear power in it had 15,000 horsepower.

INTERVIEWER: The ideal -

MR. NIEDERMAIR: Yes, and somehow the horsepower is going to last us a good long time. This is the point I want to make, but this is so important because when you get enough experience or background in here, you have an insight on these things. This hidden little thing that you build up, you get these insights, and this is what controls your actions.

INTERVIEWER: Yes, I understand. In the case of 15,000 horsepower, is this designed for what kind of speed?

MR. NIEDERMAIR: Speeds that run you up in submerged speeds probably to around 30 knots. This is because you can pull full power out of it with atomic energy, where before you crept around in World

War II submarines and they were lucky if they could make 12 knots for an hour. So you couldn't get very far away when they were dropping these depth bombs on you.

We proceeded along all through the postwar times there, but it's these early things that we had to work on that led to what you might call the postwar programs.

The Forrestal didn't come along until sometime in 1950. In the meantime, Cochrane had finished off, Mills became the chief. He was an engineering officer. And then Rickover got into it after Mills was the chief. I've forgotten now just when Mills became the chief. Yes, here it is. He became the chief about 1946, and it was during this period 1946-49 that he, of course, got interested in nuclear power and he picked Rickover to be liaison, as I mentioned before and we talked about it here.

It was a natural for Earl Mills to think that way because he was an engineering officer, not a naval architect. That's the way this thing sort of gets in there. Mills got along and he left in 1949, and he was followed by Admiral Clark.

INTERVIEWER: Admiral what Clark?

MR. NIEDERMAIR: He was Rear Admiral D. H. Clark. He was chief of the bureau from 1949-51. He was only there a short time. Then that's where Holmer Wallin comes in. We've mentioned him. The submarine program had a lot of interesting facets to it, especially when we were getting into the streamlined or the airship type of form. It so happened that we had information on the hull form of the British airship. The British had an airship for a while that got into trouble. It didn't last very long. It was similar to the zeppelins. Probably it was a German zeppelin that was built for the British. I don't think that's right, because I had another odd thing in connection with that hull form, and that is that I was told that a woman was the one who developed the hull form for that British airship. Her name was Hilda Lyons.

INTERVIEWER: An English woman?

MR. NIEDERMAIR: An English woman. She had quite a lot to do with that hull form. Women's lib would like to know this! I'm not sure about this but I think Dr. Todd, who came over here from Great Britain, was the one who had the contact.

In any event, Captain Saunders was in contact with the British people quite a lot, so if it wasn't Todd it might have been Captain Saunders who led to the use of that British airship hull form for the Albacore. Of course, the things have been refined. But, you know, as you put holes and put appendages into these submarines, the least-resistance type is one that has an L over B ratio that's greater than 5. It sort of compensates for the holes that you put in it by trying to make it slimmer. I have a number on your note there that says $L=8$. We found out when we put the holes into the model of the Albacore, the best length to beam ratio was 8. You could vary these things to suit so you'd get the least resistance and better control and so on. You tried to get the least resistance and tried to get the best flow because a lot of noise is developed by the water flowing over these, especially when they go fast under water. If any turbulence is developed it makes a noise.

I think that that gets us into submarines and -

INTERVIEWER: Let me ask how successful the Albacore proved to be?

MR. NIEDERMAIR: Very successful. I have a note here, but that's way, way along, that the hull form of the Darter, I think it was, had a streamlined, less noise, hull form. The last non-nuclear submarine was the Albacore hull form. All the rest of them were that form. I just wanted to bring that up to show. The Skate was the first production type nuclear submarine, but there was a terrific amount of field work that you had to do. I had to go over to Annapolis and have demonstrations made for me to show how this hydrogen-peroxide explodes. When you were through you'd have a little cupful of hydrogen-peroxide and you'd have the catalyst and you'd try to toss it into the cup and the thing would go zoom and it would explode. The catalyst would set it right off. I'm glad we didn't get into that sort of thing.

INTERVIEWER: It sounds rather dangerous.

MR. NIEDERMAIR: I thought it was more dangerous than nuclear.

Here's another thing in connection with this question of trying to run a submarine and be able to run it at high speed for greater periods of time submerged. We had all kinds of suggestions coming up. One of them was to carry liquid oxygen in the submarine. I made an investigation of how to carry liquid oxygen in a tank in the submarine. I tried all kinds of ways. I finally came up with the idea of suspending the tank inside the submarine on a system that looked like the spokes of a bicycle wheel, because it was in contact with the outside and the water was cold to you but it would be hot to the liquid oxygen and would expand it.

Then, in the end, we found out we really couldn't keep this liquid oxygen a captive. No matter how you tried, it would try to leak out. So by the time they came to the development of the Polaris submarines, they were trying to put missiles into those early missile submarines based on the Redstone missile that had liquid oxygen in it. We already knew that oxygen had all kinds of risks and you never knew whether the thing would take off, because with this escaping oxygen it would always condense any moisture that was around the mounts of the valves. They had a lot of trouble down on the launching pads. They had to postpone the launching for a day or two because of difficulties with freezing up.

That was another angle. The risks involved with the hydrogen-peroxide, the thought was to carry liquid oxygen instead, carry fuel oil and a liquid oxygen and you would have the oxygen right there. That was another way of doing it but we never did it. It was impossible to work it that way.

The trend, however, as I pointed out, while Mills was there until 1949, during his time Rickover got started on the idea of nuclear power, and that meant that we could drop the idea of anything but nuclear power. So they're all nuclear-powered now.

Around that time, in those early days, I already sensed that the submarine would be the - I somewhere have a note of mine here in which I looked into the future and decided that the backbone of the fleet would be nuclear-powered submarines. I see now the debates that are going on for the carriers.

They're phasing out the big carriers because of the problems with the missiles that are coming out - that is, missiles that can destroy the surface ship. The carrier will be phased out as the backbone of the fleet, and I still think that the submarine will be it.

There has been much talk about how to destroy the submarine. A lot of work is going on to find out some way of destroying a submarine, and we had that same problem when we were working with the submarine. In fact, preliminary design worked with all types of ships. We'd be designing a submarine on one end and a ship on the other end that was supposed to go out and get a submarine and drop a depth bomb on her. That's why I'd get these ideas, because I'd have both ends of them in the same shop!

In any case, that I saw just recently, and I have a paper here somewhere clipped out of The New York Times about the debate that's going on with regard to the aircraft carrier and its future.

INTERVIEWER: It has been for a number of years.

MR. NIEDERMAIR: Yes.

Of course, we weren't standing still just working on submarines. We were also working on new destroyers because the World War II destroyers were all little fellows. I have here a little check-up I made at one time and I came across it.

The Fletcher class was the basis. The Sumner class came in later and finally wound up being 476 feet long in 1963. But it started with the Fletcher class, which was only 376 feet long. The demands of the war started making these ships longer and longer. The first postwar destroyer was the Forrest Sherman class and that wound up with a length of about 407 feet on the DD.

We finished our design on the first one. Cochrane was still in the bureau when we started our studies. I had finished a study and I found that, no matter what I did, this thing kept getting bigger and bigger all the time.

INTERVIEWER: What were some of the new requirements that made it get bigger?

MR. NIEDERMAIR: Well, the missile armament that had to go on it. They took up more room. And the accommodations -people didn't want to be packed into the same space any more. They had to have more endurance. The speed was about the same. But it's like everything else. It never gets smaller. It keeps getting bigger and better, they say, but Cochrane used to worry about that and he'd always take length out because he'd say even if it was only a couple of feet held like to get it out, because the shorter, the smaller, the less work you had to do.

Anyway, the Sherman wound up being about 407 feet long, but the DDG, which was the guided-missile ship - you see, the postwar Sherman still only had guns on it, but when you got into a guided-missile ship the length jumped up to 476 feet, and the horsepower jumped up to 80,000, while the Forrest Sherman had 70,000. That's how these things were jumping.

They were very anxious to get this destroyer into contract design phase and get started on building the new destroyers. The yards were crying for work, actually.

INTERVIEWER: So that was one of the factors?

MR. NIEDERMAIR: That was one of the factors. So I had to turn it over to contract design. I felt that I was still not sure of the weight. I felt that it could increase another 100 or 200 tons of weight. No, they said, turn it over to contract design and they'll find the weight. But my experience had been that they never found weight, they always added weight to it. And so the first postwar destroyer went into contract design, they started making the DD contract design, and it got heavier and heavier and heavier, and finally it was decided to turn it back to us, which I wanted to do in the first place. I told them:

“Now” I've finished this, I think I ought to start all over again.”

But they said, no, we'd better get going on it. So it came back and it wasn't until 1952, the 1952 to 1956 era, that the Forrest Sherman was really finished. That was eight to ten years.

INTERVIEWER: And what was her length then?

MR. NIEDERMAIR: It was 407 feet long, which wasn't too bad, but still we couldn't put a guided missile in it. This was the problem. They wanted to get a guided missile in it. So we finished the Forrest Sherman up and that class were shorter than the DDGs. The DDGs, the 927 class, which came out ahead of the Sherman, was 476 feet long and their horsepower was 80,000.

I just bring this sort of thing up to give you some idea of just how you struggled around with the war there and we finished up our carrier in time. By about 1950 the carrier had been finished that Spruance was interested in.

INTERVIEWER: It was called the United States?

MR. NIEDERMAIR: Yes, but it wasn't really. I don't see how you could call it the United States because the keel was only laid. It never was christened. It would have been the 49 or 48 or something like that. But it was supposed to be the United States.

The interesting thing about that United States was that it had an angled deck on it. We had the angled deck to get the fighters off, so fighters could take off while the bombers were sitting on the catapult side. Fighters could take off from the angled deck, which was on the starboard side, as I remember, and the takeoff was on the starboard side. The island was on the port side, as I recall it.

When we come in now the angled deck - on the Forrestal it was a landing angled deck, and I think that's where the British got the idea. When they saw the original sketches of the United States, they thought that's what it was. They never said so. I don't know why BuAir didn't get the idea first, but they didn't. The first angled deck was on the United States. That was to let the flyers go off.

INTERVIEWER: Was there a feeling of shock in the Bureau of Ships when this was cancelled?

MR. NIEDERMAIR: Oh, yes, the shock was terrific. That's a good question. Actually, the shock was so that Secretary Johnson ordered that all information on the United States should be rolled up and put away and not another minute's work was to be done in connection with carriers. That was a military

order, but it didn't apply to me. None of the officers or the chief of the bureau came down to tell me what to do. So I didn't abide by that restriction. I had my chief surface-ship man, George Dankers, button up everything we had in connection with the United States.

Another interesting thing on the United States, I was also afraid of the increased power of torpedoes. So in the design of the United States I increased the torpedo protection, the depth of the torpedo protection 25 per cent to take care of what I thought would be the more powerful torpedoes, and they are more powerful. I know that. That was long before they did any work in underwater explosion laboratories down in Portsmouth. They tested for years and I think they kept the same depth that I took. They kept working on it and I noticed - I have a note here where Captain Evans, who wrote to the

Naval Institute Proceedings about the short time it took us to build the LSTs, we mentioned that, I think, before, he was down at Newport News during the time that the Forrestal was building down there. Newport News wanted to take the extra depth out of the ship to save weight, but I told Captain Evans: "No, you won't save weight. You actually will increase weight because it's part of the torpedo-protection system. They could save weight and also get more room inside for the machinery."

You see, both things, but I said:

"No, you can't save weight because you'd have to make all the other things heavier against the bigger torpedo that I'm thinking about."

So they didn't change it, and when we designed the Forrestal we kept that same depth. With all the research that had gone on in the meantime, it never got changed during my time. I understand now that most of the big carriers are Forrestals and there are one or two nuclear-powered carriers.

The big quarrel that's going on is that the Navy wants to phase out 'the Forrestal types and come in with all nuclear carriers, because they got better endurance that way. But they're not smaller and they're more expensive. According to the original estimates that I worked on, the Forrestal would cost about \$300 million, and the Enterprise, which we got into later, couldn't do anything else except it had

more endurance than the Forrestal, cost twice that, \$600 million. Now, I think they cost a billion for one ship.

INTERVIEWER: Yes, the Nimitz, I think.

MR. NIEDERMAIR: And I don't blame them for worrying about spending that kind of money on a ship that maybe could be knocked out with a missile, which is a lot worse than a torpedo. It's more like a kamikaze airplane coming down on you.

I'm keeping myself up-to-date on this thing because I'm still very much interested in what's going on.

I put an escalator in the Forrestal. I put it in and nobody took it out. I mentioned, I think, the Franklin had a kamikaze and they lost a lot of people in a space between the flight deck - between the hangar deck and the flight deck there were the ready rooms, right under the flight deck, in the Essex class. And when the kamikaze hit, the ready room was wiped out. It killed all the pilots who were in there. So I wanted to have the pilots stay down below and then put escalators in so the ready rooms would be below, and on the Forrestal they are below and they come up on the escalator from the ready rooms. It's safer. And the Forrestal, as compared with the Essex class, the flight deck is built into the strength of the ship. There are no expansion joints in the Forrestal, but the flight deck on the Essex had an expansion joints.

All these different things that you see there were done and decided by 1956 or 1958. I retired in 1958. It was also during that time, of course, that I received all kinds of honors in connection with this sort of thing.

INTERVIEWER: By that time, all the lessons of the war had been absorbed, hadn't they?

MR. NIEDERMAIR: To a certain extent they had, yes, but the lessons from that war - one of the risks of learning a lesson from a previous war is the probability that the next war won't be the same. Unless

you have imagination and this insight that I'm telling you about, it's not going to work. You know that your enemy is going to study what you have. If he's wise, he's going to find out where your weak points are and he'll decide to hit your Achilles heel. That's all there is to it. All you need to do is read your Greek mythology to find out how to do it!

In the same period after the war, the Army transportation service was asking us to make designs for them.

INTERVIEWER: MSTTS?

MR. NIEDERMAIR: Yes. We developed the first roll-on/roll-off ship design for the MSTTS.

INTERVIEWER: This was quite innovative, was it?

MR. NIEDERMAIR: Yes. The nearest thing we had to it was a ship that was designed by Seatrain people. You know, trains would go down to Panama and so on on Seatrain ships. In a way, they were roll-on/roll-off but not the same as these. These were trucks and craft of that kind.

We also got busy trying to come up with designs for making LSTs faster because the speed of the LST was a little over 10 knots, and of course, in the modern age 10 knots is like standing still. They worked on that and came up with solutions on how to design them with more speed. We did build faster ones and streamlined them and so on. But we kept the same slope on the bottom that I picked out in the early days, 1 in 50, which Professor Hovgaard didn't agree on. That is still the basic slope of these LSTs and any of these fleet landing ships.

The landing ships, dock, came in during the war, and the landing ship, dock, was really designed by the British. They came up with almost a complete concept. They carried long barges in it during the war. The Marines liked that LSD very much. We had an open deck, like having half of the ship look like a dry dock, with boxy wings on the sides and a big tank in the middle, and a big gate on the end.

INTERVIEWER: What is the length of the landing ship, dock?

MR. NIEDERMAIR: It would be somewhere around 500 or 600 feet long. They could carry long barges in there, a couple of hundred feet long each. They were designed to carry two barges around 200 feet long, but they never carried them. They were much better for everything else. At the landings in Okinawa, they used the LSDs, and the Marines used a lot of their smaller amphibious craft. They'd carry them in the

LSDs and then they'd float out of the LSD, you had to sink the LSD down, put the gate down, and you'd fill the compartment with water, the central compartment, you let the water run in there. And you put water into the side tanks to increase the draft of the ship, and these things could float themselves out.

That was a great idea and we used it in many ways. The Marines really latched onto that. Then they wanted a deck put over to close the compartment off so they could land helicopters on the deck. And then they came up with a later design.

We put that thing together. In fact, we had to redesign the British LSD because it didn't have enough stability.

INTERVIEWER: When you begin to build all that superstructure, of course, it doesn't.

MR. NIEDERMAIR: And the gate was very heavy. It had to be worked out. It had to be very wide. Gibbs and Cox did that. We did put a deck over on the later models. Various things were done to the LSDs. Until just lately, they worked about ten years on getting out the LHD, or whatever it was, down at Litton, for the Marines. It was an offshoot from the LSDs.

INTERVIEWER: LHD.

MR. NIEDERMAIR: I don't know what they called it. They had a design contest back in the sixties on those, and they just recently launched them and put one into service. In the wartime you can't sit around and wait that long.

The problem of how to catch the submarines is still before you. They haven't really solved that problem. In order to solve it, we're coming along with the SES type designs, fast surface ships.

We just recently have had this Guatemalan earthquake thing and I got thinking of that in my mind, and I got thinking again, really a naval architect is the only one who can design something against disaster, like that, because what does he do? He designs a structure that goes out on a liquid base when the stormy weather comes around there's an earthquake every day. The base that the ship is going on and the thing that's destroying these houses is the shock wave that comes along. The Japanese have designed a certain proper base for structures to withstand a certain amount of earthquake destruction.

So I got thinking, well, gee, a naval architect is always working with earthquakes - seaquakes, if you want to call them that! What led me to that idea was that this is what these different little gadgets are faced with, the SES, or anyone of these little things. It would be very difficult to have them be out at sea~ whereas the submarine doesn't have to worry about this. It's submerged. Not only that, one of these submarines, the Skate, I think it was, ran submerged all the way across the ocean, then it went under the north pole.

INTERVIEWER: Yes,.

MR. NIEDERMAIR: I guess I was at Groton, Connecticut, when I got these pictures of the Plunger #1 in connection with the Skate. It takes a long time before you arrive at the Skate. The Albacore was the preceding thing, and because of that interest, I was right up at Electric Boat there and I got these pictures.

But the submarines have to be designed against pressure and they're limited in the depth they can go to, but we can go much deeper than the World War II submarines. World War II submarines could only go down a couple of hundred feet.

INTERVIEWER: Which wasn't safe really because they could be reached by the depth bombs?

MR. NIEDERMAIR: Yes, in a very short time. And another thing is they could only travel twelve miles or so. They could creep at a creeping speed and go probably thirty miles, they'd have enough

juice in the battery. These are the problems so now the backbone of the fleet, I think, is going to be the submarine, if you're going to have a navy. They'll be the infantry. No matter how many bombs you have or how many missiles you have, you can't get control of the sea without having a ship on it of some kind. The submarine will be the one that will have to do it. Submarines can't screen a carrier against a missile, a submarine can't do that, so we have destroyer screens around to screen against any ships. They forewarn the fleet that the enemy is coming, where the fleet would be.

Now, we're getting into the age when maybe that's not the way to live. I don't know.

Interview No. 6 with Mr. John C. Niedermair

Place: His residence in Stone Harbor, New Jersey

Date: Monday afternoon, 19 April 1976

Subject: Biography

By: John T. Mason, Jr.

INTERVIEWER: You were about to describe a folder that you gave me with some enclosures.

MR. NIEDERMAIR: That's right. First, I furnished you with copies of McQuilkin's letter and so forth. Then an index to the damage- control book by Mandelkorn. And the other is the Geographic picture of the Plunger, which was Holland's design, and this memorial with the Plunger in it is in Jersey.

Then there are a few corrections that I want to bring out in the last recording, that is, the February 9th recording. I was fumbling around on the United States with regard to her number. I believe I said it was 48 or 49. It was really 58. Now, the Forrestal's number was 59.

INTERVIEWER: You had not attempted to give me that number. That's 59.

MR. NIEDERMAIR: 59, yes. Then I said that the test lab in there with regard to torpedo protection and one thing and another was at Portsmouth, and that isn't correct. It was Norfolk Naval Shipyard where that's located.

Somewhere along the line in the last talk I said something about the oxygen tank, liquid oxygen tank, that we were considering to be put into the submarines. I mentioned that the contact of the oxygen tank with the sea water - that statement is wrong, because that wasn't our problem. Our problem was that we had to keep the side of the oxygen tank clear of anything else. It had to be an independent structure so that you could always examine it for leakage. We couldn't integrate it. We tried that

originally and I shouldn't have mentioned that we hooked it onto the hull, because we soon found out that we had to make an individual tank, and that's why I had to suspend it on these bicycle rods so that it was a floating tank, really. It didn't touch anything around.

I support that tank like you do a bicycle wheel, but we never used it.

That takes care of the notes that I made with regard to our last talk. Now, as we agreed before we wanted to do, I want to get into some management considerations here. I was particularly thinking about the reason why the Navy yards were started in the first place. Now they're phasing out Navy Yards, and I know why. Because private industry was always anxious to get that much more business, which is logical, it's all right.

INTERVIEWER: It was too great a competition.

MR. NIEDERMAIR: The original need for the Navy yards was, first, to build up a system of training for the members of the Construction Corps, and especially since submarines and things like that were getting in the picture and one thing and another. The other need for having ships built in Navy yards was that when they were building some of the ships, it was very hard to get them out of the private yards, first, because they dragged out the building of the ships in the yard; and, second, was that often the private yards were really not doing very good work.

G: They were heavily unionized, weren't they?

MR. NIEDERMAIR: In those early days they were not, really. Not back when they got going on some of these yards. For instance, my Professor Cathcart, he was a commander in the Navy, was telling me while I was a student at Webb what happened to him when he was on a trial trip on a ship that was built at the Cramp yard. It had reciprocating engines in it and so, in order to find out how much indicated horsepower the engine was putting out, you had to get indicator cards which depended on a spring that

was inside and the area of the indicator cards was a function of the indicated horsepower. So if they had the wrong spring tension in there, it could come out as having a nice big indicated horsepower.

Well, Cathcart let them go on their trials, as he told me, and when he got back from the trial trip he said:

“One of the things I want to take with me are the springs that were in the indicator device.”

Then they knew the jig was up!

They tried to hire him but he wouldn't do it.

I was on the Nevada in 1915, my first summer job - Webb had a system of 10 weeks of summer work. I went up to the Fall River Yard and worked on the Nevada. She was the first Navy, or really the first big ship, that I'd ever been on. My experience on that ship indicated, too, that you had to be pretty foxy. In fact, the shipfitters told me about some problems in the framing, where the framing missed the side of the ship and they filled out the distance with wood. I believe I mentioned that in a passing sort of way once before, but it did have something to do with the kind of troubles that the constructors were getting into. In the early days of building submarines, the Portsmouth Naval Shipyard got in there as a submarine-building yard so that the constructors could handle that and know how to judge the construction and the work that was going on in other yards. This increased the expertise of our naval Construction Corps and also made a wonderful esprit de corps in the Construction Corps.

The Philadelphia yard was a great yard and the New York Naval Shipyard was one of the greatest, but that's phased out. I feel in the modern time it's in the wrong place.

That's one of the problems of management that we got into. We were constantly under pressure because one of the things was that we didn't have insurance fees the same as private yards had to carry and so our costs would be always compared back and forth.

INTERVIEWER: Are you going to talk about the value of the Navy yards in World War II?

MR. NIEDERMAIR: In World War II, of course, the Navy yards were really very great. The Boston yard was filled with work. Charlie Brand was commander of that yard, in charge of that yard, during the war, during part of the war. The LSTs were built there and escort vessels. It was a terribly busy yard. I used the Boston Navy yard when I was demonstrating the LSTs, and they furnished me with transportation and everything and we really got things done in a hurry by the work that the Boston yard did for me. All I had to do was to get sketches for them. And then when the Combined Chiefs of Staff came up to see the first trials of the LST, they accepted it and they knew then -at least they thought they did - that they could land on Sicily or wherever they were going.

The Philadelphia yard was always a very good yard and a fine design organization. They built practically every type of ship there. Later on, when they needed to develop boiler-testing stations, they had one in Philadelphia. The Air Force had a base at Philadelphia, that is, the Navy air people.

Then the Norfolk Navy Shipyard certainly proved itself to be a very capable yard. It's still a great yard and it's in being.

Then there's the Charleston Navy Yard. That still has quite a record.

They've all kept up-to-date in their technical things. I know when I was in the New York Yard - I really got started at the New York yard. Whatever part of my career amounted to can be traced back to the freedom that I had at the New York yard. That led to my coming to the bureau and contacting people like Admiral Rock and others, Admiral Wallen and so on. My whole career got started up there. As a matter of fact, I had ten years of field work at the New York yard before I got to Washington.

INTERVIEWER: Yes. You made that very clear that this was of immense value in the development of your career.

MR. NIEDERMAIR: As far as I was concerned, I couldn't have had this and it became very valuable during the war. Apparently, my contribution during the war has been considered as quite a worthy one.

G: It causes me to ask, with the phasing out of some of these naval shipyards, diminishing the number, what happens in case we get into another real conflict?

Mr N: That is still a question. The Philadelphia yard is still functioning, Norfolk Naval Ship Yard is still functioning.

I went to Washington in March and I met Vice Admiral Gooding and had a chat with him, and they're making great efforts to break away from this package system of awarding contracts that McNamara instituted, and they're trying to develop their in-house design. I do want to say that our naval Construction Corps was based on the British experience. The British didn't have a construction corps in the early days and the line officers ran the show in Great Britain. Then around the Civil War days or after the Civil War days, they built some Monitor-type ships there and they were really handled by line officers. The line officers wanted to keep control of this thing and the constructors really didn't have a say on how unseaworthy these monitors would be.

The line officer and his aides and all went off on the trials with the monitors that had been finished and were going off to sea, and they were all lost. He was lost with it. That was quite a disaster. Then they passed a law in Great Britain that made it so that the Construction Corps would be in charge of shipbuilding and ship-designing.

INTERVIEWER: Based on that disaster?

MR. NIEDERMAIR: That and similar cases. That was a very important one, but there were other disasters, where the Camperdown, in turning, was in a collision and capsized.

The result of all that was that the independent Construction Corps was organized at that time and their word was law. The only one who could change their decision was the king, so they told me.

Taylor was one of the stars who were trained over in Great Britain, at Greenwich, and Admiral Rock was in the British shipyards up in Scotland. I don't know whether he went to Greenwich or not. He never told me. Maybe he went to the University of Glasgow, up on the River Clyde, because he told me about that. He learned shipbuilding there.

Then some of our constructors went to France and learned how the French were doing their building. This gave us an advantage on what other countries were doing. Captain H.T. Wright was French-trained.

G: Williams was also.

MR. NIEDERMAIR: Williams probably, yes. He came at that time. I didn't know, though, that he went to France.

INTERVIEWER: He told me he did.

MR. NIEDERMAIR: Did he? And I think Leslie Kniskern went to France - Admiral Kniskern - Leslie, to me. And so it went, and they brought this expertise back.

Admiral Taylor went over there and he went into the naval Construction Corps. He came out on top. He had the highest marks of any naval constructor over there. There he came in contact with Froude's Model Basin and he came back to the United States and an experimental model basin was built at the Washington Navy Yard. There's where Taylor got started on working out a series of experiments that resulted in a very famous book Resistance and Propulsion of Ships. I used to know that so well that I could imagine the diagrams and the pages they were on. I could even visualize the shape of the diagrams, which helped me a lot.

Later on, I became fairly close to Admiral Taylor. One of the honors that I received was in the way that he consulted me, and it upset other people in the bureau because I was a new guy down there and Admiral Taylor had been chief of the bureau and they didn't like him coming in to see this new guy.

No one ever talked to me about that, how come Taylor came to see me. They kept that pretty quiet. Anyway, Admiral Taylor used to talk to me about these things.

Later on I met quite a few people who worked with him. There was one named Phillips and Hewins who worked at his experimental model basin and part of the work that resulted in this book. So Admiral Taylor, who was really a genius, learned that by going over and working with the British constructors.

All this great work helped us through World War I. Taylor was the chief of the bureau then. And then by 1928, when I arrived in Washington, George Rock was the assistant chief and Beuret was the chief of the bureau. There again, I had met Admiral Rock up at the New York yard. He knew then when I had gotten in touch with Admiral King on the salvage of the S-51, when these letters of commendation came into the bureau recommending me for promotion and so on, there was no problem because Rock knew me right away, and he wrote to me about how pleased he was to hear that I had been successful.

So, you see, the tie-in there with the people who had the contact and understood the kind of person I was, they already had been working like that and were trained to understand it, whereas a line officer wouldn't be able to understand it. However, I got support from line officers, also, because I worked with them and I answered their questions and never violated any confidence that they had put in me when they exhibited what they didn't know about something. This sort of thing was appreciated.

Rock then became chief of the bureau and then Jerry Land became chief of the bureau. There were others in there - Clark. I was very close to Jerry Land. I don't know where he got his training, but he must have gotten it in Great Britain because during World War I he was over there, working very closely with the British, and he got involved in submarines then - Jerry did. Again, Jerry Land could understand me. He tried to hire me for BuAir when he heard about me. He tried to get me into the lighter-than-air side and he tried to convince me:

"Don't worry about going into lighter-than-air, naval architecture isn't too far away from that."

But you see the understanding that he had of these things and that helped me again. So you can see why I was a great believer in the Construction Corps and how these men were trained. A lot of great work was done by them. Quite often they came up with ideas that became a fundamental part of our business. Wallen, for instance, he's one of them. He got into the welding. This intense feeling for these technical things. No line officer will ever do that, unless he's trained that way. Not only that, but they spent years of service in the shipyards where they were building the ships. Now, it's too bad because the Construction Corps was eliminated about 1939. That came about when Charlie Edison was Secretary of the Navy, Rear Admiral Harold G. Bowen was chief of engineering, and Rear Admiral W. G. DuBois was chief of the Bureau of C. & R.

They got into trouble with destroyer stability and one thing and another, which I told about before, but really that wasn't the reason for the whole thing. It was really mostly personality.

They combined the Bureau of Engineering and the Bureau of C & R. The engineering officers were usually line officers. They had been seagoing officers who worked in the engine room. Constructors very seldom had that kind of duty, although they could become the first lieutenant, as they called them. That is, I think, what they called the construction officer on the ship, for some reason.

INTERVIEWER: But the engineering officer was an EDO, wasn't he?

MR. NIEDERMAIR: The engineering officer was not an EDO.

INTERVIEWER: He was not an EDO?

MR. NIEDERMAIR: No. Some of them were interested in design, like Mike Robinson -Sam Robinson. He was greatly interested in design. The EDOs came in afterwards. All these people who became head of the engineering lab or became important in the bureau were officers who had served as an engineering officer running the machinery on the ship. They became familiar with the way the

machinery was working and actually were the chief engineers of the ships. But a construction officer, a first lieutenant, who was on a ship wasn't running the ship. There was quite a difference.

However, I got along very well with these people, too. As it turned out, the engineering officers, Bowen and later on Mills - Earl Mills, who was an engineering officer, and Leggett was an engineering officer. He was in command of a submarine at one time and he also was the engineering officer on a submarine. But no construction officer would have commanded a submarine.

When they combined the Bureau of C & R with the Bureau of Engineering it was almost settled that that was the end of the Construction Corps, because now these line officers, the engineering people who were the chief engineers of ships and seagoing in their own field - as a result of all that and Charlie Edison and the other difficulties, by 1939 the thing was consolidated, and it wasn't very long after that, about 1942 - I have here an organization diagram that shows the organization that came into being when Admiral Van Keuren was chief of the Bureau of Ships. Robinson had been chief of the bureau for just a little while - Mike Robinson.

INTERVIEWER: You called him, Sam, too?

MR. NIEDERMAIR: Yes.

INTERVIEWER: Mike was a nickname?

MR. NIEDERMAIR: Yes.

INTERVIEWER: Sam was his given name?

MR. NIEDERMAIR: It was his given name. I don't know how he ever got Mike. I knew him very well because he became head of Webb at one time. I might tell a story about Mike.

When the war was over, I never had met him. He sent his aide up. He had a paper to write about the future of shipbuilding. His aide gave me a few minutes and I said:

“Yes, I know. You go back and tell Admiral Robinson to take a look at the ships that were built in 1900. Our ships that we have today will look just as bad thirty years from now.”

Then Mike Robinson called me on the phone and said he'd like to see me in his office, and he congratulated me for that suggestion. He said:

“Now I don't have to write a speech.”

It was just little things like that that I could think of in a split second, which was helpful. It's like a joke. If you tell it tomorrow, it's too late!

Anyway, I regretted to see the Construction Corps go because that expertise, I was afraid, would disappear. This experience in the yard, the handling of the men working in the yard, and so on - and Admiral Julius Furer, who was one of the people in the Construction Corps and he became a rear admiral, he was a rear admiral in about 1915. And Taylor became a rear admiral because he was chief of the bureau. I don't think Furer was in the Bureau of C & R during World War I.

Furer opposed this thing, the elimination of the Construction Corps.

INTERVIEWER: What was his reasoning?

MR. NIEDERMAIR: Because of just what I was telling you. The spirit of the corps would be lost, it would disappear, because it had quite a reputation and lots of power. Anyway, so was Jimmy James opposed to it, he told me many times. Furer was working with Morison -Samuel Morison, the historian, at the time, and he came to me to talk about organization and the new organization under the new system and what would happen to the expertise, and the clamor for top promotion. This was a thing that he was worried about. Of course, he got to be a rear admiral, all right, but I think we lost some good men who left because they couldn't get to that position. The highest rank an officer in the Construction Corps could really hope to get was captain.

INTERVIEWER: Oh, really?

MR. NIEDERMAIR: Yes. I don't think that they even made a commodore, although in World War II Shade became a commodore -Commodore Shade, who's a professor out at the University of California - Packy Shade. I know Packy very well. He handled the carrier desk when he was in the bureau for a while.

So Furer was opposed to the idea. I was, too, and I felt that the system of promoting these officers should be changed. But, you see, we were taking in regular line officers now, who were alternating at being chiefs of the Bureau of Ships with the old engineering officers who came in now, former heads of the Bureau of Engineering. They alternated. Cochrane, a constructor, was chief of the bureau, and Mills was chief of the bureau next, and he was an engineering man. Wallen got in there, and Leggett, an engineering officer, came in next. So it went.

I don't know just whether that system kept up, but it seemed to be rocking back and forth.

The result was that we lost the Construction Corps, and we began to get a scramble for choice billets so they could always qualify for the next grade. Even in preliminary design, even though I was there and was still carrying on, they would make up these design arrangements - I gave you a set of early ones - for preliminary design. I also included in the data one arrangement on the record - and here's some more rearrangement, bringing in billets. Then along came Captain Romberg, and he redrew the thing. What did he do? He didn't have an assistant head of preliminary design, so he created a vacancy for another fellow to get in there.

INTERVIEWER: I see.

MR. NIEDERMAIR: Then they would draw the diagrams and I would be in the middle and they'd draw all kinds of lines all around us, so that I could get anywhere I wanted to get, but that was simply a play at making up an organization diagram to find billets for these people.

We did finally get quite a few officers in there. When I first started there was no officer in preliminary design. Jimmy Bates was a civilian and I was selected to relieve him. And we didn't have any contact with the experimental model basin because the officer in charge there refused to come up to the bureau. For some reason or other, he didn't like the bureau system, and so Admiral Rock brought a young officer in, Leslie Kniskern, to be liaison between preliminary design and the model basin. So Leslie Kniskern came in and worked in our group as a liaison officer, and gradually, when things started

to get fixed up, a billet was established for him to be in preliminary design when Bates left.

From a military standpoint, you have to have contact with other military people. I can understand that, but I never could understand trying to do it this way. There's a limited number.

I'm giving you this bunch here and included in this group are the early attempts at building up an organization diagram for preliminary design. I included a position description because I created this job, in a way, of the position that I finally arrived at as technical director of preliminary design. You have a copy of this in there, plus two position descriptions - one long one describing the thing in great detail, and then my original comment on an organization that was being attempted. You have this on the advantages and disadvantages of some reorganization they were trying to make. I included that in there so for the record you have the problem of rearranging and rearranging and rearranging.

Romberg came into our section as a captain and usually the people who came in here wound up later on being a rear admiral, but Romberg wasn't. He never became a rear admiral. He left and he remained a captain. He was in there in 1951. He worked very hard at this but somebody caught him, I guess. He was always a little bit afraid of Armand Morgan. I won't tell you who told me that, but it was a very high-ranking officer who told me, and he was also afraid of me, this high-ranking officer. He confessed it to me not too long ago. He said: "You know, John, I was always afraid of you."

I said: "You don't really mean that. You had no reason to be afraid of me."

But I was so close with everyone up at the top that any young officer who came into my group tried his best to be a very good fellow.

So, poor Romberg, he never made it. He didn't make it for a lot of good reasons.

That brings us along quite a way here in this story about organization. The consolidation was effected in 1939, and Admiral Cochrane became chief of the bureau in about 1942. You don't have a copy of this that I call No.1 on my talk sheet, which is the organization of the Bureau of C & R under Jerry Land shortly before it was consolidated. It was signed by Jerry Land on July 1, 1935. I don't know how I can duplicate that, but I do have it, so if there's any demand for it, maybe I could find some way to copy it. That's No.1. No.2 of the organization diagram made up by Van Keuren for BuShips on October 23, 1942. Now it's BuShips. That's the first inkling I have of an organization and that was drawn up during Van Keuren's short time. That, I suppose, can be copied because it's a black and white sort of thing. I'll try to work up some copies and put them together for you. I think, for the record, you ought to have copies of these.

Now, then, there's another one that gets into the picture and it's connected with Admiral Cochrane. I call it No.3 in my story here. It was gotten up by Admiral Cochrane pretty soon after he got to be chief of the bureau, on December 30, 1942. So you know what the organization looked like at the beginning of the war. That's why I was glad to have that.

You asked what are we going to do when the war comes, where will we get our talent.

Another piece of information in this organization business is a geographical list of shipyards that was made in the Bureau of Ships on 10 December 1943. This list includes private shipyards, Navy yards, building vessels for the United States Navy. It also lists the builders for the U.S. Army, Maritime Commission, Coast Guard, and it included Canadian yards. They had a list of the people and where they were, and I'll try to get you a copy of that. That's item No.4. As we said before, there were a lot of

regrets about jumping from the Construction Corps to this new organization, but this new organization got busy pretty quickly, which you can see from all these shipyards that they could manage. A lot of that was because of the great expertise of the previous officers who'd been in the Construction Corps, like Admiral Haberle, Cochrane, and Captain Irish, for instance, who ran the New York office in connection with Gibbs and Cox.

INTERVIEWER: Also, the pressure of war, I would think, was a factor, wasn't it?

MR. NIEDERMAIR: Yes, but these people really were good. They knew this stuff so well that they could decide. They didn't always come back and have to see the chief.

INTERVIEWER: No, but the fact that they were working under pressure.

MR. NIEDERMAIR: I don't know. It does something to you. Really, you're a different animal altogether. Your mind is much quicker. I guess it's because a guy's aiming at you with bullets. You've got to be quick or you're dead. That's about what you mean, isn't it?

INTERVIEWER: That's what I mean, yes.

MR. NIEDERMAIR: Anyway, I have a list here that I call No.5. It's the way when I got busy and began to take over I broke up the work of preliminary design into a sheet like this, which included three stages. There was the A stage, the B stage, and the C stage. The C stage was the final one. The B stage was what they call now the conceptual stage. The B stage is an extension of the conceptual. The A stage is over here. I just called it A. In the present way of looking at it, that's conceptual design.

INTERVIEWER: A is conceptual, and B is conceptual also?

MR. NIEDERMAIR: B probably is the second phase of the conceptual. And what I called the C stage is what they call the final preliminary design. So you can list that among the things that you should be getting.

Then, for the record, I decided that you ought to know what the Ships' Characteristics Board looked like shortly after the war.

INTERVIEWER: Indeed, yes, I'd like to.

MR. NIEDERMAIR: And the officers who were on it.

INTERVIEWER: Is that No.6?

MR. NIEDERMAIR: That is No.6. It is the Ships' Characteristics Board roster of officers. See what it says on top, in pencil.

INTERVIEWER: July 1950, yes.

MR. NIEDERMAIR: Now, to continue this thing and give you a further idea of how we tackled preliminary design and the way we looked upon our contact, you'll find that in a paper that you have in there that's entitled "Preliminary Ship Design." It's already marked 7a, 7b, and 7c in your folder. In here we have a diagram, a very simple diagram, that shows the way - my concept of how quickly I could step right from here to there. You have a copy of that.

Then, to continue this article I wrote at the time, I believe this was a lecture that I probably gave some of the officers of the Navy, or it might have been given at the postgraduate school, I don't know. I continued this and I wrote down what I called a mission, the tasks and the characteristics list. That's given on page 3. Page 2 has a little diagram that shows things flowed between us and the Ships' Characteristics Board, and from us down to engineering, contract design, and the code desks, and so on. Further, I list the immediate job and the different things that we had to do, which would be judged by item No.6 that I told you about.

One of the important things that's in here is a list - this was written on 12 June 1954, that is No. 7a -that includes, as I said, an indication of the broad field we worked in, as given by the following partial list of ships we have studied since World War II, and then I give a list running all the way down from airplane carriers, landing ships, minesweepers, hydrofoil craft, oil tankers, refrigerator ships, icebreakers, and so forth, which I think you'll find very useful as a reference.

INTERVIEWER: Yes. In the previous taped interview you talked about some of that.

MR. NIEDERMAIR: But not completely.

INTERVIEWER: No, no, no.

MR. NIEDERMAIR: Then again, in the same period, I list submarines, the different types that we worked on, and so forth. I thought that I should include this for you because it completes the story that you will have in your appendix and I think would be a fine way to refer to that one, which will be a very important item in this thing.

Then there's an item that you have in your folder called 7b, which discusses the problem of personnel with regard to preliminary design and the type of people that we think we need and how we never would have enough people, the kind of people, and the training that was necessary after the war ended. We had to continue getting more people and training them because we felt that we would be busier than ever after the war than we were before, and it turned out that way.

Item 7c, of which you have a copy, was the Boos, Fry, Allen, Hamilton report to Secretary of the Navy Knox about the preliminary design branch and what they thought of us.

INTERVIEWER: Their report to the Secretary of the Navy?

MR. NIEDERMAIR: Well, they originally were doing this for Secretary Knox. He was the fellow who brought them in from Chicago. He wanted to know whether we were ready. We certainly were ready,

according to this. They say here, "They are men of worldwide fame," but it so happened that I was the only one who could fit that description. People knew that I became that way, anyway, and they got to be known, too. It rubbed off on them.

So there you have these specialty things that I made up related to the way we were managing because I'll be drifting in to some things of interest later.

Included further, I have a thing that happened July 11, 1949, which I call item No.8 here.

INTERVIEWER: Do I have a copy of that?

MR. NIEDERMAIR: No, you don't because I haven't had time to do any of these things.

Item 8 is entitled "Provisions of HR 1689," which is a congressional thing, and (Calendar No. 641 in the U.S. Senate, July 11, 1949). It lists the proposed salary schedule for U.S. government officials between \$25,000 to \$10,000 annual salary. About that time I became technical director and I was included in this sort of thing in another bill, but this is the only record of this sort of thing I have. If you think you want that part of my story, I'll get a copy of 8 for you.

Q.: All right.

MR. NIEDERMAIR: Because you should have the story.

That completes the enclosures or whatever you call them, appendixes, because now I'm coming to the point - we talked about the elimination of the Construction Corps and now, in this management procedure, I have hit the point where we're going to eliminate the Bureau of Ships.

It's been a long life, hasn't it?

Admiral Brockett was the chief of the Bureau of Ships until 1965, and shortly after Brockett's resignation - I must have a statement here. Yes, I was a little ahead of myself. 7a and I gave you No.8. I retired November 1, 1958, and so these design procedures that I mentioned here and organization

continued to about 1962, with modifications brought about by the effects of systems analysis and the impact of project management. These were brought to the fore by the Polaris Special Project under Rear Admiral Raborn, with the PERT charts and all the fancy names. But, you know, systems analysis was really invented by General Electric. They finally decided they had to put their refrigerators through this to be sure they were going to make the best refrigerators, for example. So they had a systems analysis.

So, now, I retired in '58 and I worked with Raborn to get the Polaris started. That was one of the last projects I was on. I helped to build up the team that was responsible, and I mentioned that before, and it resulted in Raborn's great success. In fact, we not only designed the submarine, but we forced the rocket that Werner von Braun wanted to put into the submarine out of the picture. Solid-fueled missiles came into the picture at that point. The missile was developed in parallel with the development of the submarine that was to carry it, a very unusual procedure. This had everybody thinking, now, that's the way to do a job, to put it into a project.

INTERVIEWER: A special project?

MR. NIEDERMAIR: Yes.

INTERVIEWER: But you can only have one special project going at a time.

MR. NIEDERMAIR: We knew with that oxygen tank that I was trying to get into the submarine and the oxygen leaking out of it, you couldn't use the Redstone missile, which was another oxygen tank, sixteen of them. It could have only carried about two of those on the ship. They were too big, in the first place.

INTERVIEWER: So was the Jupiter too big.

MR. NIEDERMAIR: Was that the Jupiter?

INTERVIEWER: Jupiter was the Army's, yes. Redstone was the Air Force's.

MR. NIEDERMAIR: I thought it was the Redstone missile because it was a missile that Werner von Braun had something to do with. In any case, we wiped that out of the picture, and I left. And I've been told that the retirement party I got finished all retirement parties. People came from all over the United States. Admiral Cochrane came down and brought his son, and all the shipyards sent their people down, Bethlehem, Newport News. I have loads of pictures in here that illustrate that. It was really a wonderful party. It was so good that I hated to leave! For my wife and me that was a great experience.

But, anyway I went off and by 1961 Robert S. McNamara became Secretary of Defense. That's why I said about 1962 they began to modify the system. They gave him a chance to get in there. He brought about the so-called total package procurement system, which included naval ships. You could see package stuff for an airplane, maybe, or smaller things, but a ship is quite a complicated thing. It's the biggest man-built structure ever, actually.

Rear Admiral William Brockett, chief of the Bureau of Ships, strongly opposed the adoption of what he called the package award system - that is, Brockett called it that. He resigned as chief of the bureau and his assistant resigned with him. The two left. Fortunately for me, being a Webb man and the people who were looking for somebody to head up Webb and friends of mine came to me and asked me what I knew about Brockett. Of course, I knew a lot about Brockett. So he became head of Webb.

As I say here, "Shortly after Brockett's resignation, the Bureau of Ships was phased out, and the Naval Ships Systems Command was phased in." I don't know of any better way than that to say it, because it had to be done something like that. Rear Admiral Nathan Sonenshein was appointed commander of the Naval Ships Systems Command and held that position from 1965 to 1972. And here's where I got in on this thing.

I met Sonenshein in New York at a meeting of naval architects and I advised him that the package system - or the package winner take all, as I called it - would be a failure, especially during war emergency. I told him that in 1965, when he first got the job. Then I met him again in his office in June 1972, when I discussed the 2,000-ton surface-effects ship design, because I was asked to take on the job

by Aerojet, as a consultant for them in connection with the SES. So I went to his office and talked about this idea because I wanted to find out just how serious the Navy was about the surface-effects ship. We talked for about an hour, and one of the things was that Sonenshein wondered whether a smaller SES should be tackled, so now he was consulting me. I told him I thought not. I said:

"No, you might as well find out the limitation or the SES."

I knew you could make the little ones go and they're still trying to come out with a big one.

I say here that I had arranged this meeting with Sonenshein to find out how serious the Navy was about the SES. This was a very fortunate meeting for me because now I met Bob Gooding and, that same day, he was going to take over Sonenshein's job.

INTERVIEWER: Oh, I see.

MR. NIEDERMAIR: Bob Gooding, incidentally, had worked in preliminary design under the war damage group when I was there. He is a vice admiral now. I said to him:

"Gee, I'm glad to see you because I want to break into the Pentagon today."

He asked me why, and I said: "I want to see an admiral over there," a can't think of his name now, "and I want to talk to him about SES because some project management group of his is working on the SES. I'd like to meet him."

I remember Bob Gooding calling him up and saying:

"A friend of mine is here, John Niedermair, and he'd like to see you. He's forgotten more than we'll ever know."

So I had a date with him that day and that's the last I saw of this person.

Then I studied further into this question of what was happening in this management system, and I found that Leopold wrote quite an article in the U.S. Naval Institute Proceedings and the Naval

Review of 1975, in which the article was entitled "Should the Navy Design Its Own Ships?" He gives a rather complete discussion of the present design and procurement procedure, and he also refers to how the organization appeared before 1966, but he doesn't say too much about that.

Then there was another article - and this one was really an eye-opener - by Ken B. Spaulding, Jr., and Anthony F. Johnson. It was in Naval Engineer Journal, that is, the naval engineers' journal, of February 1976, quite recent, entitled "Management of Ship Design at the Naval Engineering Center." This gives a very complete insight into what this new procedure looks like. I looked it over and I decided that to me the entire method appeared too dependent on design teams systems approach. The long time lapse from the time that there is a need for a new type of ship to completion of the preliminary design and contract design is entirely too long and complicated, with management methodology. This systems approach, again.

Interestingly enough, I'm a Webb man and I found out that Ken B. Spaulding, who wrote a very good paper on how they're doing it, told me all about it, is a Webb man. I only found that out by trying to find out why he could write such an article. Now I know.

INTERVIEWER: Now you're going to talk about some of the recognition that you received in the postwar era as a result of what you did during World War II, particularly.

MR. NIEDERMAIR: Yes, I'll try to get into it in sort of a chronological way.

Around November of 1945 I received the Navy's Distinguished Civilian Service Award, which is the first one that I got. The next thing that happened to me was that I became the president of Senior Engineers, an engineering organization. I was their first president, by the way. I helped put this organization together and that organization presents an award every year, which is called the J. C. Niedermair Award, for the best paper that's presented at their symposium.

G.: And is there a monetary award as well as -

MR. NIEDERMAIR: It's just an award. You get a plaque with my name on it. It's a beautiful plaque. I have one that they gave me and I'll show it to you next time, if I think of it. I've got it in the same package it came in.

Anyway, then I became chairman of the local section of the Society of Naval Architects and Marine Engineers. I was their second chairman because I recommended that Bates, who had been my previous boss and went with MARAD, become the first chairman of that section. We were the second district section that was established by the society. Now, of course, the Society of Naval Engineers has that same system. They have a special name for their local sections.

In 1956 one of the more astonishing awards came to me when I was picked as one of the top ten Civil Service people in the United States. I received a lot of publicity from that and the Navy seemed to feel quite honored by it, that I had been selected, and they sent a bulletin around to all the naval stations in the whole United States and abroad, too.

INTERVIEWER: Who makes this selection?

MR. NIEDERMAIR: The Civil Service League. This was the second year that they did this, and I was on the second one. Quite a lot of people went to this meeting and they made a particular effort to get the governor of New Jersey to attend this meeting because I was considered a native son of Jersey. I left Jersey when I was four years old, my father took me away.

INTERVIEWER: But here you are back again!

MR. NIEDERMAIR: The governor came and he made the principal address.

INTERVIEWER: Who was that, Meyner?

MR. NIEDERMAIR: No. I can't think of his name now. He was quite a prominent governor but it's too far back for me to pick up his name. I'll look it up later.

These things have a way of being like fire, you know, you set the grass on fire and it keeps spreading. So that year I also received the honor of becoming an honorary member of the Society of Naval Architects, and also a council member of the Society of Naval Engineers about the same time. In 1958 I received the Society of Naval Architect's top award, which is the David Taylor Gold Medal - a solid gold medal that weighs about eleven ounces - ten ounces, or something like that.

Somewhere along the line in there I received the William S. Owen Award from my alumni association - the William Selcock Owen Award - which commemorated my contributions and what I did for my alumni and for Webb.

About two years ago, in November, the society also made me a fellow of the Society of Naval Architects, so I've had about everything that they can do for me. I presented two, papers before the society. They both had to do with the stability of ships. After I came back from the Safety of Life at Sea conference in 1929, Admiral Rock, who considered me the top expert in that field, wanted me to present a paper, which I did around 19,2 or '.,. Then a couple of years later I wrote another one.

In 1950 or '51 I went over to the 100th anniversary of the Royal Institute of Naval Architects, and Jimmy James went over there, too. I presented a paper before the Royal Society and he presented a paper, also.

INTERVIEWER: Cochrane did, too, did he not?

MR. NIEDERMAIR: No, he didn't. He was knighted, but he didn't present a paper at that time. He was so busy with other things he could only stay one day. He flew in and left the next day. But he really received quite a bunch of honors that day. I've forgotten what they were all about.

I received a sort of a small award for my paper from the society.

Then I made some presentations at the University of Michigan, at Webb Institute, and also at the postgraduate school at Annapolis, at Philadelphia at the damage-control school there. I spent quite a bit of time doing that sort of thing.

So much for these honors. I've been honored, I believe, very generously, but as it goes, you know, none of us do these things alone. I would say that I have been given credit for having put together the best technical team in my field. The British naval constructors when they came over here during the war went back home and tried their darnedest to do the same thing the way I'd worked it out, and they never succeeded. I went over particularly to see the chief constructor over there, but they never could undo. This is what I'm afraid will happen here because we've undone a good working arrangement. They had a working arrangement of sorts before for a long time and they couldn't undo that one to go to work and do the one that I had, which was really better than what they had, but they couldn't undo what they had.

They'll find trouble with this organization they have now, with all the different groups that they've built up.

INTERVIEWER: You mean our people?

MR. NIEDERMAIR: Yes. There'll be a lot of resistance against this project manager system for a long time. It takes ten years to build up a good football team and you can lose a good football team in the same time, if you're not careful.

INTERVIEWER: Faster than that!

MR. NIEDERMAIR: Yes. So it's going to be a hard job.

I also co-authored the first chapter in the society's Principles of Naval Architecture which is a worldwide basic textbook on naval architecture. I co-authored that because this William S. Owen Award that I mentioned that I got, he was a professor of naval architecture at Webb and he was the author of a previous article, or chapter, in a book of naval architecture. Now the book is going to be done over again and he was going to be working on it, but he died before he could do anything, so I took it over. I used some of his material but I changed the ship he used and all that sort of thing.

Anyway, I'm on that and the society said they couldn't do anything for me. They gave some of the authors a life membership and one thing and another, but Holden said to me:

"John, we can't do anything for you. You already have it." So I told him not to worry.

Then I was a chief consultant for Gibbs on a limited-time basis. I wouldn't give them any more than about a third of my time. They didn't like that very much.

INTERVIEWER: You mean this was in retirement?

MR. NIEDERMAIR: Yes. I felt I didn't want to be a fulltime consultant. I wanted to be free to be on other committee types of work, so while I was not more than a third of my time consultant to Gibbs, in the meantime I was also on committees for the Mohole Project with the Academy of Sciences committees in connection with the Mohole Project, which was to drill a hole through the mantle somewhere where the sea was 25,000 feet deep.

With the Academy of Sciences or the Science Foundation, I was on the advisory committee to CNO Arleigh Burke regarding the selection of advanced ideas. Arleigh said, "I don't know anything about this stuff. You people pick it out." And no sooner did we come around with our report when all the professors on this thing found things in there that they wanted to write papers on, even on our recommendations to Arleigh. I wouldn't let them do it, so the academic people weren't very happy with me. That was that.

Then, again, I was on another committee in the academy, either the Science Foundation or the academy, an advisory committee to the Maritime Administration regarding the future of the merchant marine.

INTERVIEWER: In what period of time was this?

MR. NIEDERMAIR: These all took place between, I would say, 1960 and 1968. On top of that I was on the advisory committee to the Bureau of C & R. Rear Admiral Ralph James was there on hydrofoil designs and fast destroyer type designs.

So you can see I kept occupied.

The Bureau wasn't C & R really. That should have been Bureau of Ships there. I was an old hand so I called it C & R, My subconscious mind was rescuing the old C & R.

I was on the advisory committee to the Ships Systems Command. I got into that place. That happened to be through Rear Admiral Frank C. Jones. This was a very interesting committee that I was on because it concerned personnel selection and policy questions. I liked Frank Jones quite a bit. That was around the time that the Ships Systems Command was under way, right in the very beginning, and they knew they had to get rearrangement in their organization, and one of the problems was the selection of the personnel. So from that standpoint, I had something to do with the people who were supposed to do it, but while policy questions came in they never brought up these other things. Maybe their bosses were bossing them around so there wasn't anything that I could advise them on because they couldn't tell the boss off! So there I was stuck with something I didn't like, but I did the best job I could in picking the things out for them. I've been over there and been in Leopold's office, talking to them, and they all want me around, which is very nice, I think. Regardless of whether I agree with them, they all want to see me.

By 1960 I was on a long job that started before I retired in preparation for a Safety of Life at Sea conference in London. Cochrane was the chairman of that committee. Of course, being in the bureau, I was appointed on the committee and now I was retiring, so I wrote to Admiral Cochrane and told him that I was leaving the bureau and I guessed he'd have to pick somebody else to represent the bureau. He wrote back and said:

"We didn't pick you to represent the bureau. We picked you as a person."

That was nice of him to say. I have a letter in which he says, "you weren't representing the bureau, you were representing John Niedermair."

Fortunately for me, I was walking through these spider webs. I was this female spider on this web and I wouldn't get caught!

Anyway, I finally wound up in London in 1960 as the industry expert, representing the industry for the Society of Naval Architects. By that time, the Coast Guard was responsible for safety of life at sea. In London I got very much upset by the system that the British representative was using to get the votes on his side. They had a secret code arranged, and it had to do with the way he held a card. He always had a card in his hand, and if he held it edgewise it would be the same as saying "down," no. If he didn't raise that card up, it was yes.

INTERVIEWER: How did you catch on to the system?

MR. NIEDERMAIR: Well, I watched this person and I noticed it corresponded with the way this group voted. I had talked to John Comstock - Cochrane had died now and John Comstock became the chairman of the committee. He was the naval architect for Newport News. We were sitting there in this big room and it occurred to me what the hell they were doing and I said:

"John, I've got it. You know I've been complaining about this voting and it's funny that these people are all voting against us. "

The only people who were voting for us were the Russians, the Italians maybe, and so on, and I said:

"I know how they do it."

He said: "Shh, John, keep quiet. You're talking too loud."

I was all excited now that I had the answer and it was the code, yes. I was so damned mad when I came back here I had a heart attack.

INTERVIEWER: But it wasn't publicized there?

MR. NIEDERMAIR: No, we didn't do it. They asked me not to do it because what difference would it make.

INTERVIEWER: Tell me about the award that is still to be given you next Monday by the Academy of Sciences.

MR. NIEDERMAIR: Yes, at age eighty-two. I think we should put that in the record. It's very nice.

Q.: You certainly should.

MR. NIEDERMAIR: This award will be given by the Academy of Sciences. It's the Gibbs Brothers Award. It's a sort of a great surprise to me. I was amazed to get the announcement of it on April 2nd. That was the first I knew of it. And it took from April 2nd until just last Saturday to find out just what kind of a suit I had to wear.

INTERVIEWER: Now you know it's black tie.

MR. NIEDERMAIR: Now I know. I think it's a very fine thing because I knew William Francis Gibbs quite well. He did some great work for the Navy. There was no question about that. He was a great organizer. I doubt very much whether anybody could beat him at that, because during the war he not only did great work for the Navy but he also did great work for the merchant marine, too. The Ugly Ducklings and all those ships, he organized. Now this medal is in honor of the Gibbs brothers.

INTERVIEWER: And it is for what kind of merit?

MR. NIEDERMAIR: I understand it's for my outstanding contributions in naval architecture and marine engineering, particularly in regard to my guidance, I believe is the way they put it, or direction of the basic designs of all types of Navy ships. I believe that's the way they worded it.

INTERVIEWER: That's quite a sweeping award.

MR. NIEDERMAIR: Yes.

INTERVIEWER: And it's a gold medal plus \$1,000?

MR. NIEDERMAIR: And an illuminated plaque. I think it's a tremendous thing. They're giving me one minute and I could really talk for an hour!

INTERVIEWER: Well, this will cause you for a few days before the award is given to really choose every word.

Thank you very much, John.

UNDERSEA & HYPERBARIC MEDICAL SOCIETY

INTERVIEW OF
JOHN CARR

Kensington, Maryland
Friday, September 5, 2003

PROCEEDINGS

INTERVIEWER: You've been here at Special Clearance Team for quite a while, right?

SENIOR CHIEF CARR: I just got to over five years. Actually, I'm the last of the Mohicans. Nobody's been here longer than I have.

INTERVIEWER: How long have you been in the Navy?

SENIOR CHIEF CARR: I've been in the Navy for nineteen and a half years.

INTERVIEWER: How much of that has been as a diver?

SENIOR CHIEF CARR: I've been a diver for seventeen and a half years.

INTERVIEWER: Summarize your career. What have you done in addition to the clearance team?

SENIOR CHIEF CARR: I was a 31. I went to 31 schools.

INTERVIEWER: That made you an EOD assistant?

SENIOR CHIEF CARR: That was what made me an EOD assistant. I don't know what they call them now, a '39' or something. It used to be the 'fourth man diver.' Then, they actually got an NEC and it became a 5331. I did that in 1986.

Then, I was at the Detachment in Yokosuka and the plank owner in MOB Unit 5 in the Philippines. I left there and went back to school. I did the whole school again. Now, the guys go back through if they already have to dive. We had to go back to SCUBA school. We had to go back through everything all over again.

SENIOR CHIEF CARR: Then, Eglin had come on board. So, I went to Eglin and then, I was mostly at Eglin and Indian Head and then I came out here. I went to MOB Unit 3. I think I got there in the end of 1989 or the first of 1990. I was there until spring of 1995. I went to training in one in Hawaii. I was there until August of 1998. So, I did about three and a half years there.

Then, I came here and was VSW and we were commissioned on September 5th. Well, actually, it's our first year anniversary. We had a cake. Did you get any of that cake?

INTERVIEWER: No. I didn't know there was a cake.

SENIOR CHIEF CARR: Yes, we got a cake in there. Today is our one-year anniversary.

INTERVIEWER: Congratulations.

SENIOR CHIEF CARR: Thanks. Since then, I've been here.

INTERVIEWER: Tell me a little bit about the evolution of various shallow water mine countermeasures, as it developed from an idea and now, at the one-year anniversary of the Special Clearance Team.

SENIOR CHIEF CARR: Well, they took an MCM team. It was my old MCM team at MOB Unit 3. I can't remember how they put the numbers, one to three or whatever, but they put them around about the time I had left and decided they were going to do that. It was TAD orders for everybody. They took some guys from the MOB Unit and kind of stood it up. That was when Gilbert had gotten on board with that. Then, the SEAL team sent over all their broken guys, guys in wheelchairs, guys with casts and all kinds of stuff. I mean, it was bad. You probably don't want to print that. But they really did. I mean it was a dumping ground for garbage, at the time. Guys were getting out and all that stuff. They didn't take it too seriously, at the time. I got here at kind of the tail end of that. Well, Mark can tell you. I mean, he was here.

INTERVIEWER: Mark Sanders?

SENIOR CHIEF CARR: Yes. He was here for a fair amount of that. Then, we had the Marines coming in. To test that, we had Commander James, Jack James. He's a twin pin.

INTERVIEWER: 'Twin pin' means that he's special warfare and EOD qualified?

SENIOR CHIEF CARR: Yes. He was an EOD tech and a SEAL team guy. He was our officer in charge (OIC) because we were a detachment of the group. I got here and I'd had prior mammal experience with Mark 4. I made chief and I already had orders to come here and I was going to come and go into the dive platoon. But I made chief before I got here, and they asked me to relieve Chris Winn, who was the senior chief who had EX-8, at the time. I relieved him and we had an officer, Rob Seinert. Chris Winn got out. Rob Seinert came in. He knew that he was only going to be here for a year or so. We had all our developmental tests and everything as EX-8. Then, he left and I gapped the billet for about six months. I was the OIC of the platoon.

Then, Jeff Simons came in and I was with Jeff Simons. Simons went into Ops. Hunter Halver then came in. I went through three OICs. I was with the platoon for something like three and a half years. I then made Senior Chief and I got into Ops. We were not co-located, at the time. We are not co-located now, either. But we always had some buildings here and we had some buildings over there. We kind of had buildings everywhere.

INTERVIEWER: Some of your mammals were over at Point Loma, as well, right?

SENIOR CHIEF CARR: That's where we were. We were the only mammals VSW had, just EXA at the time. We had four mammals. That's where I was, with those other people who I named, and our platoon.

I want to say that the push came from COMINWARCOM. They wanted to have everybody co-located. So, with the facilities that you see out here, the pier and everything, they just now took the pens away from us. They took them back because we never really utilized them. We had all this unspecified money, or whatever, for projects. The Navy has something like ten of them a year at \$1.5 million apiece. We ended up getting in on one of them. We got the fish house, the compound, the pens and the pier and all that stuff built.

It really didn't work out for us. We were kind of told, "You need to be over here so that we can keep the command unity." But what happened was it was just a long haul for us every day and our boats were breaking down. I mean, we were using experimental boats. We were using boats that had come from D.R. Merrell, and it never transpired for us.

We made an agreement and left the mammals over there. The guys still showed up here and they'd transit back and forth every day. Man, that was miserable. It didn't work out for the animals. The productivity of the animals went down, I think, because they didn't get as much time in the water working. By the time the guys came here, PT, mustered and did all their stuff and drove over there, they were already an hour or two behind the power curve.

Then, you tried to get them out there and worked them and then went back and cleaned everything up and then drove back here. We just increased the shift. We made their eight-hour

day a twelve-hour day, every day. Well, you know what suffers from that. The guys kind of get to the point at which they say, "This is stupid." Then, they start cutting back training sessions.

Personally, I think that hurt us in the Gulf a little bit, you know. We had that. We had the X-8. We went through that. We came in less than two years early of what our forecast was, to become a Mark 8.

At about that time, we started knowing that we were going to become a command of command, and they had already selected Commander Rodgers to be our commanding officer (CO). He was in Washington, D.C. I think our focus was pretty much always over the horizon, you know, twenty miles over the horizon. We moved in and did what we do. I know you've heard this all probably a hundred times before with all the other guys. But our mission was clandestine, you know. We had to go in, locate all these objects, detect the presence or absence of them, map them and get out.

Then, it kind of changed last year when Operation Iraqi Freedom started. I think they had a special job they wanted us to do and it was along our parameters. We just kind of shifted more toward the riverine. We worked up in the river instead of being an assault force, you know, clearing for the assault force, leaving them a big deck, going over the horizon, mapping everything out, doing what we needed to do and coming back.

We actually wound up just going to the port and doing everything there. We are the only group that does it. It wasn't a mission creep, but I think we'll probably always do that mission now. I don't think we'll ever get rid of it. I mean, they saw us do it before, so I would imagine it's probably going to be here to stay, along with our primary mission, which is to clear lanes.

INTERVIEWER: Will it be difficult to train for both?

SENIOR CHIEF CARR: No. It won't really be difficult. I don't think so. You have divers diving, for the most part. All the equipment and gear is the same. Your dives may not be as tactical, I guess. We are usually set up for a denied beach or, you know, we hope for it to be a friendly beach, but most of the time, if it's already friendly, what are we doing there?

SENIOR CHIEF CARR: Maybe you've got something where we've already gone in and bombed them and softened them up and knocked out some of their thermal imagery and some of the things with which they could detect us. We're still going to go in and look for the defensive mining capabilities that they had. Those dives are three or four hour dives. That's a long mission with an animal. A UUV mission is pretty much the same. They set it up, drop their sensors, spin the prop and off it goes. But for the man and the mammal it's pretty intense because you are driving over the horizon in the middle of the night. You only have one cover of darkness. You've got to get there, stay undetected, get in the water, do your mission, get the information back, pack up and leave with enough darkness to get out of there safely. I think that's more labor intensive, you know, than what we just did. But who knows? I mean, the port was hostile when we got there, for the most part. The guys who had secured it were leaving as we were showing up. During the first couple of nights stuff was being blown up around us and across the way until everything was secured. I'd say that the first two days were a little bit sketchy.

If we run into that situation again, in which we are actually having guys fighting on the wall and guys trying to do their diving at the same time, then that, I think, would be difficult. But if it ends up like it was, you know, those missions are pretty easy. You just suit up. You rack up. You go out and you do your dive. The UUV is already gone. A mammal has marked it. You've already had two good looks at it. You go out with your INSS and it's either something or it's not.

INTERVIEWER: You take the data from the UUV and that gets downloaded into your INSS?

SENIOR CHIEF CARR: Yes.

INTERVIEWER: From there, you can go to specific contacts that are of interest?

SENIOR CHIEF CARR: Yes. We usually take a mammal across, at first. The mammal will go, and you run tracks and you know where he should be going positive. If he doesn't go positive over that track, you can turn around and you can actually interrogate him. It's good to give him a blank look at it, a blind run, so if he hits it right off the bat, that's a really good indicator. I mean, the UUV has given us some type of imagery of something. We don't know what it is, but it's

meeting some of the criteria for a mine. None of us are really sure. We've seen it enough that we can tell what we are looking at. The next thing to do is if you run a mammal over that and the mammal goes positive on a blind run, and you are not interrogating to that spot, then you get a really good feeling there's something down there. There's something that's sticking out. It's very prominent.

If you go over it and you pass it one way and you pass on the way back and you don't get anything from the animal, then, you know, with two good looks at it you can turn around and interrogate the animal. You can bring the animal into that area and start keying him. The animal may be messing around, not really hunting, and not seeing anything for a long ways. But you bring him in and you really work him on that area and then he goes positive, you know, then you've had two solid looks at something. That's pretty good. That's better than nothing at all, like we used to do. It's kind of like going out with two alpha.

INTERVIEWER: It's a lot of work for a diver to do it like that.

SENIOR CHIEF CARR: Oh, yes. That's what we grew up on. I've been doing that since 1986. You know, now you look at it and wow, it's pretty. A lot of technology has been put into it.

INTERVIEWER: You can accomplish a lot with those UUVs and those mammals. They are so much faster than humans.

SENIOR CHIEF CARR: Oh, yes, they're great, especially with both of them put together. You get guys who are pro-mammals. You get guys who are against the mammal program. I'm pro-mammal, obviously. I've worked with them. I'm pro-UUV, too. I think we can use both of them if we have the time. The O-6s and the O-7s and the guys who are making the decisions, you know, and sometimes time is of the essence. Maybe you only get one of those sensors in there to take a look at it. But if you are the guy going down looking for it, you do the tactile search with your hands and two sensors, three being better, but sometimes you don't gets that. You kind of have to go with what you get. They are good, though.

INTERVIEWER: When you went to OIF, what was your position?

SENIOR CHIEF CARR: I guess I'm what they call the 'senior talk officer.' I run a tactical operations center. I work for the CO. I take the night shift. I go on at about midnight to nine in the morning. That's usually the CO's sleeping time here and there.

By virtue, I'm off since I'm the senior chief. That is the shift I get. I do message traffic coordination of what's going on, you know, when the dives are, de-conflicting. For these guys, it's like running off. You know, you are doing radio checks with the ship and with the group and all the rest of the guys out there. You know so-and-so is going to be diving X amount of hours or whatever and so-and-so is going to stand by down here and somebody else is doing something over there. You're basically running what used to be called C-3 cell, command and control.

INTERVIEWER: Yes, and communication.

SENIOR CHIEF CARR: Yes, and communication.

INTERVIEWER: Now, they've got C-4 ISR. They keep sticking more letters onto it.

SENIOR CHIEF CARR: That's right. There's another chief and me. Sometimes, we have two and three of us when we do it. We'd just do it every day until we were done. That's pretty much what we did. You're kind of driving the ship, so to speak, so the CO and the rest of the guys are free to look forward and get other things lined up. You know, they can't be sitting there all the time. That's what our job is, you know. The divers are in the water, this and that, chambers, what have you, directing traffic, I guess, for the most part.

INTERVIEWER: The tasking to stand up is a VSW capability and the test attachment. Where did that come from?

SENIOR CHIEF CARR: It came from the CNO, I think. I read it once here. It was the Secretary of the Navy or the Secretary of Defense. Somebody had basically written a paper and it read that we could ill afford to sail 13,000 miles, only to be stopped in the last 1300 yards of the beach.

Essentially, we became the products of the first Gulf War, with all the mines and everything. They had guys up there. They couldn't get in. It was heavily fortified. At the time, the MCM Navy people would kind of say, "Yeah, yeah. Okay, we'll throw them a couple of hundred dollars to keep them happy down here." It wasn't a big priority until then.

It was the USS *Princeton*, or was it the USS *New Orleans*? One of the Gators, I think, ran into a mine. All of a sudden, mines were important again. It'll be something else next time. We kind of slack up until the next time and say, "Wow, we didn't have this to defeat that." They put it together and getting us up and running became a CNO priority one billet. It was a test ad. What do they call it? They used to call us a 'war fighting laboratory.'

We have grown leaps and bounds since then. But there were so many good guys who have come and gone through there, guys that really had vision, guys who were forward-thinking. I'd have to say that Commander Jack James was top-notch. Things are coming up now that he thought about years ago. Mark Sanders, when he was our executive officer here, was one of them, and so was Carlos Flannigan, who was our last guy who was here, a SEAL team guy. Now, we have Commander Rodgers. All the guys who got in here haven't just looked at it for what it was, here and now. They've all been really looking forward.

In my tenure here, I would say that Jack James was the first guy, when I was here. He really was a forward-thinker. When it comes down to it, whatever happens, I think he deserves a lot of credit for the VSW situation being the way it is. He got us up and ready for Flannigan, and then Flannigan got it ready for Rodgers.

INTERVIEWER: How did the concept of having Marine reconnaissance divers, SEALs and EOD working together evolve? You said it started out at the MOB Unit 3. They just converted a MINECON attachment into VSW.

SENIOR CHIEF CARR: They knew they were going to add some mammals to it. I wasn't part of that, but I know how it got there. Basically, the Marine support here came because our mission was to clear the lanes so that the CAD and the CLF could get Marines to the beach. So, that's really why we're here. They kind of went out, I think, however. The guys in D.C. worked that out and they said, "Okay, Marines, this is a mission for you guys. You've got to pony up some bodies," and they started getting the recon Marines in here.

The SEAL Team, I think, came because of their tactics. Neither the SEAL team nor the Marines knew anything about the mine warfare part of it. EOD was a little behind the power

curve, I think, at that time, in the combat swimmer-type thing. They brought that into it. But it was an EOD mission.

INTERVIEWER: You initially said the SEAL teams didn't support very well.

SENIOR CHIEF CARR: I think they still would just as soon have their teams out. Well, they are under-manned. I think they'd just as soon have their guys out, deployed on other teams.

INTERVIEWER: They would rather have them on regular SEAL teams?

SENIOR CHIEF CARR: Yes. I'm sure D.C. looks at MCM as our business. That's what we do. That's probably our biggest part of the business. We understand it. It was like, and I don't know if you would call it a joke, but it was the best of the best in EOD, and MCM got selected for VSW. We were very selective in our process.

The SEAL team wasn't going to send somebody over to them. What is the VSW anyway? There were literally guys showing up with casts on their arms and legs and a couple of guys were in wheel chairs. It was like we'd say, "Okay, we owe them ten bodies. You, you and you with the patches on your arms, you in the walker and you, drag your IV bag and go over there." You can ask Mark. He'll tell you. They weren't all that way. We got some good guys. But some of them were that way. Commander James took a pretty dim view on that. He put the kibosh on that pretty quickly. He went back to his own community and basically laid down his swords and said, "We are not having this any more."

We had some growing pains. Now, it's more friendly rivalry-type stuff. Marines are Marines. They think that everything involves them. But they don't know anybody about mine warfare. That's what they are here for. I mean, the guys who are here now are good operators. But this isn't their job. They didn't even know how to spell 'mine,' let alone know what one looks like before they got here.

It was a struggle in the beginning. I remember coming in here and they would say things like, "We're SEALs and we're the toughest," and "We're Marines," and all that stuff. I would say, "You guys, you don't get it. This is MCM, man. This is something totally different. You

guys can just leave that stuff at the door.” After a while it finally started getting better. It’s gotten really good. I’ve stayed here. I’ve been here for five years.

INTERVIEWER: You must like it.

SENIOR CHIEF CARR: Oh, I do, yes. It’s been good. I would have hated to have been transferred last year and not have come into this deployment. Of course, it’s a lot of hours, a lot of mud, sweat and pain over the last four years getting things up to where they are. Then, to transfer and see somebody else go, I would have been crushed, you know. But it worked out that way. I would have done it.

INTERVIEWER: Are there any questions I should have asked you or things that we should have talked about, but we didn’t?

SENIOR CHIEF CARR: I don’t know, there are probably a lot of them, but you know, we could stay here for the next three or four days going through all the sea stories and all that stuff. No, I think that probably sums it up.

INTERVIEWER: Great. Well, thank you very much for your time.

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UNDERSEA & HYPERBARIC MEDICAL SOCIETY

INTERVIEW OF JOHN P. CRAVEN

Kensington, Maryland

April 2003

PROCEEDINGS

DR. CRAVEN: My name is John Pina Craven. The middle name is rarely used, so I generally go by the title of John Craven or John P. Craven.

INTERVIEWER: What is your preferred title?

DR. CRAVEN: Do you mean as far as official title of some kind? Right now we're using 'Former Key Scientist, U.S. Navy Special Projects Office.'

INTERVIEWER: You and I have something in common. We're both from New York City.

DR. CRAVEN: Yes.

INTERVIEWER: I was born in Manhattan and raised in Queens.

DR. CRAVEN: Yes.

INTERVIEWER: You were born in Brooklyn, New York, on 30 October 1924.

DR. CRAVEN: Yes.

INTERVIEWER: What are your earliest memories of Brooklyn?

DR. CRAVEN: My earliest memories of Brooklyn are at age five, which was October of 1929, and the family was then affluent. For my birthday, I had a very expensive Navy-style pea coat. Since I already knew that I was predestined to be a naval officer, because of my father's family and history. I might as well go into this right now. The family history on my father's side goes back to Oliver Cromwell in 1640. At the end of the British civil war, the British Navy was split into two parts. The part that had been loyal to the King became the Royal Navy. The other part had been loyal to Parliament. That ended up becoming a kind of Scotch Presbyterian, a privateer navy of one sort. In that society there was still the tradition that when a male child was born, he was destined by God to be either a Presbyterian minister or a naval officer of some sort. This carried all the way through to before the Revolution with a forebear of mine who was one of the people who started the College of New Jersey, where, of course, he taught navigation. Then his children moved down to an ancestor of mine named John Craven, who had a daughter who married Thomas Tingy.

INTERVIEWER: Was she of Tingy House fame?

DR. CRAVEN: She was of Tingy House fame. She was Hannah Tingy Craven of Tingy House

fame. She still haunts Tingy House, because Tingy House was left to her in Thomas Tingy's will, and the federal government took it away. That started a long line of naval officers and Presbyterian ministers, the most famous of whom were Thomas Tingy Craven and Tunus Augustus McDonough Craven in the Civil War. T.A.M. Craven went down at the Battle of Mobile Bay. Meanwhile, Thomas Tingy Craven was court-martialed once or twice. It continued on. When my father was born, he was predestined to be a minister of music. I put the emphasis on the word 'minister' of music. When I was born, I was predestined to be a naval officer, and given the name John Craven, who had been the captain of the battleship USS *New Jersey*, not the modern *New Jersey*, but the *New Jersey* that was part of the fleet headed up by Admiral Robley Evans.

INTERVIEWER: What was your father's name?

DR. CRAVEN: His name was James MacDougall Craven. Notice the MacDougall in there, indicating the Scots part, the Scots Presbyterian. Now, the thing that happened that was key and central in my life was that my father's sister went to Smith College, of course. Where else did you go? She studied sociology, which was a new subject. She came to Brooklyn to work with poor Hispanic girls and raise their standard of living and standard of life.

One of those poor Hispanic girls was destined to be my mother. Sally saw this lovely girl, and they didn't realize that my mother's father was a John Pina, who worked directly with Samuel Gompers in setting up the AFL-CIO and Classical Culture Society. There was a marriage across the tracks. When I was born, my father wanted to name me John Craven. But my maternal grandfather said, "No, he must be John *Pina* Craven."

Pina, Then is the double N, as compared with P, which is the original name. I was John Pina Craven. He was a great negotiator, and so he won. As I grew up, my father literally told me that I should only use John P. Craven because I was not 'one of them.' He felt very strongly that I was not one of them. He was a wonderful man, but he was very much prejudiced. That meant I started my life with the full intention, even as a child in the earliest days, of going to the United States Naval

Academy, no question about it. That meant I wore sailor suits and sang "Sailing, Sailing, over the Bounding Main." I did things of that kind.

When it came time to join the United States Boy Scouts, I joined an organization called the Junior Naval Reserve, which was a small organization organized around the Brooklyn Navy Yard, where we behaved as seamen. We read the *Blue Jackets Manual*, and we carried out all the tested duties of a seaman, and we tied all the knots you could tie, and so on and so forth.

INTERVIEWER: Where did you go to secondary school? Was it in Brooklyn?

DR. CRAVEN: Yes, I went to Brooklyn Technical High School, where else? I went precisely for that reason. I had no interest in technology. I did not know what technology was about, but I knew if I went to Brooklyn Technical High School, I had a better chance of getting into the Academy than if I had not. I was very young. I entered high school at age 11. Consequently, I, for many reasons, graduated at the bottom of the class. I wasn't terribly interested, at that time, in technology, since my father was a musician, and the house was filled with classical music.

My father didn't end up. In those first years, up until 1929, in order to make a living, he played the theater for the silent movie pictures. He played at the Roxy Theater, and he got \$200 a week. We went from riches to rags. That's why I remember my fifth birthday, because that was the last opulent birthday I ever had. From that point, the family was desperately poor and desperately broke.

We lived in this area, Williamsburg, right near the Brooklyn Navy Yard. Now, as far as the Navy is concerned, when I graduated from high school, and I graduated in 1941, I had given up. We could not get a Naval Academy appointment because it was a very, very Democratic congressional district. Of course, my father was a very, very right-wing Republican, no question about that.

INTERVIEWER: May I ask you about Brooklyn Tech? Were there any teachers or people there who influenced you?

DR. CRAVEN: Yes. There were many. Probably, one of the most influential guys was a guy named Chogrin who taught industrial processes. That's an interesting question to ask because, of course, of

the conductor of the orchestra. They got me into the orchestra. Nobody in Brooklyn Tech played in the orchestra. They put a cello in my hand, and they told me to learn to play the cello, which I really didn't, but they made me the cellist in the orchestra. His name was Bardansky. I remember it. Then you asked the question as though you may have known some of these professors. Did you?

INTERVIEWER: No.

DR. CRAVEN: Yes. What was very influential, and I was going to put it in my current book, but I'll put it in my next book, was the fact that I learned all sorts of technological things that have stood me in good stead. I'll give you a few examples.

INTERVIEWER: Please give us examples.

DR. CRAVEN: The first course I took was a course in forging. What we had to do was put a piece of soft iron in the forge until the sparks flew. Then you pulled it out and wined it on the end, and got all the slag off it. Then you beat it with a hammer, and then you beat it into a shape of a link. You then had to weld the link by taking the two ends of it and hitting it hard together. There I was, just barely 12 years old, and very much a weakling. I could hardly pull that piece of metal out, much less hit it on the anvil, much less do it. I burnt up three or four pieces of metal and the instructor said if I wanted any more pieces of metal I had to get them from my classmates. My classmates had fathers who owned machine shops, and they started giving me pieces of metal made out of high-carbon steel that couldn't be welded by Vulcan himself.

At the end of the course, all my fellow students were doing andirons and everything else. The instructor came up, and he took my twisted piece of metal, and he said, "Hey, class, if this kid knew what he was doing, he would have known that he had a piece of metal that could not be welded." He said, "Let me show you." He went over to the grinding wheel, and he put it on the grinding wheel, and blue sparks flew off. Then he took a soft piece of metal, and put it on the grinding wheel, and yellow sparks flew off. He said, "See? He would have known that." Now, that was the most fundamental lesson. In my book that I've published I talk about hazards, and one of those hazards is what we call NDT...no ductility. The awareness of the ductility of materials as a

function of their capacity was brought in right home to me at that time.

Then I went through a series of experiences like that. I got into foundry. In foundry, we had to make green sand molds. We were told that to make the green sand mold correctly, you shouldn't put too much water in. If you put too much water in, you would think it was going to work out correctly, but wasn't.

At the end of the class, he selected five green sand molds that he was going to pour metal into because they looked so beautiful. One of them was mine. When they poured the metal in and they opened them up, all five came out looking beautiful. He grabbed mine and said, "See how beautiful this looks, fellas?" Then he took the ballpin hammer and he hit it. There was a big blowhole in the center that came from the expansion of the steam.

As we went on through these things in mechanical drawing, and machine shop, and things that they taught you at Brooklyn Tech, and they taught you in too many ways. By the end of that time, I really understood manufacturing. I understood metals and metallurgy, and I understood industrial processes. I understood all of these things in a way that no other high school graduate understood. When I left Brooklyn Tech, I had a solid foundation in what I'd call 'applied engineering,' even though I didn't know it.

Then what happened was that I went out to look for a job. I was offered a job at Bell Labs. They told me, "Craven, if you come to work for us, you must go to college, and study engineering and technology." I told them that the last thing I wanted to do was study engineering and technology.

Instead of doing that, I ended up working for a bank, the National City Bank of New York, with the optimum salary of \$12 a year. I sort of cheated my way into Brooklyn College because I didn't qualify. I went to Brooklyn College at night and majored in English. At that time, I spent, at night, about a year, a year and a half, immersed in literature and poetry, and things of that kind.

INTERVIEWER: Why didn't you qualify for Brooklyn College? Was it because of your grades?

DR. CRAVEN: Yes. In order to go to Brooklyn College you had to have several qualifications. In order to qualify for either day or night school, you had to have a C average. I had a C minus or D

plus average in high school. I didn't qualify for that.

Then you took an entrance exam, and if you had a very low average, not a very high average, you couldn't qualify for day school at Brooklyn College. You would then qualify for night school at Brooklyn College. If you weren't good enough to qualify for that, then you could qualify for Brooklyn College at night and go for an Associate of Arts degree. Then you could qualify for Brooklyn College and just take courses. There was also a category in which you couldn't qualify for anything. I did the typical Brooklyn kid thing. I got the application blank, and where all those things were there, I left them blank. I took the examination, and I was very good on examinations, and I don't know what happened. All I know is that I was accepted to go to day school at Brooklyn College.

At that point, a good Brooklyn boy did not ask any questions. I couldn't afford to go to day school, so I signed up for night school. I think that that had to do a lot with what you did as a Brooklyn boy, and that kind of behavior carries through all your life. That is, you did not get stopped at any time by the formalities of paperwork. As you'll see, that is what happened to me later in life. No, it happened even earlier in life. I worked for the bank and I'd go to school at night.

Then December 7th came, and the war came along. What had a tremendous impact on me was on about December 10th or 11th, when the cruiser USS *Nashville* pulled into Brooklyn Navy Yard with my father's cousin, Captain Francis Craven, as its captain. He invited the whole family to have dinner with him in his wardroom on a wet, rainy night in Brooklyn. We went up there, and this man was just absolutely dejected. He did not see how the United States could possibly win the war. He'd heard what'd happened at Pearl Harbor. He'd go from the Atlantic Fleet to buttress the Pacific Fleet. He was with his family now, so he could be very frank to indicate what a desperate condition we were in. Early on, I got a very strong feeling, in terms of my ancestors, and in terms of everything else, that we were in a desperate situation.

When the draft became imminent on me, which was early in 1943, I went down and joined the Navy so I could fulfill the family destiny. It turned out that I sort of disgraced the family destiny

because I was the first enlisted man in the family's history. There never had been any enlisted men, all the way back to this other period of time.

Then I really disgraced the family. I got into a fight on active duty and broke my hand. I should have had a court martial, and I don't know what they would have done to me. The bone protruded through the hand so they had to send me over to the hospital. The medical officer who interviewed me asked me how it had happened. As I started to tell him, he held up his hand. He said, "Son, you were reaching to open the door, and someone opened it from the other side, and it hit your hand."

INTERVIEWER: He was a wise man.

DR. CRAVEN: Yes. But I could not believe that any naval officer who had gone to the Academy would so perjure himself. I mean, at that time, I was very, very puritanical, and very believing in the Navy, in an idealistic sense. I didn't know how to respond, and so the net result was that I didn't finish quartermaster's school, and I got shipped directly out to sea.

INTERVIEWER: Where did you go to boot camp?

DR. CRAVEN: I went to boot camp at Samson.

INTERVIEWER: Where was Samson?

DR. CRAVEN: It was in New York. Then I went to quartermaster school in Newport, Rhode Island. I could be indelicate on the camera, where we cheered "Newport, Newport, rah, rah, rah, three dits, four dits, rah, rah, rah."

You asked an important question. At that time, I was enamored of the PT boats that were practicing out there in Narragansett Bay. I applied to go to PT school, and I got accepted. I would have gone, had I not engaged in fisticuffs. That terminated my training in quartermaster school and sent me directly out to sea. I got sent out and assigned to the battleship USS *New Mexico*.

Now, what was relevant in my experience on the battleship *New Mexico* was that it was a 1918 battleship. It was *still* a 1918 battleship. We slept in hammocks. We stood watch four hours on, four hours off, with one hour before sunrise. In Herman Melville's book, *White Jacket*, he has a little

section, an essay on why a sailor does not live a long life. He describes that they have to stand watch four hours on, four hours off, 24 hours a day. That was in Melville's time. They didn't stand an hour before sunrise at general quarters.

Then he elaborates on the fact that your hammock has to be stowed away during the daytime. There's hardly any time, maybe once every two days, that you can unlash the hammock and sleep in it, which was the case on the *New Mexico*. To me, at the present time, that was very relevant in my total career. Because as you're starting to see now, I had a Navy career which, while not chronologically, but *de facto*, goes back well before World War II.

When I was on the battleship *New Mexico*, certain things happened. One of the things that was distressing to me was that my father notified Captain Frank Craven that his son was on the battleship. Frank Craven was coming down to the yard at this time. He notified Captain Zacharias that this young Craven was aboard, and that there was a high probability that I was able to play the organ. If they needed an organist for the choir, I'd probably be it. As soon as I got on board, I got called in by the chaplain and was asked to volunteer to play the organ, which did not endear me to my fellow hash mark seamen, at the very start of this operation.

Here is an anecdote about my interaction with the captain. I think it was a Saturday morning. At one of the first inspections, he came by and looked at me, and he said, "Seaman, your pants are too short in our regulation. I want a pair of white pants that are full regulation for next week." I took the pants and I lengthened them, and now the stencil was on the outside. The next week he came by, and he looked down, and he said, "The stencil is on the outside. Next week, I want a pair of pants that are regulation, with no stencil on the outside." So, I went to small stores and I got a pair of pants, but they were too long. They were flopping over my shoes, no matter how much I pulled them up. He came by and looked down at me, and looked up at me, and then a big smile broke out on his face. He said, "Seaman, the choir sounded good Sunday."

The next thing that happened that I think is relevant, as far as a naval experience is concerned, was that shortly after we were on board the ship, we had a number of recruits like myself.

Remember that it was a ship that had plank owners. Not only did it have plank owners, it had hash marked seamen. It had very, very few replacements because the war hadn't been going on that long. A small group of new recruits came in with a great deal of disdain. One of the things that we did when we were first out was to cross the equator.

There were 2,000 men who had about two dozen men as their fodder for crossing the equator, and that was one of the more drastic days in my life in terms of the total, you know, just all day long, getting hazed and shaved. I don't know how many times I got shaved, and so on and so forth. I finished the day with a completely bald head. No, actually, the next day, I finished the day with just patches around here. The next day, you went to the barber, and he shaved it all off.

The other thing that happened was that there came a time to take the test for the third class quartermaster. We all took the test and we all knew things almost by heart. There was no question. We all got the answers right. The first class quartermaster came back and announced that we all failed the test. We wanted to know how we had failed the test, and he said, "I'm not going to tell you how you failed the test, because I don't want to give you the answers."

At that point, almost all, excepting me, decided to go to the chaplain and complain to the chaplain about the inequity. The chaplain came and went to the chief quartermaster, and said, "Hey, chief quartermaster, your quartermaster is not grading the tests properly." We were immediately designated as chaplain strikers, all right. I was included in that designation. I'm an old Brooklyn boy and I'd been through all these things. I knew that you shouldn't go to the chaplain. I also knew that you shouldn't tell them that you didn't go to the chaplain. You had to let them find it out themselves. They found out themselves that I was not a chaplain striker. Immediately, that moved me over from the crew of new guys to be bosom buddies with the old guys. That was my change. Now, the other guys had their change later on when the ship got hit with a kamikaze. I was not on at that time. But once that happened, of course, there was no division between the crew.

INTERVIEWER: When you were on the *New Mexico*, was the kindly old gentleman down in the engineering spaces?

DR. CRAVEN: No, but his reputation was. One of my dilemmas in life is in the book. It was when the kindly old gentleman leapt out of the blue and chose me to be the project manager of the *NR-1*. I never knew why he was playing God.

There were several things that he might have known, and he might have known that I was on the *New Mexico*, because his job on the *New Mexico* was to be the assistant engineering efficiency officer. He was so good that the *New Mexico* was Queen of the Fleet several times during that period. He was hated aboard ship because he put plugs in the water pipes so that when you took a shower, hardly any water came out.

When he left the *New Mexico*, he was then slated for command. They gave him command of a gunboat on the Yangtze River. At that point, he knew that his career was over. He had gone through a period on the *New Mexico* as an officer that was just like the period I had gone through as an enlisted man. Did I see action on the *New Mexico*? Yes, I did.

INTERVIEWER: Of what sort was the action?

DR. CRAVEN: Well, the action I saw, primarily, was the invasion of the Marshall Islands. At the start of that action, my battle station was the Fifth Auxiliary Steering Station at the bottom of the ship. There were 17 watertight doors between me and freedom and myself.

INTERVIEWER: Did your Presbyterian soul say there might be some predestination in that?

DR. CRAVEN: Did it say anything about being on board that ship? No. I was sitting on the starboard side of the ship and the chaplain was announcing, so all could hear, the nature of the engagement. He announced that a Japanese shell had landed off the starboard quarter, in the water. I got up and moved to the port side. Then he announced that one landed off the port side. I got up and I sat in the center of the thing until it was over.

We didn't get much resistance from the Japanese. We just bombarded them terribly. I don't want to go into the details, but my observation of the carnage on land was that moment that comes to young men in battle that says that war is the most obscene activity of the human animal. It's just a human abattoir. It's a terrible thing. One of the things that I've always pointed out that those people

born in 1924 were 17 when war broke out. We were 21 when the war ended. A small number of us, but a significant number, lived a whole lifetime in those five years.

Therefore, we started out life with several experiences behind us. You'll see a large, large number of people in the class born in 1924, who dedicated their lives to the prevention of a future war, one way or the other, almost uniquely. There was Senator Matsunaga and the president of the university, and I forget his name right now, and the head of our Department of Engineering, who was a Haole, and a Haole is a white person, who had only one arm because he had been shot down in the war.

I almost got to the point at which I could identify in my generation the leaders in this society, and say, "Class of 1924." Also, there was a little bit of the class of 1925, but they didn't see that much of the war. The classes of 1923 and 1922, or most of them, had started on their careers. Psychologically, they were waiting for the war to be over in order to continue their careers and go back to them. Those of us who hadn't started on our careers, or who had started a career that was so frustrating, didn't go back to it. It was the wartime experience, and I'll tell you a little bit more about that. That led me to say not so much. Let me put it that way.

I guess that right after I got into that fight and discovered that the people who supported me were not these right-wing, religious Christian guys, I had that moment of what you might call 'disenlightenment,' if you will, by which I had a whole new framework for viewing life. At that point, I rejected predestination completely. I saw things more as fate and as chance, not correlated by any hands above or in that line, but somewhat correlated by human history, or shaped by history.

When I was sent off to college, and I'll come to that point in a minute, I said, "Okay, I am now going to be a naval scientist." I knew I was going to get a naval commission in the Reserve, but I knew that in my family, that did not count. If you got a commission, it had to be from the Academy. Otherwise, it didn't count. Now, it may be a funny thing to say, but it was true. It was exactly true. I decided that I would be a Navy scientist, because that was a trend that my career was going in.

How was I so fortunate as to get off the ship? I don't know where I won the second Battle Star. To win a Battle Star, it isn't just that you have to be in battle. You have to be shot at. I don't know if people know that or not. This is where the CNO Mickey Border got into terrible trouble. He wore Battle Stars he was not entitled to, and he thought he was entitled to them because he was involved in engagements in which the people who decided whether you were entitled to a Battle Star did not say he was entitled to a one. He just presumed he was entitled to a Battle Star and never checked with his official record to see whether the action had been so classified. In order to be so classified as a Battle Star, you've got to be shot at. In the Marshall Islands, we were shot at when we went into Kwajalein, and later on, when we went up to some of the other islands. Our skipper, when I was there, said, "Let's get closer, maybe they'll shoot at us."

INTERVIEWER: Who was your skipper?

DR. CRAVEN: The captain was Ellis Zacharias, who was very significant because he was later in the ONI. That was a funny thing. I had to give a talk to the Parsi submarine people. I wasn't going to talk to them about anything significant. I opened my talk by saying, "I want you young lads to know what it's like to be on board a ship on which your captain is engaged in naval intelligence. In addition, you are told that you must not tell anybody that he's engaged in naval intelligence, or you must not say what it is." They were all ears. I said, "I was on the battleship *New Mexico*. My captain was Ellis Zacharias, and he was carrying out classified operations on the ship. I mean, all sorts of stuff was coming in on the whole thing. We were cautioned, as crewmembers, not to tell anybody that our captain was involved with naval intelligence." That was kind of a letdown for them. It was a good joke. But it was true that by being quartermaster on the bridge, I had that relationship with the Naval Academy guys and with a captain who was involved with intelligence, and that made me feel a part of the strategic Navy, and not just the swabbie down below.

The other thing that I learned there was that we zigzagged six times an hour, and that they would always keep the youngest quartermaster whom they felt was well qualified on the helm. The old salts didn't like to take the helm. They'd drink coffee, and so on and so forth.

In a very short time, I was standing a very substantial percentage of every watch at the helm. You were taking this battleship through head seas, through following seas, through beam seas, through quartering seas. You were taking through sea stage 4, 5, sea stage 0, and things of that kind. That was a skill and art that you can only accomplish by understanding how different it is to steer in each one of them.

INTERVIEWER: Was it something that you only learn by doing?

DR. CRAVEN: You could only learn it by doing it. In other words, what you had is as follows. The officer of the deck was required, every so often, to calm the helmsman by saying, "Right five degrees rudder," or "Right ten degrees rudder," and bring you up to the new course. He could say, "come to and steady up on course, so and so," too. If he said "come to and steady up on course so and so," he wasn't getting his own qualification drill for calming.

Now, if we liked the officer of the deck (OOD), and he said "Right five degrees rudder," and we knew what course he wanted to come up on, we would give absolutely right five degrees rudder, plus or minus, in order to get that to be the right effect. If we didn't like the OOD, the ship would wander all over the ocean, and we'd be precisely carrying out the directions that we had. I mean, you've got this attitude of the helmsman, and you know, Mao Tse-tung said, "Sailing the seas depends upon the helmsman." It does.

When you were taking a ship alongside, or when you were taking an aircraft aboard, you had to go in and do a turn. You did things of that kind. At that time they wouldn't let you take the helm unless they thought you'd acquired the skill to do it, because you were continuously adjusting the helm on the basis of the realities of the situation. You could not always succeed. I remember one night we had a following sea, a big heavy following sea. It lifted the ship up to what we called 'falling off.' It fell off into a trough and a great wave came up over the fantail, on which all of the officers were sleeping in blanket rolls and they all got soaked. They all came tearing up on the bridge to find out what helmsman had allowed this to happen. It wasn't the helmsman. It was God. What can you do? In that situation, the rudder was out of the water. It did not make any difference

what angle it was. That's the kind of thing I'm talking about. Then you got this feeling. What's wrong with this crazy Navy, that they take a guy like me, a young guy like me, and give him what we thought was the most important job on the ship? Well, maybe it was, maybe it wasn't. I don't know. I mean, but you can see how we got that feeling.

The next time we had saw action was off New Ireland, of which I didn't see very much. But the enemy fired back. I just got on my record that I've got two Battle Stars. I don't know what they're for. In a sense, that really didn't count because I could have gotten those Battle Stars without really seeing the abattoir of war, but I did see the abattoir of war. That's what really counts, in terms of the individual, who is engaged in battle.

Between engagements we spent time in the New Hebrides. We also spent our time, when we got a chance to go on rest and recreation, in Sydney, Australia, which is way down under. It is so far down under that they didn't even see the war. As we came into the harbor, ships of every kind came out and flew the flag. We got there, and there were 17 women to every man. The longest period in my life was spent standing there, in the line, waiting to change my currency into Australian currency while the guy from the Bank of Australia sat there eating his lunch, his sandwiches, for half an hour. All the while the girls were standing up on the parapet, raising their hands and lifting their skirts. We had a great week in Sydney. There was a period of my life that you don't have. Of course, most of my fellow guys got drunk. We showed up at two a.m. instead of going back at midnight, and the ship was not at the pier. We had to take a water taxi to finally find it. Some of our colleagues were so drunk that others, as they ordinarily did, put a cargo net over the side. You piled the guys in the cargo net.

Then I was out at sea one day. I was on the fantail talking to the radio operator. A fellow named Gil McTachels, and I remember his name very well, said to me, "I'm getting off this ship," and he put an adjective in front of it that I will not repeat here. I asked, "How are you doing that?" He said, "I'm going to the college training program." I asked, "What's that? I never heard of it." He said, "Well, the Navy has a V-12 college training program."

INTERVIEWER: When was that?

DR. CRAVEN: That was early in 1944. I asked, "How come you're going?" He said, "Well, I'm the radio operator." I got the message. They were to pick the 13 best men in the fleet. The fleet at that time consisted of three battleships, three cruisers, I don't know how many destroyers, and I don't know how many landing crafts. I think it was about 200 ships altogether. I thought, "How come they picked a stupid guy like you?" He said, "Well, there is a person called the educational officer of the fleet." That happened to be my division officer. He said, "You know what a lazy jerk he is." I'm sorry about saying that. He wasn't a lazy jerk. As a matter of fact, he was a hero later on. I knew him later on. But that's all right. This was an enlisted man's view. He said he'd never pass the word.

Right about that time, there were only eight applicants for the thirteen vacancies. I remember it was at 1600 hours, coming off watch. I ran into Commander Harold and I saluted him. I said, "Sir, I understand there's this college training program." He said, "too late, too late." I said, "I understand it closes at midnight tonight." He said, "Okay, go see the yeoman, all right." I went down to see the yeomen. There were nine applicants for thirteen vacancies, and they sent eight of us, because one was the yeoman. He was too valuable to the war effort to send him.

At that time, I had no anticipation of ever going to college. For some reason, I put down Dartmouth University as the college to which I wanted to go. Gil McTachels had always wanted to go to Cornell University, and he wrote down Cornell. He went to Dartmouth. I went to Cornell. I arrived at Cornell, and I didn't keep a good record at Brooklyn College at night. I was a straight C-minus student at Brooklyn College. They said, "Seaman, on the basis of your record, we would never take you into Cornell under any circumstances. We have to, because we have a contract with the Navy to take the people they send."

I went to Cornell, and the Navy told me that I would study engineering. That was why I was going, to study engineering. I got in the shortest engineering line, which was civil engineering, which was perfectly all right. I got to Cornell. Now, at that point, there were two things that stood me in good stead. My training was at Brooklyn Technical High School. I was far ahead of my fellow

engineers at that point, coupled with my training at sea and my training as a quartermaster. At that point, I knew applied engineering, I knew navigation, and I knew all sorts of things. That put me ahead. Second, I was motivated. The war seemed like it was never going to be over. If I didn't succeed there, I was going to go back and be killed. There was no question about it.

Indeed, a month or so after I left the ship, we took a kamikaze hit right on the bridge. It didn't kill any of the quartermasters, because when you were on the bridge, you were on a different side of the officer on watch. The officers moved to the starboard side and you moved to the port. The officers all moved to the starboard side, and the captain was killed. He was tended to in his last moments by my relief and the quartermaster. He sent me a letter describing the thing. It was really very tragic. How personally tragic death in action really is, when it really occurs.

The captain was lying on the bridge. They were trying to give him help, but the captain just waved them away and said, "Back to your duty. Go back to your station." He knew that he was dying, and in his final moments, he wanted to have his own private moments. He also wanted to make sure that that ship was continuing to fight, which it did.

I graduated near the top of my class at Cornell. As I did that, I discovered that the one course that didn't make any sense to me was fluid mechanics, because we had an old professor who didn't understand fluid mechanics himself. At that point, I started to firm up my decision to be a naval scientist of one sort or another. I graduated. I could have taken a career and I could have taken an appointment in the line, but I would have had to serve for a year, and those guys all went to Eniwetok. I didn't want to do that, so I took a Reserve commission in the Civil Engineering Corps. I cut out and I immediately applied to get a master's degree at CalTech.

INTERVIEWER: Why did you go to CalTech?

DR. CRAVEN: Why did I go to CalTech? I asked of my professors who the best professor in fluid mechanics and hydromechanics was, and they said it was Hunter Rouse, who was at CalTech. That's a very perceptive question, because it goes as follows. They said it was Hunter Rouse, and he was at CalTech. CalTech, of course, was the number one school still. Now that I'm a graduate of CalTech,

there is no other school in the world that qualified as CalTech did, as a superior school. That's not really true. That's the way we advertise ourselves.

INTERVIEWER: We'll send that clip to CalTech and they can use it for promotion.

DR. CRAVEN: That's right.

INTERVIEWER: Was he indeed that good at fluid mechanics?

DR. CRAVEN: I spent the summer very productively, working with Standard Oil of California at the central office on Bush Street.

INTERVIEWER: That was 1946, by the way, wasn't it?

DR. CRAVEN: It was 1945, when the war was over. No, it was 1946. I mean, if you asked me how long I was in the service, I would reply that I went in on April 1st, and I was in there three years, three months, and three days. You can calculate time from that. During that time I spent not a single day wearing civilian clothes. In wartime, you just did not wear civilian clothes. That was the equivalent of desertion. I spent three years, three months, and three days in a Navy uniform.

I worked that summer. Standard of California owned Aramco at that time, and we were using Bechtel Corporation. I was working in a special section right up at the vice president level. I got to see the kinds of things that Standard Oil was doing with respect to the oil fields and what we studied. We studied whether it was easier to build a pipeline across the Isthmus of Panama than it was to keep using the Canal. We studied whether it was cheaper to use hot oil flow going from southern California to northern California than to pay the tanker crewmen higher wages, and things of that kind. We got a chance to get involved.

Now, the funny thing that happened was, and I didn't realize it, that Standard of California, Aramco, and Bechtel Group, is itself its own tribe and corporation. They felt that once you were a member, you were always a member. They were very angry with me when I didn't go to work for them when I got through at CalTech. What they did do was they started sending me the Aramco magazine. I receive the Aramco magazine every month, even today. If I change addresses, and I do not indicate that I've changed addresses, that magazine still comes. Once you are a member of that

tribe, you are always a member of that tribe. It's wonderful, because I keep in touch with what that tribe is thinking and how they're thinking. That's very important, because more than people realize it, the current conflict these days relates to the control of oil for the Middle East. The last big control over oil that we have in the Middle East comes through the Bechtel Corporation. The vice presidents of the Bechtel Corporation made up almost President Reagan's entire cabinet. Ronald Reagan's Cabinet was almost entirely the Bechtel Corporation.

I got a chance to see, at that point, the emerging power of this geopolitical block that was important to the nation, is still important to the nation, and will probably be very important to the nation in the future. The people in the Middle East try to wrest control of the Middle East pipeline from the U.S. and move it into other hands. This is the nature of the Cold War that's coming up.

When I got to CalTech, I said I wanted to study with Professor Rouse. They told me that Professor Rouse had not been there for five years. I asked, "Where is he?" They said he was in Iowa, an unlikely place for naval hydrodynamics. But it was a very likely place for naval hydrodynamics, because the Navy took the hydraulics laboratory at Iowa and changed it into a Naval hydrodynamics laboratory during the war. They persuaded Rouse to go from CalTech to that place, where he was at a great institute. It was the Iowa Institute of Hydraulic Research.

When I graduated from CalTech, I had all this G.I. Bill of Rights left. I decided I'd go find Hunter Rouse and study with him. I found him in Iowa. I went to Iowa to get a Ph.D, and I did. It was four long, hard years. The beauty of it was that Rouse insisted that you did all of your work in the laboratory with real water, real flumes, real water tunnels, and real things of that kind. You never did anything theoretical without checking out the behavior in water. It was fluid mechanics as well as hydrodynamics. Hydrodynamics is a very theoretical thing that applies to fluids only under certain conditions. Fluid mechanics, however, is the behavior of fluid in its most viscous form. The net result is combining these two together in order to get design parameters for something that's really going to work in the ocean, where the front has to be like a hydrodynamic shape, and the rear has to take care of all the turbulence and things of that kind. It was four long, tedious years there.

INTERVIEWER: Was Rouse's lab still supported after the war by the Navy?

DR. CRAVEN: Yes.

INTERVIEWER: ONI probably supported it after 1946. Were you aware of it?

DR. CRAVEN: Yes, I was very much aware of it. People from the David Taylor Model Basin would be sent out to Iowa to get their Ph.Ds for a long time. People who retired from the Model Basin would go out and teach at Iowa. There was a very, very strong Institute of Hydraulic Research tie-in to the David Taylor Model Basin. In other words, the David Taylor Model Basin was an academically experimental institution. When I graduated from there, I applied to a number of Navy laboratories, but I immediately went to David Taylor Model Basin.

INTERVIEWER: You received a Ph.D. in 1951.

DR. CRAVEN: I got the Ph.D. in 1951. Then I went to David Taylor.

INTERVIEWER: What did David Taylor look like in 1951? It must have been still fairly new, because a lot of the facilities were moved up from the Washington Navy Yard, weren't they?

DR. CRAVEN: They were. I think they were moved up before the war. I think those two long buildings were there. In my mind, the Model Basin of today looks like the Model Basin of old. There have been some new structural laboratories added, and there has been a new maneuvering basin added. That maneuvering basin was added even while I was still in Washington, D.C. The Model Basin still looks very much the same to me now as it did then. The other thing that is relevant is that I got married at that time and my wife and I came to Washington. She was involved with speech pathology and audiology. She went to work for the University of Maryland.

I still had a lot of G.I. Bill left, surprisingly enough. So, just for the whim or the fun of it, I discovered that I could go to law school at night, and only take a few courses. You can't do that now. Now, if you go to law school at night, you've got to take a set curriculum, and you've got to finish in a certain period of time.

At that time, you could go to law school at night and take a few courses, until you finally accumulated enough for a degree. I ask myself, "What would I have done had fate not taken me

through this whole naval thing?" I probably wouldn't have gone to law school. But the whole postwar notion on the part of everybody was that you should have been a lawyer or a doctor. Just as a hobby, I decided I'd go to law school at night. I did go to law school at night, and I went for seven and a half years. At the end of seven and a half years, they told me, "Craven, take your degree and get out of here, because you're not going to take any more courses anyhow. Okay?"

INTERVIEWER: That was at George Washington University?

DR. CRAVEN: It was at George Washington University. That's an element to this history, and it's a very important element, as far as my Navy career and experience is concerned, as we'll see. Let's get back to the Model Basin. What was the first thing I got involved in? I was there during the Korean War.

INTERVIEWER: Who was your boss?

DR. CRAVEN: My boss was a man named Phil Eisenberg, but Admiral Albee Wright, who was very influential in my life, was also there. The head of the Model Basin was an old guy named Carl Schoerner. That was the hierarchy. I reported to Eisenberg and Eisenberg reported to Carl Schoerner. There was somebody before Admiral Wright. It was Admiral Mumma. You'll see that Mumma's history is involved with Admiral Rickover. After the Congress came back the second time and said, "Pick the following admiral," they almost kicked the bucket over again, and appointed Mumma to that job because he had the same experience with going down to Oak Ridge that Rickover had. If you read the congressional mandate literally, and you fitted naval officers to it on that pattern, Mumma would fit that pattern. Mumma would never have done what Rickover did. I mean Mumma was a conservative of the old school. I just add that in because I think these are things that you need to know.

INTERVIEWER: Yes, I've interviewed Al Mumma.

DR. CRAVEN: You have?

INTERVIEWER: Yes.

DR. CRAVEN: Aye, aye, sir.

INTERVIEWER: Yes.

DR. CRAVEN: He didn't give me the same, not with the same shade.

INTERVIEWER: He's got a few Rickover stories. Let's put it that way.

DR. CRAVEN: Sure. Well, we all do.

DR. CRAVEN: The first thing I started working on was minesweeping, because we lost all these minesweepers at Wonson Harbor. That sent me off to Panama City. It also got me involved with John Isaacs, who was the chairman of the Mine Advisory Committee of the National Academy of Sciences.

INTERVIEWER: Characterize John Isaacs for me. He was an interesting character.

DR. CRAVEN: Yes. He was one of the most brilliant men I've ever met in my life.

INTERVIEWER: He was, really?

DR. CRAVEN: I'm not sure he ever graduated from college. He had been a fisherman. Maybe he graduated from college. I don't know. He was a fisherman, and somewhere along the line studied physics on his own, and learned physics. He learned the physics of the sea, and the physics of the world in such a fundamental way that he could always apply the appropriate principle, regardless of what discipline it was in, or how it was. He was just so fundamental. For example, he noted that the spiral of the eucalyptus trees went one way on one side of the highway and the other way the other side of the highway. He figured out that it was due to the cars driving by. He worked out the vorticity that was associated with that. He correlated that vorticity with the occurrence of tornados on the West Coast and discovered there was a perfect correlation between the volume of traffic and the occurrence of tornados. He was able to compute what vorticity was introduced. Of course, his solution was to turn the direction of the cars around, and drive as though we were in England, in which case you damped it out. I just give that as an example of his kind of thinking. He wrote a paper and he sent it to me, and he asked, "John, will you check it out and tell me if it's right or not, and I'll get it published." I said, "Yes, it's right, John. But you are not going to get it published. No one's going to publish it because they don't publish papers like that." That was one of his

innovations.

The thing about him was also that he learned to innovate by deliberately making mistakes. At one summer study we had he introduced a game in which you played chess back to back and had a referee. That summer, he started out losing every game he played. There was a guy there who was proud of his ability at poker and cards and everything else. He won every game. On the last night it was played, John Isaacs said to him, "I'm going to play (whatever his name was) and I'm going to beat him." He just laughed. I was the referee and I watched. John Isaacs use every lesson he learned in every game in which he had deliberately made bad moves. At the end of the game, there was a long period of time during which John was thinking. (Whatever his name was) said, "You don't see me worrying." John made his next move, and he said, "Checkmate." That was John Isaacs.

Then of course, he smoked like a chimney, and so that got him. The first thing I was asked to do was to evaluate a scheme of John Isaacs'. It was called La Pouche. It was a novel form of ship that should not have any pressure signature. I had just spent three long months designing a micro-pressure range, and running all sorts of tests and experiments. At the end of that time I could prove, beyond a shadow of a doubt, that the thing didn't work at all.

Eisenberg and I then got on a plane, a DC-4, and flew across the country, getting airsick and everything else. We arrived and as we got there, this cheerful guy with a beard came tearing forth, and I ran out to him in my compulsive way and I said, "John, Dr. Isaacs said your idea does not work." He said, "I know that. I knew that three months ago." I wanted to hit him. He said, "Besides, I've got lots of other ideas since that time. I've got lots of new ideas." We spent the afternoon on some new ideas we started. Finally, he said, "Hey, let's go over to Roger Revel's house." We went over to Roger Revel's house, and Roger hauled out the cart full of liqueurs, and Isaacs would invent an idea. Eisenberg and I would go in a corner and independently analyze it and come back and show why it was wrong. Isaacs would invent a new idea, and all I know about that day is that we passed out about three or four in the morning. I have no idea how the day ended.

I learned more about minesweeping in that one night than I ever was to learn again, because

he introduced, each time, these crazy new ideas in which, by evaluating them, you discovered that they weren't quite that crazy, and they would lead you in another direction. That's enough said about Isaacs, except that there's a lot more to be said about him. The book that was written about him is very bad.

INTERVIEWER: I know. I read it.

DR. CRAVEN: Yes.

INTERVIEWER: Sometimes he is somewhat compared with Alan Vine, with the same kind of personality and the same kind of idea production.

DR. CRAVEN: I think so, yes. I knew Al Vine very, very well also.

INTERVIEWER: I missed John Isaacs, but I got to interview Al about four times before he passed away. You were at the Model Basin, working on minesweeping?

DR. CRAVEN: Yes, I was working on minesweeping. That's right, I was working on pressure minesweeping. Then the Korean War was over. After the Korean War was over I was head of a flow study section, which worked on any kind of a problem out at sea in which it is presumed that the flow might be affecting the structure. We had a whole bunch of sonar domes that kept blowing up, and it turned out that it was just simply a bad welding practice with putting the sonar domes on. But it looked like they were being hydrodynamically damaged and we sent guys out to sea and we studied the domes. The cruiser USS *Boston* had a major, major vibration that turned out to be a cavitation, an excitation and so forth.

Then along came the new submarines. The first new submarines were the USS *Nautilus*, USS *Seawolf*, and the USS *Albacore*. My section was assigned the responsibility of evaluating their hydrodynamic performance.

INTERVIEWER: One of the things I'd like to ask you is that I know Dr. Eisenberg was heavily involved in the original Series 58 hull design, which took format first on the *Albacore*. Were you there while he was doing that, and did you have any hand in that?

DR. CRAVEN: I didn't have any hand in it, but I was completely aware of the Series 58 forums.

Mort Gertler, who just was a technician, towed all the forms for the Model Basin until we got them. I don't quite know the basis for the design. The reason I know the basis for the design is that the shape of the bow has a lot to do with the pressure signature. It turned out that a ship could become, empirically, one of the most efficient forms moving through the water. The problem we had with minesweeping was that we tried to get things that were so efficient moving through the water that they created a big pressure signature, and they wouldn't do it. It turned out that the most efficient thing that was moving through the water was a ship. The most efficient thing that was moving through the water was a ship with a hydrodynamic nose, with which you tried to maximize the volume and minimize the pressure distribution associated with idealized rotational flow, if I may say that.

INTERVIEWER: Sure.

DR. CRAVEN: That was what the Series 58 was all about. Then out of that came the *Albacore*. There were also stability and control considerations. We had a lot of trouble at that time and we still have trouble today with stability and control, particularly in the vicinity of the free surface because of the fact that you have this characteristic on the body called 'added mass.'

As a helmsman, I know exactly what an added mass is. You try to turn the ship to starboard, and the mass of water that's with you keeps going in the same direction. Therefore, the ship doesn't turn, or the ship was turned before, and you're trying to go straight and the ship keeps turning. Added mass is this mass of fluid that you entrain. As long as you're going steady-state flow, that's all right. But as soon as the mass of flow becomes unsteady, the mass of fluids you entrain has a phase lag, and continues to go. The net result is when you're looking at stability, which involves changing in direction, changing speed and things of that kind, you have this whole question of estimating added mass. The only reason you use the term 'added mass' is because the hydrodynamic equations are too complex to give you the real solution that takes place, although now, with the high-speed computers, we can do it.

At that time, we couldn't do it. We had to use all sorts of approximations. We had a big

problem of taking simple theoretical models and making them more complex, and more complex, and bringing in the effects of free surface, and so on and so forth, and trying to match those with the things that were there. Anyhow, we went to sea on all three ships for that purpose. We never really got to sea on the *Seawolf*, because the *Seawolf* didn't go to sea simply because of its sodium reactor.

Now, there's a chapter in my book that the publisher pulled out, which I'll get back in some time. It talks about the sodium reactor, and talks about it in terms of two mythical models. First, it was the *Nautilus* and Captain Nemo, and the other, the *Seawolf* and Larson. In World War II, there was a *Seawolf*. All the ships were changed from S-boats to the names of fish. There was a *Nautilus*, however, which was unique. There was also a *Seawolf*. On the *Seawolf*, they put the wildest, most daring guy. He had done the first patrols during World War II.

When he did those first patrols, he thought he sank two Japanese cruisers. He came back, and the morale was heightened. Then he did his second patrol. During his second patrol, he expended his torpedoes but nothing happened. He stayed in the area until he could find the location of Japanese ships to report to his other guys. He fulfilled the image of Wolf Larson, and he fulfilled it so much that he eventually rose to be a Commander of Submarine Forces, Pacific (COMSUBPAC). The next thing that happened was that he was relieved. The next skipper decided that he was going to carry it out in exactly the same mode. What he did was he went into a submarine area where the fleet had been told that U.S. submarines were going and to stay out of it. Our own people sank him.

You had the *Seawolf* mode exactly in the mode of the original *Seawolf*. Now, when *Nautilus* came along, and Rickover named it that, Rickover saw himself as Captain Nemo. *Nautilus* was not designed with a military function in mind. It was not developed or used with a military function in mind. It was used primarily as a demonstration of a *Nautilus* in the mold of a ship from *20,000 Leagues Under the Sea*. The fleet was furious, because they wanted an attack boat. They also wanted an attack boat that was superior. At that point, General Electric came in and pointed out that the sodium reactor will be a fast reactor and a more lightweight reactor than the pressurized water reactor. On paper, that's exactly true. They got the ship's characteristic board to authorize the

Seawolf in parallel with the *Nautilus*, with the full hope and expectation that it was going to sail rings around *Nautilus*.

INTERVIEWER: But Rickover knew the risks he was taking with that coolant didn't he? He signed off on the sodium, right?

DR. CRAVEN: He signed off on the sodium?

INTERVIEWER: Yes.

DR. CRAVEN: No. Rickover didn't care about the risk with the sodium because he had the *Nautilus*. He didn't care about the risk he was taking with it because he had the *Nautilus*. The other one was in no position to fight the sodium one. He came up with the sodium one, and it was Admiral Gallatin, Pete Gallatin, who was behind it. Not only that, they deliberately named Dick Lanning as the first skipper of *Seawolf*, because Lanning was in the *Seawolf* mode. Gallatin's book points that out. Gallatin writes that Lanning was this daring guy. So, that failed entirely because the sodium leaked. In my book, I point out that one of the rules we had in the Special Projects Office was that if you put something aboard a submarine that can burn, it *will* burn. There is no way you're going to contain it. You may think that you're going to contain it, and you may do everything you can to contain it, but there's no way you can contain it.

Maybe that is just hindsight. Anyhow, the *Seawolf* figured a lot in my life in the future. It figured in my life then. That is, that we never went to sea on it other than at half-power. We never carried out our experiments on *Seawolf*. We did do that, however, on the *Albacore*. On the *Albacore*, we carried out all our experiments, and we showed that the *Albacore* behaved theoretically, and we had this wild man, John Boyce, on board. If you want an exciting experience riding submarines, go to sea with John Boyce.

INTERVIEWER: Did it really perform as well as you thought it might?

DR. CRAVEN: Yes. It performed beautifully. It performed extremely well.

INTERVIEWER: How fast did the ship go when you were on it?

DR. CRAVEN: I don't remember. That wasn't the thing. It was the maneuvers, the stability, and

things like that. Then it was heading right down for collapsed steps, you know. You were watching this thing go down, and it got pulled out at the last minute. When you were new to submarines those things bothered you more than after you had been on submarines for a long period of time. The *Albacore* was my first submarine. Then came along this very important thing, as far as I'm concerned, which was the *Nautilus* vibration. I describe it in detail in the book. I don't know whether you want me to describe it now.

INTERVIEWER: Was that the vibration with the Helmholtz resonator effect on the bell? Yes, please describe it.

DR. CRAVEN: Yes. What happened was that the *Nautilus* was successful and went out on these long cruises. As it did, it had a very, very heavy vibration. You were in a new ship, you were going fast, and you were going to have vibrations. Then it was turned over to the structural people. The structural people went out and took measurements of the amplitude of the vibration, and all they said was, "Wow." We had no idea what it was.

The problem was passed over to me at the flow studies section. I took a look at it. I hadn't the vaguest idea what it was, but I presumed it must have been a hydrodynamic of some sort. I laid out a whole series of vortex shedding things like we had on the *Boston*, but we couldn't have cavitation interaction because were too deep for cavitation. I laid out all these things and decided that I'd put a whole series of pressure gauges throughout the submarine to measure the pressures on the hull. Then I had to back up these pressures on the average submarine depth, because the submarine was going up and down.

I devised a long spiral of hypodermic needle, which went to a ballast balloon on one side, so, as the ballast balloon changed, the change was communicated slowly to the back of the gauge. The back of the gauge was always seeing the average depth of the submarine over an integrated period of time. That way, you could get a good result on the gauge. We got some 20, 25, or 30 gauges of that kind, and we laid out a location on the submarine. We were told that we couldn't put it on until the submarine went into dry dock. Because the USS *Broderick* was very expensive, we had to put it on

at that time.

I discussed this with a naval architect up at Electric Boat (EB), Robert McKenlist. I discussed it with him. I asked the question about Helmholtz's resonance. I concluded, quite correctly, that Helmholtz's resonance did not apply. The little brown jug phenomenon, as we know it in ordinary physics, does not give you the right frequencies, the right resonance. I talked to McKenlist and said, "You know, this is so non-applicable, I don't think I'll instrument for it." He said, "Hey, Craven, instrument for it, okay? You just never know." I instrumented for the brown jug phenomenon along with everything else. I went up to New London, and the ship went into dry dock. The first three people who crawled inside the ballast tank were Andrew McKee, Dennis Wilkinson, and myself. You want to talk about shock. We went inside, and the main stringers, the stiffeners, had separated from the pressure hole. You could take your hand and put them between the stiffeners and the pressure hole.

The ballast tanks, meanwhile, had split at the side, and the ship was already down by the bow when it came in. All of the tanks that held air, the ballast air, were broken loose from their moorings and are hanging by the pipes. I mean, can you imagine that? We came out of there, just shaking. Everything hit the fan, all right. So, immediately, all the admirals came up from ----, with one exception. Rickover didn't come up, because never associated himself with them. We had this daylong meeting. It started early in the morning. Everyone wanted to take the submarine, put it in dry dock, review the design, rebuild it, and go through a long, long outage period before trying again, see. Finally, it got down to me. I was this kid there.

INTERVIEWER: How old were you then? You were born in 1924, so this was about 1953 or 1954?

DR. CRAVEN: The date is in the book. 1955, I guess it was.

INTERVIEWER: The *Nautilus* went to sea in 1955.

DR. CRAVEN: It was one year since, so it was 1956. I was 32 years old. You know, when I wrote this book, the editor kept complaining that I didn't put any dates in it. I said, "For us guys, dates don't mean a thing."

INTERVIEWER: It was a stream of consciousness, right?

DR. CRAVEN: It's just continuity. I've got a few paragraphs in my book that point that out, that time has no meaning to you. There are always new problems coming up, and problems had to be solved, and so on and so forth, and you lost all concept of time. The only thing that you related it to were certain events like Larson pitching a no-hit ball game, or Kennedy getting shot or something of that sort.

They got to me, and I said, "Look, why don't we repair the damage, put the gauges on, go out to sea, and see if we can find out what's wrong with it?" They all agreed that that was what they were going to do. EB insisted on putting the gauges on, and EB made the mistake that I would have made, but it was a mistake that, because EB made it, saved my hide. That is, they attached all of the gauges to one big bladder, so that if that bladder failed, all of the gauges were going to fail. They attached the gauges to one big bladder, and they put that big bladder in a cage, and they tied it down. We went out to sea, we took the first dive, and we hardly got started when that bladder failed. All the gauges failed. I went and saw Dennis Wilkinson and I say, "I hate to tell you this, but every single gauge has failed, and the water came in the back and destroyed them, as a matter of fact. We've got to go back." Dennis turned us back, and we got there, and there were four admirals waiting for me at the hatch when I came up there. I told them that all the gauges failed. We had the same meeting all over again. When they got down to me, I said, "Why don't we repair the gauges and go back and do it over again?"

That time, there was a lot more debating. They finally decided that we'd repair the gauges, and we'd go back and do it over again. But we would not put the ship in dry dock. They decided that I had to do it. I decided to put a separate bladder on the back of each gauge. I discovered there were no bladders in the Navy stock system. I went down to Woolworth's and got 36 brightly colored beach balls. I came back, and Electric Boat said, "We will not put that on. If that's going on, this crazy guy Craven and his mechanical helpers are going to put it on."

In the meantime, we went to Statham with the gauges, and Statham said well, "We can

return them to you in two months.” We said, “No, no, Statham, we want them returned immediately.” We finally got them so convinced of the thing that they took the whole staff in, dropped everything else they were doing, and started working on the gauges. As each three or four gauges were repaired, they put them in a car and drove them from Boston to New London and we didn't put the ship in dry dock. What we did was put plates over the openings in the ballast tanks, and then drilled holes in the top of the ballast tanks. As we went down there, all of a sudden, the pumps stopped, and the water started pouring in because the plates hadn't been put in properly. The two of us were racing out of there. They were still welding on the hull. We came tearing through. We didn't care. It really wasn't that dangerous. But you know the situation.

Then they put the ship in dry dock. Here you were, thirty feet above the ground, crawling out on the stern planes and the appendages, putting in these gauges, and we must have worked 24 to 26 hours, continuously, until we had the gauges installed. We then went in and they took the ship out of dry dock. Then we went out to sea. We went down to depth, and we started to run. I have to say, that was probably the most dramatic moment of my life. I had the gauges set for one pound per square inch (psi) as the maximum throw as being very dangerous.

Fortunately, you could set these gauges for things beyond that. I went down there, and all the needles were going at unison, hitting the stops on both sides. I went from one to five psi, and they were all hitting the stops on either side. I went from one to ten psi. They were still all hitting the stops. It wasn't until I went to thirty psi, plus or minus, that the needles didn't hit the stops. We had a pounding of the hull at thirty pounds per square inch, at 12 and 15 cycles per second.

I hastened to develop the records to make sure I'd gotten the record on this thing. I went in and saw Dennis Wilkinson, and I said, “I have good news for you, Captain, and bad news. The good news is that I know what's wrong, because there's only one phenomenon that can produce this, and that is a Helmholtz-type resonance. There's no other way that you can get all of the gauges going in unison like that. The other thing is that this is completely destructive pounding, and if I were you, I'd turn around and go back to port.” Dennis said to me, “No. I've got two days' worth of tests to carry

out." I said, "But I made up these tests." He said, "I don't care. I'm going to carry these tests out." I said, "But the submarine might not make it." He said, "Of course it will make it." He said, "We repaired all the damage, and we've been out for 18 months with all this pounding going on."

For two days, we went through the pounding. Then the last tests were done near the surface. At that time we got these great big cavitation booms that really would scare the daylights out of you the first time it happened, because with minus thirty psi, you're going to get cavitation. You had these great big cavitation blasts, you know. Boom, boom, boom. Then you had collapsing. We came back into port and discovered that there were very simple solutions to the thing. We just put air on the top of the ballast banks, and that stopped it. All we did was put in veins in the ballast tanks, to knock off the forcing function, which was vortex shedding over the ballast openings.

That became very classified. It may even be still classified in one sense, because what happened was that the ship was absorbing a 4,000 horsepower in this vibration, and it was putting out acoustic signals that could be heard for thousands of miles. Russian submarines were also putting out signals like that. We didn't want the Russians to know that we had solved this problem, or how we had solved this problem. We wanted to keep that away from them as long as possible. Then they immediately modified all the ships. That was as far as the *Nautilus* was concerned. At that point, I did become kind of a hero to the fleet. I mean, "This 'Kid Craven' went up there and did all those things." We moved into the very first stages of the Special Projects Office as I went back.

INTERVIEWER: You were still only a GS-12, weren't you?

DR. CRAVEN: Yes. I went from GS-12 to GS-16 in one day.

INTERVIEWER: You've got to teach us how to do that.

DR. CRAVEN: Yes. I don't know how to do it, but I'll tell you how it happened.

INTERVIEWER: Great. That sounds good.

DR. CRAVEN: At that point, the Special Projects Office asked every laboratory to assign one man to be responsible for all the special project questions that came in.

INTERVIEWER: The special project being the Polaris project? That's what I've got.

DR. CRAVEN: Yes, the Polaris program. That office had not been set up with the gigantic change that took place after *Sputnik*. R.B. Wright was there at the head of the Model Basin then. R.B. Wright could not abide by Carl Schoerner. Wright appointed me to be the representative to the Special Projects Office for all projects coming into the Model Basin, to decide where they were going to do them and how they were going to do them. Then immediately, there came some projects from the launching and handling branch. The one that was very exciting and that gave me a further reputation was the question of the interaction between the missile and the waves.

The launching and handling branch, when they started to launch from under the sea, or do a launch at sea, model basins all over the United States built their own models, and they built their own tanks. They tested them all, and in most of them, you couldn't get a missile out of the water. If you had a 180 scale model, the number was so bad that the missile leaving the tube would just fall back into the sea. Already, there was a tremendous notion that you would be able to do this function. So, early on, they built a facility over at San Clemente Island, called 'pop-up,' at which they had a full-scale missile, a dummy missile that they could launch out of the thing. But as they launched it out, they launched it in still water. So, a Captain comes to me and he said, "Hey, Craven, can you design and build a wave maker that will make ocean-sized waves that will go over the pop-up facility, and we'll build it?" I said to him, "Well, when do you need it, Captain? He said, "In two months, Craven, okay?" I said, "I don't think you can get it in two years."

But he was very insistent. I suddenly remembered, from my minesweeping days a technique called 'projected pulse.' Projected pulse is traveling toward a minefield as fast as you could go, and turning off just before you got there, and the waves would go on over the minefield, and hopefully you could sweep away some pressure mines that way. I calculated what we needed to get a real-sized wave going over the thing. I calculated that our largest aircraft carrier, going at top speed, would be just right. Then I looked at the profile of San Clemente Island, and I discovered that it went this way, and then it bulged out like this. So, there was the pop-up. If you steamed with markers on the hill up there, straight for the markers, and then turned off just before you got to the pop-up, you

would not run aground. You projected a pulse over the thing.

INTERVIEWER: Did you talk to the aircraft carrier helmsman before you did this?

DR. CRAVEN: No, not yet. You ought to hear how this story works out. I ran some tests in the Model Basin to check it out. It checked out fine. I made this recommendation, and it was carried up to the CNO. When the CNO heard that their best carriers were going to be shot straight for the shore, the answer came back, "You guys must be out of your mind. You're not going to do it."

INTERVIEWER: Was it Burke who was the CNO?

DR. CRAVEN: I think Burke was the CNO. Yes. He was famous for a hard and fast rigid pattern and rule that he had. He only talked to the head man. The reason he did that was because he felt that it was only the head man that could countermand the people below him, and, therefore, carry out the wishes of the admiral. There's a lot of truth to that. But the carrier had been rejected. They came back to me, and I said, "Well, a heavy cruiser will do just as well." They went back up to the CNO with the idea of a heavy cruiser. I don't know who was the CNO, but he said, "If you can find any cruiser skipper who is crazy enough to carry this operation out, you can do it." They went to the cruiser skippers down at Long Beach. If you stop and think about it, from the cruiser skipper's standpoint, it's a perfectly feasible operation to carry out. If you wanted to make flag rank, that was the thing to do. There was a skipper that said, "Yeah, sure. I'm glad to do it." We came up, and this was another exciting moment in my life, when I was sitting on this platform, and the cruiser was headed right for me. As the helmsman before, I said, "I hope this guy doesn't panic and do left-standing rudder when it should be right-standing rudder or right stand when it should be left standing rudder." As it was coming, I was shouting, "Turn, damn it, turn!" Sure enough, it turned and headed out to sea. It turned out that the captain put two helmsmen on. One guy was to watch the other guy, and to make sure that, in case one guy froze, the other guy would take over. We only needed one test. That test showed us that, at least in that configuration, the missile wasn't bothered at all by the wave. We chose the worst phase of the wave. At that point, every other cruiser skipper demanded his chance to come up and do it also.

INTERVIEWER: You had plenty of waves.

DR. CRAVEN: We had plenty of waves. We had more waves than we really needed.

INTERVIEWER: Why could you not reproduce this benign effect in the Model Basin tests, in the tank tests, or did this produce the opposite result for you? Could you simulate?

DR. CRAVEN: I'll give you that answer and I'll tell you what we did and the reason you couldn't get it on the proper test. We were involved with gas dynamics. We were involved with a gas bubble. That meant that you had to model the atmosphere. If you were going to do a one-tenth scale model of the missile, and you wanted it to be right, you had to reduce the atmosphere above in the air to one-tenth of the value. Instead of having 14.7 psi, you had to have 1.47 psi in the atmosphere above. That way, the bubble would expand properly in the model, as it did in the prototype. Nobody had a Model Basin tank in which you could reduce the atmospheric pressure.

In the meantime, Lockheed, which was trying to take the launching and handling jobs away from Westinghouse, went and proposed that they could build a facility, called LUMLF, the Lockheed Underwater Missile Launching Facility. At a great cost, they were going to build this multimillion-dollar facility, at which you could reduce the pressure and test the missile properly. Of course, Westinghouse complained bitterly and the Special Projects Office told Lockheed, "No, we're not going to fund you on the LUMLF." Lockheed took the bit in its mouth and started building the facility anyhow. They figured that if they built the facility, they would get no competition. Then someone asked, "Hey, Craven, can't you build a facility at the Model Basin in a short period of time at almost no cost that will compete with the Lockheed facility?"

My first reaction was that I could not. I suddenly thought, "Hey, what I'll do is I'll violate certain model parameters, and I will launch a very, very heavy missile. I'll launch the heavy missile so that I have a bubble that is big enough so that it will expand theoretically to the right diameter in the model as compared to the thing above." In other words, I distorted my model by shooting a heavy missile. By shooting a heavy missile, I had to use a very heavy pulse and a lot more gas than the model required. That made it burst through the 14.7 psi as though it were 1.47 psi, or whatever it

happened to be.

Lockheed scoffed at that. Westinghouse went ahead and we did it. When we did it, we solved the problem. But we didn't solve the problem immediately. As a matter of fact, we didn't solve the problem until after we had some embarrassing moments with the submarine itself. The problem was the fact that you had a diaphragm up there. The missile had a point on it at which the diaphragm had to be ruptured. It was not being ruptured symmetrically. It was being asymmetrically ruptured, and therefore, the bubble was coming out on one side of the missile and tipping it over on some of the launches. We saw that by merely putting primacord on the thing, so that the entire diaphragm ruptured symmetrically on both sides, the missile would come out. We didn't know that at the time that we launched the missile from the *USS George Washington*. The first missile from the *George Washington* came out at an angle that almost hit the stops in pitch and in yaw, okay. You still get a heart attack when you watch that missile coming out, because it came out and does the same thing every time in the pictures, and you're sure it's going to fail, and then it rights itself and goes on its way.

Then the next one we fired was perfect. We were feeling very confident. We invited the Joint Chiefs of Staff (JCS) aboard the submarine, and all their guys. We put on a great big display. We launched a missile, and it didn't get out of the water, and it came back and hit the hull with a great big thump. We launched a second missile. It didn't get out of the water, and it hit with a great big thump. Then we launched a third, and then a fourth. We'd launched four missiles, and none of them got out of the water. They all came back. We knew that there was no danger because, and I cite this in the book, we had made that missile propellant completely non-explosive. We had made that propellant and we made ashtrays out of the propellant and put them on our desks, because you couldn't set them off with a cigarette. I wasn't on board for those tests. The special project people who were on board weren't terrified. But, as we say, only the laundry man knew how the rest of the JCS felt.

Then we were in deep trouble as far as competition between the services for the missile

system was concerned. In between that and the next time, we solved the problem, much to Lockheed's chagrin. They had to pay me a bottle of whiskey because we placed a bet as to which facility was going to solve the problem. We had to agree that our facility solved the problem, and theirs didn't. They got paid for theirs, anyhow.

On the next test we did we sent the submarine out to sea so that the reporters wouldn't see it on the range. We launched six missiles, and it was six for six perfectly. Then we had the problem that we hadn't thought of. Could we improve the accuracy? They tossed that problem to the chief scientist again.

Then we developed a technique that we used in the search for the USS *Scorpion*, of going out to roughly the site where the submarine was, and precisely dropping charges. Then we related the bubble pulse from the submarine to those charges to get the precise launch position. We were back in business again for evaluation.

INTERVIEWER: At that point in time, you were still at the Model Basin, solving these problems?

DR. CRAVEN: No. I left the Model Basin before I solved the problems, and here is the reason I left the Model Basin. The Special Projects Office was moving at a pace to produce one submarine in twenty years when the Russians launch *Sputnik*. All of a sudden, the whole pace of the program changed, and it changed to one in which they took four submarines and cut them in half, and they set a schedule for production of submarines that just completely changed the management problem of the Special Projects Office. When it did that, we had the genius, and I think it was Rayburn's in that case, of knowing that if you came up with a major system of one sort, the enemy was going to come up with a countermeasure. You had better start on the counter-countermeasure at the same time that you start on the measure, or you'd get caught with your pants down. Rayburn said, "I want to set up a special long-range program, which was called the Polaris Ad Hoc Long-Range Groups, or PAHLRG." It had some crazy title. He said, "And I want that group to be divorced from looking at the current special projects development. I want them to be looking downstream, and I want them to look at each laboratory and at what they think the future deterrent is going to be, and carry on a

research. To do this, I'm going to set up a committee that consists of the laboratory head of every laboratory." They did that until they got to the Model Basin. There, in the Model Basin, Eli Wright said, "I'm not going to put myself on the committee. I want to put this GS-12, Craven, on the committee." The committee consisted of heads from every lab except me. What happened to the committee was that the committee was the only group that got briefed on every phase of the Polaris program. Because the way we managed Polaris and the real program was that we had sharp interfaces between each subsystem, and we refused to allow anyone in subsystem A to talk to subsystem B.

Every subsystem had to be developed completely independently, on its own, and only match the interfaces that were set out for it. That was the way we solved the Tower of Babel phenomenon. That was the only way we could get people to go and get this thing done on time. It was to divide it into subsystems with sharp interfaces, and then tell the people involved with those subsystems, "You cannot talk to anybody else in the program." For the long-range group, each one of the subsystems briefed us, over a period of time. The long-range group was now the only group that saw the whole product.

Then Polaris' chief scientist ran the group. He was a very brilliant guy, who was, however, not a technical man in that sense. He was an operations analysis man, and strategy man. He was omnivorous as a reader. He'd read everything that was ever to be read. He came in the morning, and he read the *London Times*, and he read this and he reads that, and he read *Aviation Week* and all those things. He knew what he needed to know during the time that we were battling for a position to just be a program. But he also knew during this time, and so did Admiral Rayburn, that he didn't know enough to be a chief scientist.

INTERVIEWER: Who was this person?

DR. CRAVEN: He was Bill Whitmore, or William Whitmore, Dr. William Whitmore. They decided that they'd get a chief scientist and the chief scientist was to have no line responsibility, but to be a chief kibitzer, as I said. He was to be the Oracle at Delphi or the high priest, as it were, so that when

somebody or some subsystem had a problem they couldn't solve, they went to that guy. That guy had to develop a technique for solving the problems when problems came up, or not a technique, but just to hold their hands, as the case may have been.

But it was a lot of genius, and I think it was Admiral Levering Smith's genius, to recognize that you had to have a guy like that in a program like that. Without a separate kibitzer or Oracle at Delphi, I had to produce a systems appraisal committee report for every steering task group, which met either once a month or during crisis periods. It was my job to look over the whole system, come in and appraise the whole system, and see if I couldn't find flaws or weaknesses, or systems failures, that were coming up and call it to their attention. That was the proactive part of my job, but the passive-active part of my job was to just sit in the office and have these guys come tearing in and say, "Hey, Doctor, we've got this problem. What are we going to do?" Bill Whitmore called up each laboratory head in turn, and offered him the job of chief scientist. Then he called me up and asked, "How would you like to be chief scientist?" I said, "Bill, I'm only a GS-12, and you're a GS-18. That can't be done." He said, "I didn't know you were that junior, or that young. I guess you're right, you can't be chief scientist."

I literally flung the telephone against the wall and put it down. A few minutes later, I got a call from Admiral Rayburn. He asked, "Why won't you be my chief scientist?" I started to explain it to him. He said, "Are you going to tell me what I can do and what I can't do?" I said no. He said, "Well, will you be the chief scientist?" I said, "Well, I guess so. I'll be the chief scientist." He said, "Okay, report in the morning."

I reported in the morning. They ushered me into this room with a great big desk and a flag and everything of the kind, and they introduced me around as chief scientist. They put the civil service announcement out for the chief scientist, and they put it out as a GS-16, GS-17, or GS-18, depending upon qualifications. I was not allowed to submit an application, of course. That didn't bother them, because they had a committee to do the selection. When the first group came in, they were deemed all to be unqualified. Then they did it again, and when the second group came in, they

were all deemed to be unqualified.

At that point, under civil service regulations, you can go outside of the qualification thing. They went outside of the qualification thing. I never filled out any forms at all. I had nothing to do with the process. At that point, they called me and said, "Okay, Craven, you've been promoted from a GS-12 to a GS-16." One year later, I was automatically a GS-17 and the next year I was automatically GS-18. What that, in the long term aspect of history, means, was that I had a senior position from that day one, even to the present day. It gives you a unique place in history.

I remember at about that time I was having lunch with a general in the Air Force. I'll get his name in just a minute. He was a general at age 34. I had a lunch with him when he was about 54 or 55. He said, "Craven, I'm going to give you some advice. Everyone thinks I'm dead because they just equate me with General Norstad." I think Norstad was the first general of the Air Force, you see. He said, "That's exactly what's going to happen." Now, that is literally true. When people ask if I am related to the John Craven who was the chief scientist of Polaris, I say that was my grandfather. From a generation standpoint, and from a career standpoint, I used to say that was my father. But now I say that was my grandfather, because that was forty years ago. That's two generations.

I was appointed chief scientist. I cite in the book my first day, as an example of what every day was like. On the first day I was there, in came the navigation people. They said, "Hey, Doctor, we've got a problem. We don't know whether to buy a maser amplifier for the radiometric sextant."

Now, at that point in time, lasers had not been invented. Lasers really hadn't been invented. I asked, "a what for the who?" They said, "Magnetic amplification of stimulated electromagnetic radiation for the radiometric section, which measures the radio signal of the stars." I figured "Okay, time for me to walk out of the office and throw in the sponge." I said, "You know, when do you want the answer?" They said, "Tomorrow." I called up Sid Reed in O&R, who was the resident guru in this area. I don't know if you interviewed Sid Reed or not, but anyhow, I talked to Sid Reed. I said, "Sid, can you tell me about masers?" He said, "No, I can't tell you about masers." I asked, "Is there some library material?" There was no library material.

Finally, he said, "If you want to know about masers, call up Charlie Townes . If anyone knows about it, it's him. If anyone's inventing it, he's inventing it." I called up Professor Townes.

INTERVIEWER: Where was he?

DR. CRAVEN: Well, this is a big argument in the whole book. I thought he was up in Boston, in my recollection. One of the problems with the book is that I have an 'un-researched' recollection. The only research that was done was done by the editors, who came back and said, "Hey, Craven, you're wrong on these items."

It turns out that Townes apparently moved up to MIT or Harvard University. He was at Columbia University, they say. They say he was at Columbia. My recollection is that I did not talk to him at Columbia. My recollection is that I talked to him at Harvard. But I guess he never was at Harvard. He was at MIT. I don't know. Be that as it may, I called him up wherever he was. I told him to talk me through it like I was a freshman in college, which he did. Then he got to one point, and he said, "I think the signal-to-noise ratio will be the following." I forget what that number was.

As soon as he said that, I had my answer. All we wanted to know was what the signal-to-noise ratio was going to be if we got one of these things. The next day I said to them, "Fellows, I think the signal to noise ratio will be the following, and therefore, we should get one, and we can use it." We got one, and it worked fine, and did the whole thing.

Then that was the kind of the thing that I got hit with day after day, and there weren't any subject areas. It went all the way from "So what are we going to do about the cigarette smoke in the thing?" to "What are we going to do about having a secure code for the President to send a message and make absolutely sure it was secure?" There were competing contractors coming in with competing techniques. We didn't know how to evaluate these techniques. They'd say, "Okay, Craven? Go evaluate these techniques."

In a way, it was actually a Ph.D. exam in a new subject almost on a daily basis, but you could handle it if you had an understanding of physics. The thing that I'm proud of is that I have an understanding of physics like John Isaacs has. I was in college long enough and in graduate school. I

took all sorts of courses, and I had the experience in high school and everything else, and as soon as I saw a problem, I did the following thing to it.

First, they came in with a new scheme or new idea. The first thing I said was, "Is it physically correct?" I dug through it to see if it was physically correct. The next question I asked was, "What is the engineering difficulty that's going to prevent you from making this into an engineering concept?" If they didn't know what that engineering difficulty was, I threw them out of the office. If they did know what the engineering difficulty is, I said, "how do you propose to solve it?" For example, it was like that on the transit satellite, which we sponsored. They came in and they said, "We're going to use the satellite for navigation." My first question was, "Well, what are you going to use for a baseline over the ocean?" The answer was, "Well, we haven't got a baseline over the ocean." I said, "Well, what are you going to do?" They responded, "Well, we're going to fire it from different directions. We're going to use baselines over the land, and we're going to try and fare in results, and through iterations, get the trajectory over the ocean." I said, "Well, fellows, how are you going to do that, unless you know the shape of the earth? They said, "Well, you're right, but we don't know the shape of the earth." I responded, "Well, what are you going to do about that?" They said, "Well, we're going to have a program to find out the shape of the earth." I said, "Well, that's good enough." I asked, "What are you going to do now about the distribution of the gravity field?" They said they were going to send ships out and measure the gravity field. They were going to measure it enough at the start to make it the most accurate system. As soon as they answered those questions in a way that went on, I told Levering Smith that he could go ahead and do it. Levering Smith said, "Hey, are they going to get it done in time for the first launch?"

This calls to mind an interesting story, which involved pearlitic graphite. We needed a new low-cost re-entry body material. Pearlitic graphite is graphite laid down in sheets so that it has a high thermal conductivity in one direction, and a very low one in the other direction. There was a company that had pearlitic graphite, and they were starting to develop techniques to make the first shield. Levering cut the program off because he saw their schedule was such that we could not make

the first A-1 missile. They came to me, and they complained bitterly. I thought they could make it. I went to see Levering. I said, "Levering, I think these guys can make it." He said, "Okay, Craven, you manage the project, but you keep reporting to me. If there's any day that they can't make it, we kill the program." They went to it and they almost made it. There came the day when I told Admiral Smith, "I'm sorry, they're not going to make it." We killed the program. I really felt very badly for those guys.

About a month later, there appeared on the market the pipe, a pipe with a pearlitic graphite bowl that was advertised as being superior. This company sold pearlite graphite pipes to everybody in the program. The pipe turned out to be a failure because it made the smoke so hot that it burnt your tongue. By that time we had come to the A-2 missile. We made the washers for the missile out of pearlitic graphite. They stayed in business anyhow, as all these things were concerned. I just wanted to give you an example of our research and development. We never got involved in a research and development project that extended beyond meeting production goals for a particular missile, A-1, A-2, A-3, or particular submarine things of that sort.

INTERVIEWER: One of the things that was considered very positive about the Polaris project, among many, was the management system that was used that you described part of earlier, the so-called PERT management system. Was it as efficient as it was advertised to be?

DR. CRAVEN: It was until Harvard got into the act. This is a very important point. The way PERT was carried out initially, and the way I always carried PERT in my programs, was that this was a program that went right down to the floor of the shop. The shop's foreman filled out the card. He had to fill out just three things: when was the earliest he was going to produce the product he had to produce? When was the probable time of producing the product he had to produce? When was the latest time he might do it? The guy would think about a scenario in which everything went right, and this was the earliest time. He'd think about it if everything went wrong. He would think, "What am I going to do to substitute it and do it?" He'd give you those three dates.

When you asked the right guy and only the right guy for that, you could put these things in,

and you could come up with the critical path. When you came up with it, you could go down that critical path, and you could see what you had to do to shorten it until it was no longer the critical path. Then you looked at the next critical path, and that system worked like a charm. It really did. Harvard came in and reviewed our management technique, and not only that management technique but other management techniques, also. They didn't believe what we said.

INTERVIEWER: Why were they invited?

DR. CRAVEN: They weren't invited. Well, maybe they were. McNamara, who didn't know how to manage at all, probably invited them. I'll give you some examples of that.

INTERVIEWER: I apologize. Continue what you were talking about. I was just curious.

DR. CRAVEN: Don't apologize. They came up with the 'per cost.' They said, "Look, when you're getting the first figure of the shortage time, we want the cost figure associated with that, and the cost figure associated with that, and the cost figure here. This will give you a handle on costs as well as on completion and schedule time."

Then when you got to the foreman, the foreman threw up his hands. He didn't have the cost. So, every contractor on PERT costs would establish a PERT cost organization. The PERT cost organization would take and massage the guy on the shops thing, and they'd make their cost thing, and they came out, always, with a time that was going to match the contract schedule.

Pretty soon, all the PERT cost guys were at the start to make the schedule. They were going to make the schedule for a long time. All of a sudden, there would be a sudden change. In one production, they fell months and months behind, because reality finally caught up with them. They'd catch up with what were lies up to the point that you did it. When we got euchred into following PERT costs, we almost always got bad results. That was the other thing.

The other management technique that we had that was most effective was to take an R&D project that was really research and development, and give it independently to two contractors. When we would give it to the two contractors, we'd tell them, "You know, at the end of the study, we're going to give the major part of the procurement to the contractor who does it best. But we are

going to give a minor part of the production to the other contractor. The percentage between the two of them is going to be how we judge how well they did in solving or not solving the problem.”

What you had was a program in which the two contractors were checking each other. Each contractor would pick up the phone and call you, and Lockheed would say, “Hey, Westinghouse is screwing up on this project, and here's how they're screwing up,” and so on and so forth.

Westinghouse would come back. The other thing that they would do was they would solve a problem we called ‘solution avoidance.’ Solution avoidance is when you have a problem, and you assign it to a contractor to solve, and he sets up a team, moves families and brings them all together to solve the problem. The solution can be obtained in one day or two days. It never happens, because these people are brought together to solve the problem. They have in their minds, “How many weeks and months is it going to take to solve the problem?” If they ever solve the problem, they go out of business. By having the two contractors, we were avoiding solution avoidance, which was a natural, healthy way of doing it. I'm starting to give you a notion of what the chief scientist was supposed to do. It's going to be hard in this interview. I'll try to do as much as I can, to cover the scope of all of the problems that I had to deal with.

INTERVIEWER: I understand.

DR. CRAVEN: Why don't you ask me some questions?

INTERVIEWER: I'm going to do just that. Some of the people with whom you interacted, who were primarily responsible for Polaris and for its success, are considerable figures in naval history.

DR. CRAVEN: Yes.

INTERVIEWER: You mentioned Levering Smith more than once. Can you characterize Smith for me, the way that you did John Isaacs?

DR. CRAVEN: Yes. Levering Smith started out as a dedicated midshipman and went into gunnery. He didn't have a very strong military presence and was regarded by his fellow naval officers as lacking, until before the war, when you looked at the characteristics of those who were becoming midshipmen. I looked at that very carefully. One of the things you looked for was a military ‘look,’ a

military presence. I almost didn't get in because of my overbite. It didn't look right to be an officer and have an overbite like I have. The ability of a ship to avoid making smoke was very important.

Levering graduated from the Naval Academy fairly undistinguished but went on as a gunnery and an ordnance guy. In the ordnance business, you learned very quickly, and it's in my book, that your first mistake was your last. Anyone who went into ordnance very quickly developed the notion that you did things with care, and you didn't make any mistakes. When you asked Levering a question, before he'd answer it, sometimes he'd think for a minute. Sometimes he'd take his pocket comb out and comb his hair, and he'd just keep combing. Once, I timed him for more than two minutes in answering a question that I asked him. That man learned how to think before taking an action. Then the war came along, and he was on a destroyer that had to take people out of the Philippines. He was quickly transferred to a cruiser, and I forget which one it was, but it was the flag cruiser of the ships that were lost at the Battle of Savo Island.

During that, he prepared the battle plan for these cruisers. There were all these slots. When the targets of opportunity came from the Japanese, they'd be on one side of the slot, and they'd pass through the slot. He got it fixed up so that the cruisers were lined up so that the cruiser with the longest and most accurate range was furthest away, and the other one was nearby. He had it that way every time there was an action. The cruiser that fired, after it fired, would turn tail and head out to sea to give a narrow profile for the returning fire of the Japanese. He laid out this plan in great detail. During that time, there was a change of admirals of this fleet. The admiral who did it looked at that thing and said, "That's not military. These guys' cruisers are going to stay in line, all right?"

As Levering said to me in a very private conversation, "This was the moment in my life when I should have resisted." He said to do that, but I didn't. He said, "He was an admiral and I was a commander." We lost five cruisers, one of which Levering was on. When he recovered from the cruiser loss, they put him on a carrier. I think it was the USS *Hancock*. We lost that carrier also.

After we lost that carrier, he got transferred to the nuclear weapons program, and he went

with the USS *Indianapolis* out to sea. But he didn't go on the last trip. He got detached before he went on the last trip. You had a man who met Admiral Rayburn's criteria, a man who had to perform in battle, and knew that when you didn't perform correctly you died. Who knew that you must do everything right and correctly? He then went to a Naval Ordnance Test Station. He started to work on the solid propellants, following up on Godard's solid propellant rockets. When Rayburn set up his first forty officers he didn't pick Levering immediately as his deputy. He picked a man named Grayson Merrill, who had a very distinguished record.

In a short period of time, Grayson Merrill came to Admiral Rayburn and said, "Admiral, the pace is too tough for me. I have just got to take a week's vacation or two weeks vacation." Rayburn said, "No, can't do it." Finally, Rayburn acceded. Grayson Merrill went on vacation for two weeks. He came back and said, "Admiral, I'm resigning. I'm retiring from the Navy because I just can't take the pace of this job." He said, "Admiral, if I had been gone for only one week, I would have come back." At that point, Rayburn set up a rule that nobody took more than a weeklong vacation, ever. Rayburn's rule was 'I want to see you guys work hard and play hard.'

Then Levering became the technical director. The beautiful thing about Rayburn was that Rayburn knew what he didn't know. Rayburn knew that Levering knew nothing about being a technical director. Rayburn was a great leader. He was a great chooser of people, and things of that kind.

Levering set up all of these ideas about the sharp interfaces, about separating everything in various ways. The other characteristic he had, which I remember distinctly, was that the first seven shots we fired on the cape all went awry. They were spectacular. They shot right across the cape. After the seventh one, we were up in Washington, D.C., but we'd heard this stuff in the blockhouse. We were all walking out of the control center with our heads down. Levering walked out and he was cheerful. I said, "Admiral, how can you be cheerful after our seven disasters?" He said, "Every one failed for a different reason. We learned what the faults are that we have to correct on them. Why do you think we're launching these missiles? We're launching them to find out what's wrong with them,

to correct them. We now have seven things to correct." I thought, "That's right." That's what I'm talking about, the ability to maintain clear logic at a time when the world around you is thinking that you're in a state of disaster. You learn things in battle. When you next have that disaster, the first questions you ask yourself are, "What do I do the next time? Did I learn a lesson?"

The way I put it is, "Every time you go to sea, and you go to sea with a new operation that you haven't done before, and you don't do it carefully, the sea will teach you a lesson you did not want to learn. That's the nature of the sea." It was this calmness and steadiness, and he had various techniques. For example, when he had a staff study done by a contractor, he would tell the contractor, "Do not talk to my people. Do not talk to my people. Do this study completely independently of my people." I was in his office one day, and this contractor was coming in. Levering was reading the second report. He got to a paragraph, and he used to underline these things. He said, "This is not what you said in the last report. Why did you change your mind?" The guy said, "Well, I talked to Captain so-and-so," someone who worked for Levering. He said, "I talked to Captain so-and-so, and he convinced me to change my mind." Levering took the report, turned around and dropped it in the wastepaper basket. He said, "Thank you. You may go." The guy said, "Don't you want to read the report, and see the rest of the report?" He said, "No. If I couldn't trust you on that one thing, how can I trust you on anything else?" The guy said, "It cost you \$10,000." Levering said, "I've wasted \$10,000. Why should I waste any more?"

Another example, now that you ask, is one in which McNamara was very upset with us because we would not use the contract definition phase. McNamara finally called in Levering, and said, "Hey, Levering, everyone's saying that I'm using the contract definition phase as to contract to the late phase. They point to your program as not using the contract definition phase as being so successful. Will you do me a favor? Could you use the contract definition phase on the A-3 missile?" Levering combed his hair, and finally he said, "Well, we don't have many technical changes on the A-3 missile. Yes, I think we could do it. I'll try to do it." Levering tried to comply. He came back and we started the contract definition of the A-3 missile, and all the contractors

groaned, because they had ninety days during which they were going to work 24 hours a day, and they were going to lose their wives and their family. You know, all those horrible things were going to happen.

Right in the middle of the contract definition phase, McNamara called in Levering and said, "Admiral, we've learned some new stuff about Soviet defenses. Can you change the characteristics of the A-3 missile at this point?" Levering said, "Yes, I can, provided that we drop the contract definition phase." McNamara said to drop the contract definition phase. Levering came back, and everyone was ordered to stop and start over. They all asked, "Where shall we send the work product that we've done?" His answer was to 'deep-six' it. We didn't want to see it.

There were grown men who were crying, literally. They had done all this intellectual work, and property, and everything else for one and a half months. Now, they were told that we didn't want to see it. If we had taken the time to look at what they'd done, to try and glean something from it, we never would have made the schedule. Does that give you a feeling? It was this wonderful, calm, cool discipline that he had.

The other day, Commander Tomsy was showing me this fitness report that I had written when I was acting as commanding officer. He showed me Levering Smith's fitness report. It was the most magnificent fitness report, in which Levering points out that Commander Tomsy has to run a program that has strong-willed captains and strong-willed civilians in it, and that Tomsy was able to overcome their strong wills. It was in the fitness report. Tomsy asked if I had written that report for Levering. I said, "No, I didn't. Nobody wrote a report for Levering. Only Levering wrote reports for Levering. He saw what you did. He saw what you had to do, and that was it." Is this helpful?

INTERVIEWER: Yes, definitely. It helps us create characters in our history who were real people, three-dimensional people, so that we don't end up with cardboard cutouts because the people you worked with were anything but.

DR. CRAVEN: That's right. That's exactly right.

INTERVIEWER: At what point, after the success of the initial Polaris system, did you find out that

you were going to be separated, in essence, from SP and moved, essentially on your own?

DR. CRAVEN: Nothing like that happened at all. Let me explain the transition. As part of our developments with the Polaris program, we were developing a new submarine, a new hull for the submarine, for which we used the Bureau of Ships (BuShips) as our subsystem manager. You have to watch that. We used BuShips as our subsystem manager for that part of the design of the USS *Thresher* with which we were concerned. The *Thresher* was designed as a new deep-diving submarine. It's hull design was to be a prototype for future attack boats and Polaris, which we thought was a bad idea.

INTERVIEWER: By the way, why did you think it was a bad idea?

DR. CRAVEN: Well, I'll tell you right now why I thought it was a bad idea. As we went through it, the first thing we discovered was that they were going to shock test the *Thresher*. We said, "We don't want our boats shock tested, and the reason we don't is that our boats do not go in harm's way. They try to stay out of the range of being shock tested. The only weapon the enemy will go after us with is a nuclear weapon. If he goes after us with a nuclear weapon, and if the nuclear weapon is far enough away, the thing is enveloped with an overall pressure wave, not with the kind of wave that you get from shock testing."

If there were any possibility at all that we might have lost a Polaris submarine as a result of it being shock tested or not having found out all the damage that had occurred, we did not do it. We thought that would be a disaster with which the nation could not cope, compared to losing an attack boat for the same reason.

INTERVIEWER: Can you say why?

DR. CRAVEN: Yes. Later on, in my book, I talk about this Soviet rogue. When you lost a ballistic missile submarine at sea and you didn't know why you lost it, both leaders were on the hotlines to find out whether it was a rogue. Was it lost by enemy action? You were talking about a vital threat to the security of the nation, in terms of having a deterrent online, unless and until you knew exactly why you had lost that submarine and can demonstrate to the enemy and to yourself why you lost it.

Therefore, you did everything you could do, in your power, to make sure that you weren't going to lose your submarines. You had a different set of criteria for the submarine for when it went into harm's way. The guy who went in harm's way fully expected to be depth charged. He would be depth charged. He didn't want to be depth charged in such a way that a simple flaw that could have been fixed, as the result of shock testing, was the flaw that killed him in battle. You had these diametrically opposed mission requirements that went right into the design and development.

The second part about it was that it was a deep-submerging submarine, deeper than any other submarine. Later, you'll see why this featured in the *Thresher* loss. For us, that's what we wanted. The deeper we could go, the more secure we were, the more hidden we were, and the more invulnerable we were to nuclear weapon overpressure. We wanted to go deep.

T-AGS boats didn't want to go deep. They wanted to go shallow. They were not going to pay as much attention to making sure that when the boat went deep it went deep safely. But we discovered that later on. The issue over shock testing got so strong that there was a conference, which I attended, between Admiral James and Admiral Gallatin.

INTERVIEWER: James was from BuShips.

DR. CRAVEN: James was from BuShips and Gallatin was in our special project yard, and at the end, there were two red-faced admirals leaning across the desk. James said, "Admiral Gallatin, if I were you, I couldn't sleep at night knowing that my submarines had not been shock tested." Gallatin leaned over and said, "Admiral James, if I were you, I couldn't sleep at night knowing that they had been shock tested."

The *Thresher* was shock tested. It was the most shock tested vessel in the United States Navy. They probably dropped the charge off too close to the *Thresher*. It came into port with a tremendous amount of damage. Then BuShips went and, quote, unquote, repaired all the damage. After they repaired all the damage, they took it out for its deep dive. They took it out for its deep dive on the day that there was a meeting in Annapolis of all the top submarine people. The reason they did it was because they expected the results to be perfect and that it would be a moment for

celebration. Admiral Rayburn was using it as a moment for what I call a 'revival meeting,' but Grenfell was running the whole thing. He started to run the whole meeting and I was sitting next to Harry Jackson, who was the recently departed EDO on the *Thresher*. Grenfell was called out of the meeting and he came back and his face was ashen. He said, "Gentlemen, the *Thresher* is down and lost on the test." That was, as I pointed out in the book, a personal shock. It was 129 members of your family. It was not just loss of the sub. Jackson said, "I should be there, I should be there."

As soon as that was over, two things happened. One was that they immediately went to work on and almost immediately knew that if that poor guy used the protocol that you used on shallow dives, he never would have made it. You didn't know whether he was given the new protocol, and you hoped he was given the new protocol, because in the protocol for emergency dives, for emergency ballast blow, there was a four-inch pipe that failed. The skipper was told, "Do not come to the surface until you have exhausted x-numbers of minutes searching the surface to make sure that nothing is there. As soon as you know that nothing is there, you don't have to wait that full length of time, but you had to keep searching that full length of time until you were sure that nothing is there. Then you blow ballast." That was based on the calculation of how much water was coming into the boat at that depth. When you went deeper, the initial ballast bubble was smaller. The rate at which the water was pouring into the ship was larger. That protocol had to be changed to a much shorter time. We went back and reviewed it. It turned out that that shallow water protocol used at that depth wasn't going to work. You knew that one of the major things you had to change was the ballast blow. The Sub Safe Program started off with redoing all the ballast systems to make them safe. At the same time, they initiated the Stephan Committee to look at the Navy and deep submergence.

INTERVIEWER: Who was Admiral Stephan?

DR. CRAVEN: He was the oceanographer for the Navy. He wasn't a ship's EDO. He started a committee and looked for volunteers to serve on the committee. He went to BuShips and they hadn't anyone to spare. Then he came to me and I had got all these guys that worked on the long-range program. Without any intention to stack the deck, I provided guys from all these laboratories who

had worked on the long-range program. One of the things I had done with the long-range program was a lot of work on deep submergence. I did a tremendous amount of work on deep submergence because I felt that it would be very important in the future.

The Stephan Committee met and when they met, they came up with the first idea for the Deep Submergence Systems Project (DSSP), which was to get a deep submergence search vehicle to get a large object salvage and recovery vehicle. It didn't include things like Man in the Sea or things of that kind, but it did that. Then they made a recommendation and because of that recommendation, BuShips was fit to be tied. They recommended that the Special Projects Office carry out the program. That was the first time, in the history of the Navy that BuShips did not do the full development and design of a ship. I think that was the kindest thing to say because it meant that they had confidence in the Special Projects Office.

The other thing to say was that they were all Naval Academy graduates. Naval Academy graduates did all the designs, and they were there. Somehow or other the line officers really felt that their brother had let them down. They felt that if it had been another kind of a case there would have been some court martials, particularly with that protocol at depth. There was absolutely no excuse for him to have had the wrong protocol. If he had the right protocol, there was no excuse for not having increased the ballast blow capability had he know that was a problem.

INTERVIEWER: Didn't the emergency blow valve freeze up?

DR. CRAVEN: I don't know. I'm just telling you what I do know. I presume he had the right protocol, but when you were looking for failure, you were always looking for whether they didn't do it correctly. You'd ask, "Is that a cause of failure?" You could go back and evaluate the cause and you could say, "Well, in any event, the cause traces back to something that failed." Did it fail because of shock testing? It failed because of shock testing. I mean, of course, it didn't fail because of shock testing, but it did fail because of shock testing. You see why the line officers had this concern and why the line officers felt the Special Projects Office could carry this out. It was assigned to the Special Projects Office, and I don't know who was the head Then Levering or whoever.

Levering made the determination that it got assigned to the Office of the Chief Scientist. I was made the head of Deep Submergence System Project below that level. Then it became very quickly apparent that the pace of special projects and the pace of deep submergence were different and that deep submergence qualified as a second project.

By that time the Navy had established an organization called the 'Chief of Naval Materiel' over all the commands. The Chief of Naval Materiel decided the deep submergence project should be made a separate project. As they made it a separate project they had this dilemma as to whether they were going to put an EDO BuShips captain in charge of it. I don't want to overstate this, but they were reluctant to take charge. They were reluctant to take charge for two reasons. One was because there was a certain disloyalty to the bureau to come over and take charge. They didn't believe that the technology was going to work. I'll tell you what the evidence and proof of that was. They didn't believe that the technology was going to work. At that point, they made the decision that I would be the project manager. They were caught with the fact and the dilemma that I was a civilian at that point. They went through all this stuff. It almost got to be humorous when someone said, "Well, he's an ensign in the Civil Engineering Corps. We'll call him back and make him a commodore." Moe Hart proposed that. They finally looked to it and they said, "Hey, we can call him back and we can give him the legal status of a commanding officer."

Later on, it was going to turn out to really have problems that I don't think anyone anticipated, in terms of that legal status. They came to a point at which I said, "Hey, you've got to have a military man as the project manager on this thing." We'll come to that fairly shortly. The Deep Submergence Systems Project was set up. I can now reveal this. It's in the book. Some time in 1965, the intelligence people, and this was really at a level above the Navy, said to themselves, "Hey, I wonder if this new technology and these new equipments can be useful in U.S. intelligence." They came back and they sort of charged the Navy with doing this. The Navy called me over into the skunkworks and to Captain Bradley and his predecessor. I forget what his predecessor's name was. Maybe you'll find that out.

INTERVIEWER: Where were the skunkworks?

DR. CRAVEN: They were in the Pentagon. Just about all the skunkworks were in the Pentagon. Not all of them were, but just about. They sat me down and they told me about a mission requirement on the part of the Assistant Secretary of Defense for Nuclear Matters. He had a mission requirement to locate nuclear weapons throughout the entire world, wherever they were, and attempt to define where they were and what command and control they were under; and if they were lost in the ocean, where they were in the ocean. If they were lost in the ocean, he had the mission requirement to recover them, if he could.

That's why it came down from above. Now, it comes down from above the ocean. The question was whether the Deep Submergence Program, with a deep submergence vehicle and a Deep Submergence Rescue Vehicle (DSRV), start to carry out that mission? They brought me over and said, "You know, can you do this?" We discussed it and we came up with three capabilities. One capability we came up with was one that we weren't sure was going to really exist and that was saturation diving. At that point, we had not even started SeaLab II, or we'd barely started SeaLab II. The feasibility of saturation diving was not known. We decided that saturation diving would probably work and it would probably be in operational capability. We came up with three capabilities. One was a submarine that turned out to be the USS *Halibut*, a submarine that was capable of putting sensors and things down to the deep ocean and taking as much stuff as you could carry from the deep ocean. Then we were going to modify the *Halibut* in full secret to do that.

Second, we were going to build, in complete secret, an artificial USS *Trieste* and use the existing *Trieste* as a cover-up. When we wanted to do a mission with the artificial *Trieste*, we'd publicly say that the *Trieste* was out on a mission so that the Russians could see the *Trieste* going out on a mission. That made it possible for them to not see the new *Trieste*. It was built in such secrecy that no one knew it existed.

Third, we were going to take a submarine and begin to modify it as we had to, so as to support saturation divers when and if saturation diving became an operational capability. At that

time we identified the *Seawolf* as the submarine to be modified. We had a mission that involved project management of the modification, or construction, of three devices. One was the *Halibut*, one was the *Seawolf*, and the third one was the *Trieste*.

INTERVIEWER: Did the people involved with either the saturation diving program or the *Trieste* realize that they were about to be picked up by an intelligence-motivated project under your direction?

DR. CRAVEN: No. Some of them just found out yesterday.

INTERVIEWER: Yes. We concluded that a few days ago.

DR. CRAVEN: That's right, absolutely. I'll talk more about that, as a matter of fact. No, they didn't know anything about it and I didn't know that the Man in the Sea Program was going to be assigned to DSSP. When I made that decision, I just presumed somebody else was going to develop saturation diving. I came back and, all of a sudden, to my shock and surprise, was assigned the responsibility for saturation diving and the responsibility for SeaLab II. It was not quite yet in the middle of SeaLab II, but right in the beginning. It came at a time that was very inconvenient for me to do anything other than to tell the commanding officer of SeaLab II, "Go do what you're going to do and just keep me informed." Yet, at the same time, I knew that I had real responsibility if anything went wrong on SeaLab II. SeaLab II was not organized properly, from a naval standpoint, in my estimation. It may have been organized correctly, but the commanding officer was not in attendance one hundred percent of the time.

INTERVIEWER: What did that mean?

DR. CRAVEN: It meant he went back to O&R. He was from O&R. He had responsibilities in O&R.

INTERVIEWER: Who was he, by the way?

DR. CRAVEN: I don't remember who he was. I don't blame him. I'm just saying that was the way it was organized. The way I organized it, Tomsy was going to be there one hundred percent of the time. A commanding officer was going to be there one hundred percent of the time, and if he was not there one hundred percent of the time he would have needed a commanding officer to relieve

him. That's what an operation in the Navy is all about.

INTERVIEWER: Did you know George Bond?

DR. CRAVEN: Oh, I knew him very, very well. George Bond was on my staff. In typical George Bond style, when he got on the staff I was SP-001. When George Bond got on, he said that he ought to be SP-007. He was SP-007. That was the way we organized Polaris. Admiral Rayburn was SP-00.

INTERVIEWER: You had your own double-O-7, right?

DR. CRAVEN: I was double-O-1. We had our own double-O-7. We called him 'double-O-7.'

INTERVIEWER: What was it about Jackson Tomsy that inclined you to place him in that particular role?

DR. CRAVEN: I'll get to that, but that's almost getting ahead of the story. I suddenly realized, of course, that they should assign it to me because I now saw the connectivity between the SeaLab and the *Seawolf*, okay. But I also knew that, in the nature of this security, no one was to know that connectivity unless they had a need to know. When the *Seawolf* was being modified, the people on it had no idea why the *Seawolf* was being modified. The shipyard had no idea why the *Seawolf* was being modified. We just told them, "At this point, we want you to cut the *Seawolf* in half and open it up and get ready to put another section in and so on and so forth, with certain characteristics." That was very bad for the morale of the *Seawolf* crew. It was terrible for the morale of the crew of an operational submarine to be sitting there for a long period of time with all sorts of phony stories being given to them as to why it was still there in the yard.

We got through, successfully, with SeaLab II and we started to organize for SeaLab III. As we did that I was working with Bill Searle, the supervisor of salvage, together, as a joint project for the development of deck decompression chambers, personal transfer capsules, and all the things you needed for an operational Navy of saturation divers. The operational equipment was carried out jointly between Bill Searle and us as part of our large-object salvage capabilities and part of his responsibilities. Therefore, with that we built a thoroughly tested set of equipment. SeaLab III did not have laboratory equipment on the whole thing. Everything was there and ready to go into the

fleet.

As we started on SeaLab III, I had already decided that the management was inappropriate, in terms of an operational command. I was looking around for a project manager. Bill Searle called me up and said, "You want to get 'Blackjack' Tomsky." I asked, "Who's Blackjack Tomsky?" He explained that Tomsky was a Mustang commander who had a lifetime of experience at sea with salvage, and he was the head of the EDO. I said to Searle, "Hey, I don't want that. I want a project manager, okay? I want a project manager." Searle said, "Well, you should take Blackjack, okay?" That was it. An hour later, I got a call and a man said, "This is Blackjack Tomsky. Can I come over and talk to you?" He came over and he talked to me, and as I describe it in the book, he sat down and leaned over and he said, "What makes you think I can't be your project manager?" He said it in the same tone of voice I later recount him saying, "What makes you think I haven't got an ace in the hole?" If you played poker long enough, you know exactly what a guy means when he says it to you in that tone of voice.

I went down the list of all the elements of the project, and he answered, "Yes, I can do that" or "No, I can't, but I'll learn." When he finished that whole thing I said to myself, "Congratulations, Jack. You're the commanding officer and the project manager of this project. You are the kind of guy I want." Again, he had the credentials of solving all these problems in battle. If there's anybody who has a terrible time it's the salvage master during a war. Can you imagine that? I mean, you're getting shot at while you're doing salvage and things of that kind.

The next thing that I immediately did with Blackjack, which I knew I had to do, was tell him, "You know, I do not like to be head of a project in which I don't know the technology. I want you to get me acclimated and learn this technology as fast as you can. I don't mind if you cut corners or anything of that kind. I want you to do it as fast as you can." As I write in the book, he said, "All right, I think we can do that. Are you in good health?" That was my medical exam. He said, "Can you swim?" I said yes. That was my swimming proficiency exam. He told me to report to the Experimental Diving Unit next Monday. I reported to the diving unit next Monday, and the first

thing that happened was that in the morning, I swam with every single piece of open-cycle and close-cycle SCUBA gear in the United States Navy. I *swam*. I had a chief going alongside me with his fist clenched, ready to punch me in the belly in case I held my breath. I finished the morning and we had a little lunch and I asked, "Was that it?" No, no, no. They took me and they put me in a hardhat diving suit. They took me and they dumped in the Anacostia River and they gave me a thing to assemble. When I got down to the bottom of the river and put the thing up to my face, I couldn't see anything.

I don't know if you saw *Men of Honor*, but the toughest thing in *Men of Honor* is when he gets down and the assembly's been thrown down and he has to assemble it. He's told, "You got to stay down there and assemble it or you flunk." I got down there and I dropped this equipment and I call up to Tomsy and said, "I've got this stuff in the mud. What do I do now?" Tomsy said, "You get it and you assemble it." I got it and I assembled it. It was difficult, though, you know, and they pulled me up. I asked, "Okay, am I finished now?" No, no, no.

Then they put me in a compression chamber and they took me down to 200 feet and brought me back up again so I could get the feeling of going down to 200 feet and coming back up again. That was all in one day, all right. That was my qualification. It served several purposes. First, it served the psychological purposes of Tomsy telling the team, because the whole team was comprised of master divers. They were all Mustangs. I had the advantage of being a Mustang. I mean, you just tell somebody that you're a Mustang. I was this man with service at sea and a good conduct ribbon before I became an ensign. That immediately put you as a Mustang. In the Navy, a Mustang has credibility as a sea person, almost above academy graduates, and legitimately so.

At that point, we started moving out. Jack moved out on the SeaLab program with a great deal of resistance from the people who didn't like the fact that it was being transferred over into this military thing. He never told them anything about the future operational capability. He didn't know too much about that. The SeaLab turned had a disaster when they lost Berry Cannon. That was very clearly the result of sabotage. We know who did the sabotage or we think we know who did the

sabotage.

INTERVIEWER: Do you know what the motive was?

DR. CRAVEN: Yes.

INTERVIEWER: Can you talk about it without mentioning a name?

DR. CRAVEN: I won't. All I'll say is that we had a psychiatrist on our staff. I'm not going to say anything except that there are certain aberrant personalities who, if they're frustrated in achieving their goals, will retaliate with sabotage. I'm getting close to indicating who that might be. I don't want to do that.

We turned all this evidence over to O&I. O&I came up and said that there wasn't enough evidence to warrant, including that in the speculations of the Court of Inquiry. The Court of Inquiry met and Tomsky behaved as a commander. Wattel did not behave. Tomsky just walked up and said, "I'm the commanding officer. There was no baralyme in Berry Cannon's canister, and I am fully responsible." Chief Wells got up and said, "I signed off saying there was baralyme in Berry Cannon's canister. I thought there was baralyme in there, but it was not in there and it's my fault and I take full responsibility." Both got letters of reprimand and they both retired from the Navy. We, who were up there in the top, felt very badly about that, but we suddenly realized this was a tremendous opportunity to put that program in the black.

We informed the Navy that we didn't want to take all the people who were there down to Panama City where the water was so shallow you had to go eighty miles out to sea to get to 600 feet depth. There was a congressman who wanted this thing, and wanted to do the study, and wanted to immediately start an institute, a new program in the black to train saturation divers and to install this equipment on the *Seawolf*. The security of this program and the nature of it was such that I did not know that about one or two weeks after Tomsky retired, he was called back into active duty by the Navy. At that time there were four admirals called back to active duty and Commander Tomsky. He was called back to active duty to report without a uniform in order to setup the school for the new saturation divers. Jack came to work for me a whole year and a half later. He never told me what he

did in the year and a half time. I did not know Jack was called back in until just a few months ago. That was how tight we kept that program. It was so tight that you just presumed that anyone else you saw didn't have a need to know. If they were working on the program you presumed they were working the program with a cover story, a need-to-know or something similar. That program had gone fully into the black. I'll come back to it a little bit later and say what happened to that program about which I can now report.

In the meantime, in parallel, we were starting a deep submergence rescue vehicle program, as a regular Navy development program, going out for contracts and bids, and it was a program that we knew was not going to mature with the DSRV until about 1970 or 1971. But we didn't care because we were going to end up with the advanced technology and do it. We didn't give the whole project to Lockheed.

INTERVIEWER: The time we are talking about is 1968?

DR. CRAVEN: It was in 1965. 1965 was when we started the Deep Submergence Systems Project. The first thing we did on the DSRV to have a whole contractors meeting. In the contractors meeting we put in our preliminary designs on the DSRV. I had a little contracting company work out designs, which I laid out, showing the tri-sphere configurations. They were telling the contractors that we didn't expect to use the tri-sphere configuration, but we were showing it to them as a thing to shoot for, what our preliminary design of the DSRV and the DSRV system. We told them that we wanted them all to make their own designs and their own bids to become the chief contractor.

As we did that, however, we separated, like Polaris did, into subsystems. One of those subsystems was integrated control and display, because we decided that it was time that mating with a submerged submarine was very complex. It was more complex than landing on the moon. We had to have a completely integrated control display, almost hands-off for the operators of this vessel, to engage in the mating process. For that, we selected MIT and the Draper Laboratory. That was a very important decision.

INTERVIEWER: Had you known Draper for a while, by that time, through Polaris?

DR. CRAVEN: Oh, I'd known Draper intimately, at that time, through Polaris because he was our number one man in the development of all the navigation and guidance equipment. What was very interesting was that there was a point at which they decided to do a Draper anniversary volume. Admiral Rayburn was asked to write the history of Draper and he tossed that to me, as the chief scientist, to do it. I went in and I saw the history of Draper all the way back to the shoe box gun site in World War II. Later on, when I went up to MIT, we lived in Draper's house, or the house next to Draper's. Dr. Draper and I were just as close could be. He was a wonderful man, a fabulous guy.

INTERVIEWER: I've never met him.

DR. CRAVEN: No. That's right, but you interviewed people about Draper.

INTERVIEWER: Oh, yes.

DR. CRAVEN: I mean, Draper is a major figure in naval history, there's no question about that.

INTERVIEWER: He was doing the navigation and a display for the DSRV?

DR. CRAVEN: That's right. He did it at command and control so that we programmed different missions into the DSRV. You were approaching your submarine. At that point, the submarine had markers on the hatch. At that point, it was hands-off. The thing would come down and it would mate, or it didn't have the markers. Then we had the screen such that all you did was keep the dot in the center of the screen.

When we had the markers at DSRV we used to get reporters from the newspaper and we'd have them come in and we'd do a mating operation. It was no problem at all. We just did it. It's an easy thing to do now, but at that time, we didn't have the computers and had to use two Apollo computers. I make that point because the Apollo computer, which Ray Ballan had worked on, wasn't big enough. That stemmed primarily from the added mass thing I told you about. There are no added mass problems on the moon, so the landing problem was the same as our landing problem. But in our landing problem, you didn't know whether it was added mass that was causing you to rise, or buoyancy, or things of that kind, and there was no way for the guy at the helm to make that assessment. The only way you could make that assessment was by having gauges all over the entire

DSRV and the equations of the motion of the DSRV were plugged into the computer. By measuring the forces and velocities on there, you solved the equations of the DSRV's motion in the computer. It told the computer what to do next. Do you see how that worked?

INTERVIEWER: Yes.

DR. CRAVEN: We did that and all the contractors went and built mock-ups and other things and they put as many people as they could in the spheres. We ran a very, very complicated test and evaluation. Most of the contractors built their own small submarines, just to win the competition. We had North American. We had Electric Boat, Bill Star, One Star, Two. We had North American, which built Dowb . We had Lockheed, which built Deep Quest. We had Westinghouse, which built the Westinghouse 4000. They built all these vehicles in order to win this contest. Lockheed finally won it. Lockheed got to do the DSRV itself.

Then a very interesting parallel thing happened. We were going to modify submarines to support the DSRV, but the Bureau of Ships decided that they would get into the act. They set up a ships characteristic board to design and build two surface ships to support the DSRV, the USS *Pigeon* and the USS *Ortolon* . A lot of people think that I was involved in the development of the *Pigeon* and the *Ortolon*. In fact, I was involved so much that when I wrote a book for MIT, they put a picture of one of those ships on the cover on the presumption that it was my design. I was really very upset because not only was that not my design, but by that time, I was wild about semi-submerged platforms because catamarans could not take heavy sea states and the *Pigeon* and the *Ortolon* could not take heavy sea states. I mean, that's a little subset. Those ships were useful. I don't want to denigrate them, but what was really useful was to take the DSRV out on a submarine.

At that point, I was running the DSRV program. I was running Man in the Sea. I was running a clandestine *Trieste*. What shall I say about that? That *Trieste* remained clandestine until the USS *Scorpion* came along.

INTERVIEWER: Let me ask you a question. It's something that has confused me for a while. Before you had built what you guys eventually called the USS *Trieste II*, there was a *Trieste II* already in

existence, correct?

DR. CRAVEN: Yes and no.

INTERVIEWER: Well, Don Walsh told me that he contributed to the design of it and I've seen one that does not look like the one at the Navy Yard in a picture on the wall of Chief John Michelle in San Diego.

DR. CRAVEN: That's right. That's different than the one that you'll see in the picture of our *Trieste II*. What you had, essentially, was on *Trieste I*, just like on *Trieste II*, the original sphere had to be replaced. Later on they replaced the original float. As soon as they replaced the original float and the original sphere they changed the configuration of the *Trieste*. But they didn't change much else. They didn't change the shot. They didn't have an integrated control display.

INTERVIEWER: Did they put a ship's faring on it so it could fare better in the towing process?

DR. CRAVEN: I have no idea. They were very angry when I took over the *Trieste* because they couldn't see why I was taking it over and they didn't see that we knew what I was going to do with it. I mean, they still had uses for their *Trieste*, or so they thought, and we just took their baby away. We didn't tell them why. We took their baby away and didn't do much with it because we didn't want to do much with it. We only wanted to use it as a decoy

INTERVIEWER: The *Trieste II* disappeared, didn't it?

DR. CRAVEN: Yes, it disappeared. We had that one disappear when we took the other one out of the closet. The reason we took the other one out of the closet was because the *Scorpion* came up.

INTERVIEWER: That was in 1968.

DR. CRAVEN: By taking it out of the closet we used it as a decoy to distract people from the possibility that we had the *Halibut*. In other words, we felt that the Soviets had no idea, which was true. They had no idea that we had the *Halibut*. We always felt that, in the whole business, whenever you got a system that the Soviets had no idea you had, you had to display the system that would be used to do what that new system is doing. You had to do it in such an overt way that the Soviets were sure that you were not carrying out that mission. Does that make sense?

INTERVIEWER: Yes.

DR. CRAVEN: You were playing dominoes one way or another. You saw that when we brought the *Trieste* out, and when we brought some other systems into play. We were then working on the *Halibut* with the idea that it was going to go out there and watch nose cones and the guidance systems fall into the ocean, observe them and collect them and do things of that nature. There was absolutely no notion as to what was going to come up with the Russian submarine, none whatsoever. Also, maybe if there was a nuclear weapon of some sort, we could go out, find it and search it and do things. We decided to use the phantom *Trieste* for recovery in the deep ocean whenever it came down. We had alternate missions for the DSRV, but I deliberately designed the DSRV to have as much alternate mission capability as you could possibly imagine by postulating almost ridiculous scenarios under which we would have to rescue people. I knew that we were going to get as much money as we needed. In addition, we used that money for cover-up for cover money

Now, before we talk about the *Halibut*, I must talk about the fact that while we were developing the DSSP into all these projects, all of a sudden there came operational capabilities that we hadn't expected. The first one of those was the lost hydrogen bomb off of Palomares. I got a call from the undersecretary concerned about nuclear weapons. He said, "Craven, we've lost the bomb in the ocean off of Palomares and you've got to go get it." I said, "I don't have to go get it." I called Bill Searle. I said, "Hey, Bill, you're the supervisor of salvage. You've got to go get it." Bill Searle said, "I haven't got the equipment or the assets of the technology to go get it. You've got to go get it, Craven." We went back and forth about this for a while and finally, one of us said, "Hey, we'll work together on this as a combined team." We put a team together with Admiral Swanson, Admiral Waters, Bill Searle and myself. I think there may have been another admiral involved with that team. That's the problem with my memory. It was a committee called 'SalvOpsMed.'

Our first problem was getting assets out there that would work. The first thing I got was a call from Woods Hole. The Woods Hole people were very proud of themselves and they believed that nothing was done unless they did it. That's a good attitude to have. Woods Hole called me up

and said, "Don't worry, Craven, we'll send the *Alvin* over and we'll find it and you don't have to worry." I said, "Well, send the *Alvin* over, but we have to put it in an airplane. You can't put anything in an airplane unless you have a detailed structural analysis of the interaction between a heavy weight like that and the airframe. They hadn't thought about that. I put them in touch with the Air Force and they started to work on that. I immediately got the USS *Aluminaut* and put it in the dry dock at Fort Snelling. I had the problem that the Bureau of Ships refused to certify the *Aluminaut*.

INTERVIEWER: No naval officers could ever set foot on her, right?

DR. CRAVEN: No naval officers could set foot in it. But I said to the Bureau of Ships, "That doesn't look right, to go recover hydrogen bombs with only civilian personnel aboard, because it's too dangerous for naval officers to be on?" They didn't agree with me, so I went to the Secretary of Navy. The Secretary of the Navy wrote a letter to the Bureau of Ships that instructed them that they should allow naval officers on board. We never got any naval officers to go on board anyhow, so the *Aluminaut* had purely a civilian crew. That was the nature of the world.

Then we got CURV sent over. I sent over the whole SeaLab team because we didn't know whether it was in shallow water or deep water or what. Then we sent over, of course, all the mine hunters, the minesweeps, and everything else. The Navy sent a cruiser in with an Admiral Guest in charge. Admiral Guest was an airdale, a flier, and he could not believe that the underwater community was so unsophisticated. I mean, he was furious about that because he wanted to know why we didn't have underwater vehicles that had the same research and development capabilities that all his aircraft had. That was a difficult "leak."

We had the problem that the only search doctrines we had were based on mine hunting doctrines, which I had been heavily involved with when I was working on minesweeping and mine hunting. I realized that those doctrines just weren't going to work. That was what I became famous for in *Blind Man's Bluff*, because at that time I had been going to some lectures by a Harvard professor by the name of Ryetha on subjective probability analysis. It was based, fundamentally, on the behavior of bettors at a racetrack. When the bettors go to the racetrack, they bet on the horses

and that determines the odds. In retrospect, 6-to-1 horses are 6-to-1 horses and 10-to-1 horses are 10-to-1 horses. The bettors bet correctly. That means that there is something in their nonverbal knowledge brain that gives them information, which is better than a pure random guess of any kind.

This leads to the notion of taking all the evidence you've got, building up scenarios based on all the evidence, building up scenarios based on a little evidence, building up scenarios that say we disregard all the evidence, but we presume it's somewhere in that area. Then you take these scenarios and get experts, fliers, and other people in there to make bets on the scenarios. You take each scenario and figure out a field of probability as to whether the thing would land. You multiply that field of probability by the bet. Then you add all the probability fields together in such a way the probability of your search doctrine is unified.

When you do that, what's curious is that you almost never get to the high point of any single scenario. The other interesting thing was that in the searches that were conducted, the high point was almost always correct, or close to correct. For the *Scorpion*, we searched that high point and it was within one-eighth of a mile of the submarine when we found it on the bottom. It was kind of amazing. When you were amazed with it you finally said to yourself, "Hey, Ryetha was right." I didn't run them through rigorous calculations, but I hired Wagner Associates to run its own rigorous calculations because I thought that nobody would believe me unless I had somebody run it through such calculations. The net result was that the highest probability happened to be in a place we couldn't go, a deep crevasse, about 1,200 feet deep, and we couldn't get anything down there until we got *Alvin*. But *Alvin* finally arrived at Rota, and we had to get it from Rota to Palomares at the same time that the USS *Fort Snelling* arrived at Rota. We put *Alvin* on the *Fort Snelling* and took both of them over. We really didn't get involved in the search until those two vehicles were in place.

Then *Alvin* went down and found it. Because we didn't have a navigation grid of any kind down there, *Alvin* had to be relieved by the *Aluminaut* because *Alvin* didn't have the staying power. The *Aluminaut* baby-sat the bomb for a long time. If you think you're cold here, those guys were as cold as could be. They sat for the long night until *Alvin* could come down and they could put a

navigation grid on the whole thing.

They then realized that it would be stupid to try to get the *Alvin* to recover it because the parachute had deployed. In our scenarios, there was one parachute deployed or two parachutes deployed or no parachute deployed. On the other scenario, three bombs were deployed but with no parachutes. Each nuclear weapon had two parachutes that slowed them down in the process. That was why we had all these different scenarios.

Anyhow, that was going on while all these other developments were going on. Then as the *Halibut* developed, we had many more problems with it. We finally sent it out on a mission that had two purposes. One was to try to get some information on the Soviet missiles they were dropping in the ocean. The other was to see whether the *Halibut* could be detected or not. We told all the surface ships that a U.S. submarine was going to be in the vicinity and they were encouraged to see if they could detect it. They didn't detect it.

We saw that we had a good clandestine capability with the *Halibut*, although we didn't have any good results. By that time, as it came into port, we were repairing all the weaknesses with the cable that had too high a strain around her shiv. Do you want me to elaborate?

INTERVIEWER: Yes. Oh, yes. I also have a question. For example, in detecting the *Halibut*, was SOSUS able to pick her up?

DR. CRAVEN: No. It could not in that area. SOSUS couldn't pick you up if you were going slowly enough, you know. You had to have something. We took the *Halibut* because it had a very, very large hangar that opened up.

INTERVIEWER: That's right. You had the old Regulus hangar.

DR. CRAVEN: That's right. We could put in a great big fish. When they had the fish, though, we had a cable that had to go down 20,000 feet. The space was such that we had a shiv that was only of a certain maximum diameter. That cable had to go over the shiv and we couldn't find any other way of doing it. We made very careful calculations and discovered that the cable that we were getting couldn't make it. We failed to realize that the cable had welds along the way and that the welds could

not take the stress on which the other thing was. The welds would snap and, when they snapped, the wire would just spring out. When they sprung out you couldn't reel it back in. There were terrible tales of sailors getting up on the high seas and pulling it in on the deck in order to pull the cable back up and get it in place. We had to solve that. The only way to finally solve it was by getting the cable manufacturers to make cables that had 20,000 feet of wire with no welds in it. The big joke was that Bob Frosh was talking to the cable manufacturer and the guy finally said, "You know, Bob, please tell me, for what building is this elevator?"

INTERVIEWER: Was Simplex doing the wiring? Was Simplex doing the cabling?

DR. CRAVEN: I don't remember. It probably was, but I don't remember it. We solved all those problems and we knew we had a working fish. We came back into port and got word that the Soviets had lost a submarine.

INTERVIEWER: By the way, this fish was a sonar?

DR. CRAVEN: The fish had sonar on it. It had sonar. It had optics. The chief thing about it was that we had color cameras that, in my opinion, produced color which was as good as the best color produced today. I suppose they are now using our technology. We had some fabulous new technology on the whole thing and we also had some side-looking sonar that was extremely good. We had just about everything on the fish you could possibly imagine.

The Soviets were chasing for their submarines on the surface. When you lost a submarine you made no pretense about where it was. You went right down the path on which it was supposed to go. It went down the usual path that the Soviet submarines took when they went on station. Ballistic missile submarines go on station. We were trying to find it on SOSUS. We could not find it on SOSUS. Finally, Captain Kelly called me up. Captain Kelly was our SOSUS man.

INTERVIEWER: Was that Joseph Kelly?

DR. CRAVEN: Yes, it was Joseph Kelly. That guy was a hero. He carried SOSUS.

INTERVIEWER: Captain Kelly is deceased. I had an interview done with him, but I never met him. He was the USS *Jezebel*'s project officer from 1951 onward.

DR. CRAVEN: That's right. I mean, he knew everything there was to know about it. He was just a gentleman. He was also an Irishman. He was proud of being an Irishman. He was just a great guy. He called me over. He said, "Hey, Craven, I think I've found the Russian submarine." I said, "Really? Let me see the record." He didn't find it on SOSUS, but he found it on a hydrophone. SOSUS is no good for finding single explosives or single devices because SOSUS is continuously breaking everything down into frequency bands. Unless you have additional hydrophones, you won't find anything. You can use the SOSUS hydrophone and just take the wrong measurement on it. Until the *Scorpion* came, we didn't really do that. After the *Scorpion* we had isolated hydrophones everywhere to pick up those measurements. At that point, the *Scorpion* accident had not occurred. I don't think it had occurred. Those two were almost simultaneous in their occurrence, so I still have confusion. My book clears it up, but I still have confusion on which occurred first.

He said, "Look, I think I found it" and showed me a single blip. I said, "Hey, Joe, there are single blips like that all over the ocean all the time." He said, "Yeah, but look at the location of this one. It's 180/40. 180/40 was not an accident of nature. It was a product of man. It had to be. I said, "Well, gee, that's interesting." He said, "Note that 180/40 is 300 miles away from where the Soviets are looking for their submarine." The blip might have been only be a trace, because it might have made that noise and went on somewhere else, like a rogue. Suddenly, that changed the whole nature of whether you wanted to go look for it.

INTERVIEWER: Can you explain what a rogue was?

DR. CRAVEN: Yes. A rogue was a submarine that was operating contrary to the orders it had received from its command. If it was a ballistic missile submarine that'd been sent out by the Russians, it'd been sent out in order to be on station. You knew that because that was why they were hunting for it. If it was 300 miles away from where they were hunting for it, then you knew that there was no way the guy could have made a navigational mistake of that magnitude, and particularly if he was going to a spot marked 180/40. Even if you didn't know what that meant, you knew that there was something magic about 180/40 and he was there. It was hard to come up with a

scenario that said it was not a rogue, unless it was a hostile scenario of some sort. Some of the admirals said, “Craven and Kelly, are you smoking pot?” We said, “Well, maybe it was on the surface, had all the ports open and went down.” They said, “Even if it went down, there are all sorts of containers and vessels on board the ship that are going implode anyhow. You're bound to get a bunch of firecrackers under any circumstance, and you didn't.” We finally took a diesel boat out to the area in question, opened up all the hatches and sank it with all the other tanks there. There was dead silence. We didn't pick up anything. That made it plausible that the one blip might have been the submarine.

Then the question arose. How serious was it? It was taken up to the President. You said to the President, “Hey, do you think this is serious? Is there any possibility at all that this is a rogue ballistic missile submarine?” That went right to the heart of national security.

INTERVIEWER: The President was Lyndon Johnson, right?

DR. CRAVEN: Yes, it was Lyndon Johnson. It was toward the end of his term. He was so busy that the Johnson Administration didn't do anything about it. But as soon as the Nixon Administration came in, Kissinger got hold of this immediately. No, he didn't, I'm sorry. Excuse me. Johnson took it seriously and he said, “Yes, go out and look for it.” We went out to look for it and nobody in the crew knew what we were looking for. The navigation was screwed so that they didn't know where they were. The only guys who knew the nature of the mission were the executive officer and the commanding officer, and Gary Lang, a lieutenant who was an Air Force intelligence officer, who was along on the cruise.

They went out and they were taking these photographs. All of a sudden, the photographer came tearing into the cabin and said, “Captain, you'll never believe what I saw. There is a perfect image of a sail. It is just absolutely perfect.” There was a picture of the part of the sail that had blown up, which was right by the missile compartment, probably, if you can believe *Blind Man's Bluff*. The interesting thing to me was that the call numbers of the submarine were clearly marked. The captain told him, “Well, you know, you've got to develop all the pictures from here on in.” *Blind*

Man's Bluff says there were 23,000 pictures. I don't believe there were 23,000 pictures, but there may have been. I don't know, but all the pictures were taken.

Then the *Halibut* came back and I got to see the pictures because I was the project manager. I met the *Halibut* when it came in. Whether I had a need to know or not, I made an interpretation as to what it could possibly be. At that point, it looked to me like something was happening with the missiles and the warheads. It was not clear what it was. During that time, the University of Hawaii called me up. That was something I only reported in this book.

INTERVIEWER: That was George Voullard .

DR. CRAVEN: Yes. George Voullard called me up and told me that his ship had found a radioactive slick, and he gave me the location of it. I figured that the location was just right for a radioactive slick to come from that submarine. I said to myself, "I cannot let that get into the press. I cannot let that get leaked out anywhere. I told George, "Oh, yeah, we know all about it and it's trivial, okay. Don't tell anybody." That worked. I was so sensitive to it that I didn't tell anybody else until now. But I do hold it in my own mind because I know that maybe sometime in the future this information will be important in confirming a story that somebody else develops that might not be believable. The biggest and most terrible problem that you had was the possibility that this guy was planning on launching a missile at Hawaii or could launch a missile at Hawaii. That would have been horrendous news. The most devastating thing you could do was to suggest that such news was true when if, in fact, it wasn't. You found yourself in possession of a speculation, and the very speculation had international implications. You said to yourself, "Jesus, what am I supposed to do? I've got to communicate this speculation at the top level." I communicated it at the top level. I'll give you an example of what I mean.

As the story starts to develop and started to break, Bill Broad of the *New York Times* called me up. He laid out a scenario that involved an attempt to launch a missile at Hawaii. He said to me, "Craven, what do you think about that story?" I said to Bill, "If that story is correct, it's headline news around the world." I said, "But it's not correct. It's not fit for the *National Enquirer*. Do you

want to publish it or not?" He didn't publish it.

Later on, as I was writing this book, he called me up and asked me the same question. I told him the same answer. He said, "Gee, can't you help me out any way at all?" I said, "Well, if there's any man that knows about this, it's Kissinger. Why don't you go and interview Kissinger?"

He then went to interview Kissinger. He came back and did not report on Kissinger's interview, but he told me that Kissinger was forthcoming. He made it very clear that he was holding his story until this book hit the street. At that time he'd gotten a story that either confirmed or denied or partially substantiated the account. I think that when he said to me that Kissinger was forthcoming, he was trying to give me some comfort, with respect to the speculation, but I don't know. Of course, as we'll see as this develops, nobody knew what that submarine was doing and may never know. That was one of the problems. Let's go into what happened and what I discovered later.

Then we came back with all these pictures and the pictures had gone to Nixon and the Navy swallowed them up at the top. I mean, as soon as they got them, they shut everybody out. Brad Mooney got a chance to see the pictures. His fellow guards didn't because of a good write-up to the CNO, and from the CNO it went right up to the President. At that point, I didn't know who had seen the pictures, but the number of people who have seen the pictures, unless the Central Intelligence Agency (CIA) has opened it up, is very, very small.

The CIA then decided that they were going to go out and pick up the submarine and find out what it was really doing. They called me in to get a briefing from me as to what I had done and how I had done it, and to get recommendations from me as to what to do. I told them, "Hey, fellows, in this business, if you have one successful guy doing it, you give him the next mission. Give me the mission. I'll do it. I'll do it from a submarine, and I'll use the same team I've got now and nobody will be the wiser." They told me, "No, Craven, we're going to do it ourselves." Then they told me that they were going to build a ship and do it as a manganese nodule ship. I told them that was wrong, wrong, wrong, because in manganese nodules, there has to be a crew cover to be a cover. Besides, if

you did it on a ship, the Soviets would know it immediately. They essentially said, “Bug off, Craven, thank you very much.” They went off and made the USS *Glomar Explorer*. I was one of the few people that knew that the *Glomar Explorer* was the *Glomar Explorer*, and I want to come back to that later. My career was starting to change and emphasized the legal side of what I was doing. I was a U.S. delegate to the Law of the Sea Conference, at which point down came Howard Hughes in the form of Summa Corporation and he made presentations about manganese nodules and the ship. They put on the screen a big picture of a mud pit that I designed and it was top secret special intelligence as though that was the mud in the vicinity of the manganese nodules. There was a mining engineer sitting next to me. He said, “Those crazy fools. There's no mud in the area of manganese nodules like that.” But he only thought they were crazy fools. The whole world was naive about breaking covers. I mean, they just didn't do it. The net result of that was that 35 percent of the Law of the Sea Treaty dealt with manganese nodules. In retrospect, we discovered that every nation, other than Russia, developed a manganese nodule research ship.

But Then we were going to come out and finally see why the CIA built the ship and why the Russians did not. I got my final clue from *Blind Man's Bluff*. Before I got that clue, I knew that Nixon had flown out to Hawaii on a trip that has never appeared in the official record. One of the things he did on that trip was assemble the crew of the *Halibut* in an athletic field. He gave all of them the President's Unit Citation, the first one that was given post-war, and told them that they couldn't speculate on what they had done. He couldn't tell them what they had done, but that he wanted to, and he then flew back. Well, it's not credible that a President of the United States was going to fly all the way to Hawaii on a trip that they, even today, deny ever taking place. Do I know that that trip took place? Yes, I know that that trip took place, because I know the officer who arranged for that trip. It was not on Air Force One. It was in another thing. Did he fly from there on to someplace else? I have no idea. All I know is that he was officially involved in this program and felt it necessary to fly to Hawaii, at least, for some reason.

The next thing I discovered from *Blind Man's Bluff*, which apparently was known all along,

that he had a phone call with Brezhnev. The phone call with Brezhnev, he said, just resulted in an undersea arms control agreement. He didn't say why he called Brezhnev. He didn't say what the call was about and what happened. You could speculate, and it's been, more or less, tacitly confirmed to me by the CIA that what happened was as follows. He called up Brezhnev and he said, "Hey, Brez, we know where your submarine is." Brezhnev said, "Oh, tell me about it." Nixon said, "Not until you apologize." Brezhnev asked, "Apologize for what?" That was the first moment that Brezhnev had any idea that his submarine was a rogue. It was very important that he discovered that his submarine was a rogue because by discovering that, he suddenly realized he had a major, major problem.

INTERVIEWER: He had command and control problem.

DR. CRAVEN: Yes, he had a major command and control problem and a major coup problem coming up and so on and so forth. I describe in the book that there were some games that we played at MIT, in which we just tried these exact same kind of scenarios because we were looking at the communications problem with Polaris. In those scenarios, the hotline was energized every time. Well, let me describe a lot of different scenarios that we used. We got teams that were really qualified. We got Russian types who could play Brezhnev and we got American types who could play Kennedy. We set up top-level teams and we put them in isolated places. Then we had a team called 'God.' 'God' told both of them, independently, that each one of them had lost a ballistic missile submarine. That was all they knew. What we wanted to check out was the first thing. Because they called for all the other submarines to report in to see if they were there, we had this big argument about whether we should have a return message or a return message capability. Well, both guys called in, "Hey, have every submarine on station report in and tell us whether they're there or not."

The next thing 'God' did was to send out search teams to search for their lost submarine. We informed both sides that, curiously enough, there was a Russian search team out in the area searching close to where you are and you've got your search team out searching. You told the

Russian guy that were two search teams out, and at that time both guys suddenly said, “My God, did these two submarines collide? Are they together?” Boy, immediately they got on the hotline. We didn’t know what happened, but whatever it was, it wasn’t us.

There, you had the situation that was almost analogous to it. We called up Brezhnev and Brezhnev said, obviously, “I’ll call you back.” When he called you back, if he called back or how he called back, he obviously said, “Hey, you’re bluffing. You’re bluffing. Why are you saying this? That was just an ordinary ship on patrol,” and things of that kind.

At that point, we said, “Do you know what we’re going to do? We’re going to build a ship, go out and recover it and we’re going to show the world what it was doing, okay?”

INTERVIEWER: It was kind of like the U2 in reverse.

DR. CRAVEN: Is that what it was? I suppose it was, yes. I hadn’t thought about that. At that point, they could follow it, anyhow. We knew they could follow it. Their satellite capability for surveillance and ours were almost identical. I was on the Defense Advisory Board and I used to look at all that satellite stuff. We used to get all sorts of strange gymnasiums and things of that kind. Any time there was a strange building built in the Soviet Union, we stuck with it until we found out what it was. They were doing the same with us. There was no question that they could follow it all the way down the line. When you look at the deployments of the *Glomar Explorer*, once or twice we deployed it right out in open sight for no apparent reason and then pulled it back. Well, of course, the apparent reason was that a crisis was coming up and developing. We looked at the next thing, which had to do with speculation. We were very much interested in what Brezhnev was going to do in terms of discovering what was going on in Vladivostok.

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UNDERSEA & HYPERBARIC MEDICAL SOCIETY

ORAL HISTORY INTERVIEW: JOHN CRAVEN

Honolulu, Hawaii

Monday, April 28, 2003

P R O C E E D I N G S

INTERVIEWER: I was asked by Don Chandler to ask you to say a bit more about the island that you built shortly after you left the Department of Defense. I believe that means the floating city prototype and any other adventures or events you can tell us that are unclassified. I think the intent is to emphasize historical issues rather than the future, but I don't see how you can separate the two very easily.

DR. CRAVEN: The past is prologue.

INTERVIEWER: Exactly. I'll start with the pat questions and then if you want to extrapolate as we go along, which you may or may not, we can do that. Like I said, I have plenty of tape and we can take breaks, and if we run out of champagne maybe we can go get some more. What affiliation do you have with Navy diving, past and present?

DR. CRAVEN: My first affiliation with Navy diving officially was when I was appointed to be the head of the SeaLab programs. I'm very bad with dates but you can get those. I had no technical experience with diving at that time and could not even snorkel. I was assigned the program, I believe, because of its relevance to a subsequently revealed program for developing saturation divers for military operations. I was aware of the fact that there was such a program. Not only was I aware of the fact that there was such a program, but I was at the genesis of that program.

After I was made director of the Deep Submergence Systems Project I was called over by the Navy intelligence people to ask if any of the technology that we had would be useful for undersea intelligence. At that point I said, "Well, sure, it would be." I wasn't sure just what it would be. We explored, but I'll not tell you what the intelligence objectives were, and we concluded at that time that there were basically three capabilities that were required.

One was the ability to search the seabed from a secure source, such as a submarine, around the world. The second was the ability to go down into any part of the sea and examine what was there, in detail, and, if possible, retrieve some of that material. Third, if it were at all possible, some way by which we could put Navy divers on the sea floor to do complex operations with respect to intelligence.

At that point, we set out developing the three capabilities. The first capability matured in the submarine USS *Halibut*. We decided to take a submarine, like *Halibut*, and configure it in order for it to detect and measure things on the ocean floor, anywhere in the world. Second, we decided that we would modify the USS *Trieste*'s bathyscaphe in order to provide a *Trieste*-like device to go down and actually do some detailed photography or recovery of things that we had spotted on the ocean floor, at any spot in the world. Third, we knew about the development of saturation diving, although I was not involved with it, and we concluded that if that diving could be developed as an operational capability, we ought to eventually have the capability of putting saturation divers in depths on the continental shelf.

In the whole Deep Submergence Program we generally had what we called the 'Two and Twenty Program.' That is, we designed things to go to 20,000 feet, if we could. Even though the ocean can be deeper than 20,000 feet, it's rarely deeper, and therefore we felt a 20,000-foot capability for anything that we had would be, effectively, a full ocean capability.

We then chose two for 2,000 feet because if we had them 2,000 feet, the useful continental shelf was pretty well covered. We had a rule in our design that if we couldn't design it for 20,000 feet we shifted back to 2,000 feet. There was hardly anything in our program that was not designed for at least 2,000 feet.

At that time, we asked ourselves, “What long-term planning objectives would we have to have, in order to accomplish this in rapid time?” The first one was to start to configure the submarine, and we chose the *Halibut*. The second was to actually start to work on the modifications and build a *Trieste*, or alternate *Trieste*, as the case may have been. We started that but it required that we transfer the *Trieste* from the station it was at in California to the Deep Submergence Systems Project. Third, and we kept it classified for a long time and as a matter of fact, it was really only revealed in *Blind Man's Bluff*, we designated the USS *Seawolf* as the submarine to carry saturation divers. The reason we did that was because we required the *Seawolf* to have a long-term modification of cutting the tube and replacing the reactor and leaving a space in which to insert the capabilities for these divers, should it ever had happened. In that sense, I was involved at the genesis of what later became part of the undersea program.

At the end of that interview I selected Tomsy to be the project manager and I did it in full awareness of the fact that he was going to be the boss of a number of medical officers who were captains. I knew that he would not be the senior officer present at SeaLab but would be the commanding officer. But that was the way the Navy was properly structured and the commanding officer had to be a commanding officer and the captain in the medical quarter was not qualified for that responsibility.

At that point, as soon as he was on board, I said to him, “Commander Tomsy, I do not have the qualifications that I need to have in order to have experience with this.” I did point out to him I was highly qualified in the technology of a seaman and fully qualified in the technology of surface ships and that I, as a child, had been a member of the Junior Naval Reserve, and had studied the Blue Chart and its manual. I had spent time at sea. I had spent time at sea during the war, and I had been working on mine sweepers and things of that kind, but I was not efficient in the

technology of the surface ship Navy, the shallow water Navy. I was very comfortable with that but I was completely uncomfortable with the technology of undersea diving.

I knew that was their test of me. It wasn't necessarily to see if I was able to do it but to see if I was going to try. That demonstrated that I could adapt to their technology. In a very real sense, I knew that it was a qualifying exam for my credibility as being their project manager and project leader. That meant that there were subsequent times that I knew SCUBA diving and went in the water without ever being qualified for SCUBA and I never did get legally qualified for it until I came out here to Hawaii.

I never did SCUBA or things of that kind unless I felt it was needed or associated with my job. I wasn't going to become a qualified diver just to be a qualified diver. Particularly here, in Hawaii, I spent a lot of time exploring the ocean because I discovered that I could explore the ocean, as well as I needed to explore it as a skin diver.

INTERVIEWER: Were there no times that you ever other than...

DR. CRAVEN: No. When I go out with the marine option program people and they go out and SCUBA dive and I go out again...

INTERVIEWER: Snorkle?

DR. CRAVEN: No. I go out and SCUBA. I qualified in SCUBA. I went to school, and this is a very important thing in terms of my own enjoyment of the ocean. I am now very much dedicated to enjoying the ocean as a human, as a marine mammal, and you're not a marine mammal when you've got SCUBA gear on, in my view. You're only a marine mammal when you're actually in the ocean with almost nothing on at all. Only at that point is snorkel gear to substitute to the fact that we don't have a convenient organic snorkel built into our bodies. We also don't have convenient fins. I feel comfortable as a marine mammal when I'm out in the water now, with fins, a facemask

and a snorkel. If I want to look at something that is thirty feet deep, I can look at something that is thirty feet deep. That meets all of my gratification needs and all other needs that are involved, except when I go out with students who are going out to SCUBA dive.

INTERVIEWER: You mentioned your affiliation with the marine option programs at the University of Hawaii here. Are you still active with that, as well as teaching?

DR. CRAVEN: Well, I'm basically an emeritus professor. I've been an emeritus professor for some time. For political reasons, on which I will not elaborate, the university has elected not to pay me for teaching and not pay me for participating. I teach anyhow, and I teach courses for credit but they don't pay me. I also participate with the program. I have MOP students that are interns with me and I go out and they're now converting my office into a marine option program study center.

INTERVIEWER: Does that include you in it?

DR. CRAVEN: Well, it's going to be called the 'John Craven Marine Option Program Study Center,' but it will be called that because I'm going to donate all that equipment to the university. The office will not be my office any more. It will be the John P. Craven Marine Option Program Study Center, and I'm allowed to go into at any time just like anyone else.

INTERVIEWER: The *Sea Words* newsletter that comes out of the marine option program makes it obvious, from various articles, that your affiliation with them is good and successful and is probably a very good advertisement for the Navy and your past with the Navy, also?

DR. CRAVEN: Oh, yes, and as a matter of fact, Admiral Cohen has asked me to use my influence with the university in order to establish a Naval ROTC here. The answer is that temporarily, my influence is not successful, but that's got nothing to do with Admiral Cohen and the Navy and me. It has everything to do with the predilection on the part of the people of Hawaii who are associated with the military to see themselves as descendants of the 442nd 'Go for Broke' Battalion and to see

themselves as descendants of the Air Force, so we have Air Force ROTC at Hawaii. We have Army ROTC at Hawaii. We have the Army National Guard. We don't have a statewide affiliation of significance with the Navy and that is a cultural thing that should change, but these things change very, very slowly.

Right now, the strongest affiliation we have is with the battleship USS *Missouri*, but even the battleship *Missouri*, and I say this kindly, is more a tourist attraction than a place for former battleship sailors to go like submariners go to the museum. I'm a former battleship sailor and I ask all my other battleship sailors, buddies and friends what their relationships are to the *Missouri*. A general answer is "no relation."

INTERVIEWER: Perhaps that's something that they can change over time since it's relatively new.

DR. CRAVEN: Well, I'll be very specific because I can be very specific. At the signing of the surrender negotiations on the deck of the *Missouri*, one person present was Admiral Paul Lacey . Admiral Paul Lacey is one of our most distinguished submariners. There's a USS *Lacey Hall* named after him and so on and so forth. He was not invited to come to the dedication ceremonies of the battleship *Missouri*. I said to him, "Paul, why were you not invited?" Paul said, "I don't know why I was not invited," but he was not invited. Captain Edward Snyder , a very close friend of mine, was the commanding officer of the battleship USS *New Jersey* and he was one of the last commanding officers of significance on the battleship, and I keep in touch with him. I asked Snyder if he had been invited for the dedication of the battleship *Missouri* and the answer was no. Then there was this guy who was on the USS *Arizona* and stayed in the Navy, went all the way to Captain in the JAG Corps, so he's a unique guy. His father was a Navy officer.

INTERVIEWER: If I could interrupt and make a couple of observations and then ask you some other leading questions? On some of your prior comments, just for your own information, I'll plan

to pass the tape through some folks who I know just to make sure. Obviously, because some things might have been in a book doesn't necessarily mean that they've become unclassified.

Another point is that obviously, you're prolific. Your latest book is fascinating. You've had a lot of interviews in different places. It would be a great challenge for this group to review everything that you have, including the tapes that we talked about today. I thought that maybe we could concentrate this a little bit more, since a lot of your other experiences are well documented. Maybe we can focus a little bit on the Hawaii affiliation and the specific question that I got from Mr. Chandler on the floating cities initiative.

DR. CRAVEN: As a matter of fact, let's go back into my association with Hawaii and why I came to Hawaii, and the first project I worked at was the floating city. What is my affiliation with Hawaii? Well, my first affiliation with Hawaii, of course, was during World War II. I arrived here for a very short period of time and stayed at the Naval Station. Then when I got on board the battleship *USS New Mexico* I didn't come back to Hawaii for many, many years after that.

INTERVIEWER: I don't know if you've ever documented elsewhere the story that you told me a couple of times, which I tell others often, about the coming back around Diamond Head.

DR. CRAVEN: That story goes as follows. One of the things I had to do is because the battleship *New Mexico*, even at that time, had plank owners on board, was filled with nothing we call 'hash mark seamen,' and I don't have the appearance of a mariner. To this day, I don't have the appearance of a mariner.

INTERVIEWER: That's questionable.

DR. CRAVEN: I know I don't.

INTERVIEWER: With those young hands?

DR. CRAVEN: Young hands. That's right. I was doing my best in the Navy to establish the fact that I was really a Navy seaman.

INTERVIEWER: What year was that?

DR. CRAVEN: It was in 1943. I was qualified in the sense that I come from a split family, which, on my mother's side, was composed of labor union leaders. They were tough guys in tough neighborhoods, so one thing I became very adept at, when I was young, was playing poker, playing craps, and playing in a world in which the dice are probably loaded and things of that kind. I know how to gamble in a gambler's society and in a tough society. One of the things I immediately got involved in was poker games or gambling or bets of some sort. I was sent out to sea aboard a troop transporter that left Norfolk and was headed for Hawaii and I figured out the time it was going to take to get there and made a bet with fellow sailors that we'd arrive in Hawaii before the first of January, 1944. Unfortunately, the ship broke down in the Caribbean. We spent a couple of days just sitting in the Caribbean without moving and then the ship broke down again in the Pacific, and again we spent some time there. But I arrived, and that was the sighting of Diamond Head, before midnight of December 31, 1943. The skipper decided to stand out until first light.

INTERVIEWER: Was that on the battleship or the troop transporter?

DR. CRAVEN: It was on the troop transporter. Anyway, he decided to enter at the first light. I got a pair of binoculars and got up on the deck to try to see Diamond Head before we pulled in there. We didn't, but I did see Diamond Head at seven o'clock in the morning and I remember that distinctly as a turning point and marking point in my life, particularly because I lost the bet.

Fifty years later, I went to Diamond Head at seven o'clock in the morning, just as a sentimental visit to look out to sea and recall the experience of looking in at Diamond Head. When I got there, a van appeared and people got out of the van. I thought I'd go tell them the story. As I

told them the story I discovered they could not respond because they could only speak Japanese. I thought to myself, "If I had died and gone to heaven and come back fifty years later, I would have known who had won World War II."

INTERVIEWER: I think that's a great story.

DR. CRAVEN: It is a great story because it's a cultural story and it's a story that tells you what has happened because in World War II, the fighting was very fierce. As a matter of fact, it's only recently that I've been able to tell people about the most traumatic day of my life. That was the day that we killed 3,000 Japanese and I had to witness all the carnage and to me, that was just devastating. That's true of any soldier or sailor in battle who experiences carnage.

INTERVIEWER: That was that aboard ship?

DR. CRAVEN: Well, I was aboard ship. We lobbed all the shells that went in, but after it was over, our photographer went ashore and took all the pictures. We completely decimated that island. The reason I know it was 3,000 is because the history books report that we killed 3,000 Japanese that day. I got an opportunity actually to see the carnage and that, of course, was the most devastating thing of all, to see all these body parts just shattered. But I don't talk about that.

That was my experience in Hawaii. I came back on a crew ship that brought me back to San Francisco, which, of course, was also a very exciting period in my life. What a wonderful thing it was to come back to the States and come into San Francisco beneath the Golden Gate Bridge when you thought that you weren't going to come back at all. I was just fortunate to get into the Navy V-12 Program. I was very fortunate. I lucked my way into that.

DR. CRAVEN: I had an abysmal record in the Navy as far as violence was concerned, but I kept my 4-0 conduct rating. That was very important. But I was listed as one of those guys. That was

the reason that they put me on orders to go to a battleship. That was where guys like me were supposed to go.

I met him again in life as Captain Harold, the head of the fire control unit of the Polaris program. I met other officers during that time. I met Ensign Napier as Captain Napier, the commanding officer of the observation island, because that battleship was manned by all Naval Academy officers in every position. I just put that as part of the Navy experience that's relevant. Well, I'm going to go one step further and tell you what actually happened, as far as this is concerned. At that time, my father's cousin, Captain Francis Craven, the skipper of the cruiser USS *Nashville* on the Doolittle raid. It was the lead ship. When he came back from the Doolittle raid, unfortunately, the *Nashville* ran aground at Midway. It was pilot error. Midway is a terrible channel to come into.

As a result of that he lost his commands at sea but became the commandant of the Pearl Harbor district. He was there at the time I was assigned to the battleship *New Mexico*. My father wrote to him and said, "Hey, my son is on the battleship *New Mexico*." Captain Craven called up the commanding officer of the battleship *New Mexico* and said, "Hey, my cousin's son is a sailor on your ship. I ended up being the organist and choir director aboard the *New Mexico* and because it was a flagship, we went from ship to ship and did that. That did not endear me to my fellow sailors. I had to go to extra efforts to demonstrate to them that I was not a 'choir boy.' That's all relevant because that experience in the Navy comes back later on in some of these other associations. I really believe, to this day, that one of the reasons that Admiral Rayburn chose me to be his chief scientist, and one of the reasons that Rickover chose me to be the project manager of the *NR-1*, was because they were both aware that I had more than the CalTech degree. They were aware that I had had naval experience under fire.

I don't know if Admiral Rayburn did it consciously, but there was almost nobody in the Special Projects Office who had not had experience in war under fire and that paid off, of course. Only when you've been under fire can you demonstrate that you have the capability to perform in a life-threatening situation, or in any situation in which you're dedicated to performance, knowing that if you don't perform, you fail. That failure is the thing that you just will not countenance. You will not countenance failure. I think that's important for this history.

Now we're going to come down to what happened when I started to visit Hawaii in connection with the classified programs. These were visits that took place for one or two days at a time. When one of those visits took place, because of classification, I tried to look like a college boy and not indicate to anybody that I had any relevance to the United States Navy. On one of these trips, I got off the airplane and these two local guys came up to see me and said, "Aren't you Dr. John Craven?" I turned around and said, "I don't think so." They said, "Well, we've got your picture right here. It looks like you. It must be you." I said, "Yes, it's me. Why are you asking?" They said, "Because the governor wants to see you."

INTERVIEWER: Was that Governor Burns?

DR. CRAVEN: It was Governor Burns. I had no idea why Governor Burns wanted to see me. I said, "All right." At that time, because of my being in charge of the SeaLabs, we were deciding where we were going to locate them. There was a moderate amount of competition from various areas of the country as to where the SeaLabs were going to be located. I went in to see the governor, who was a fabulous guy and not a politician in any sense of the word. He was very laconic. He smoked a cigar. He spoke in grunts and grimaces more than anything else. He was sitting there. He was puffing on a cigar when I was introduced to him. He said to me, "Dr. Craven, why won't you put SeaLab in Hawaii?" I thought to myself, "This is the first governor who has

knowledge about a thing like SeaLab and thinks SeaLab should be in Hawaii.” I started to enumerate on the reasons I might not put the SeaLab in Hawaii. I said “Well, Governor, it's a very complex thing. We have to have very good medical services available.” He said he had a hospital and it had already been arranged. I said, “Well, but you've got to have a diving unit of significance.” He said to me, “We have a diving unit here, at Pearl Harbor. I've already talked to them. It's already been arranged.” I said, “But you've got to have water close to shore. You have to have a base right on the shoreline, where you could easily get out to the lab.”

INTERVIEWER: You needed water that wasn't too deep.

DR. CRAVEN: We needed water that wasn't too deep. He said, “We have Barber's Point. It's already been arranged.” I said, “the big problem is you have to have water that's cold because we want to test these guys in an environment that they're going to be in, and we want cold water.” He didn't know, and I didn't know, that there is cold water there, but at that point he said to me, “Dr. Craven, that's a mistake.” I asked, “Why is that?” He said, “You're going to be doing this for the first time. You don't want to make it so difficult and so hard that you can't do it. You want to do it first in the warm waters of Hawaii before you do it elsewhere.” I thought that was pretty remarkable, so I said, “All right, Governor. What I'll do is I'll have my site review team come out and visit you,” but I knew very well that when we came out and visited him that we would not do it there. Then I thought to myself, “How did the governor know I was involved and how did he know what's involved?”

That night, I went to the officer's club and met with an admiral named Chick Hayward . It wasn't the Admiral you know as Hayward. It was not Thomas Hayward. It was Chick Hayward. Now, Chick Hayward was a very significant admiral in the Navy and knew about all the strategic planning. The reason he was so important was because he had started life out as a batboy for the

New York Yankees and had then become a sailor. As a Mustang, he got in the Naval Academy and progressed through the services, but during all that time he stayed a lifelong Democrat. As he proceeded, he became a flier, and a very distinguished flier at that. When the carrier USS *Franklin Delano Roosevelt* was launched, as he said, they had to select a captain who was a Democrat to be the commanding officer of the *FDR* and he said that he was the only captain in the United States Navy who was a Democrat. They made him the commanding officer of the *FDR*. Why that is relevant is because I first ran into him when he was head of the strategic program office in the Pentagon, and at that point, he had to rule on one of our programs as to whether it would exist. A secretary recorded the meeting. When the meeting was over he approved the project. There were other people in the Navy who felt that he did not approve the project. We went back to the transcript and the last lines on the transcript read that he is holding his thumbs up said, "Bet on the Yankees, the Navy, and the Democrats and you'll never lose."

INTERVIEWER: That could be subject to interpretation.

DR. CRAVEN: That could be subject to interpretation, but that was his statement of approval. By this time, I was getting to know this guy extremely well and he was out here at Pearl Harbor. He was at Pearl Harbor and was meeting with Governor Burns once a week, and Governor Burns was very much interested in getting Navy projects to come out to Hawaii. Governor Burns said to him, "Hey, I hear there's this project called 'SeaLab.' Why isn't it out here in Hawaii?" At that point, Chick Hayward, though he should not have, said, "Dr. Craven is in charge of this thing and is going to be out here next week. I can arrange to have him meet you."

In a sense, that was a security violation, I suppose, of some sort, but he made another violation that occurred later on that evening. On Liar's dice, I rolled the maximum five aces, at which point, they rang the bell and I bought drinks for the entire officer's club and got my name put

on a plaque. But I wasn't there and I was there. This vignette talks about my first association with Hawaii.

My second association with Hawaii was through a guy named Pryor , who is a former helicopter pilot and the son of Tap Pryor, Vice President of Pan American Airlines. Tap Pryor had organized the park and all those things got appointed to the U.S. Commission on Our Nation and the Sea. As he was appointed to it, he came to Washington, D.C. and visited all the people working on technology in the ocean, trying to get projects placed out in Hawaii. By that connection, he met with me while I was the chief scientist of the Polaris program to find out if there was something that program we wanted to do with his laboratory out there. He was a politically significant, entertaining, engaging fellow, and so I got to know him and he got to know me.

INTERVIEWER: You were in Hawaii?

DR. CRAVEN: This was Sea Life Park. Sea Life Park used to be an amalgam of the Oceanic Institute, Sea Life Park, and a whole bunch of other things that Tap Pryor built together. He's a rich man's son but very irresponsible and went bankrupt because of his irresponsibility.

I had a lot of involvement when I came out to Hawaii. However, what happened was that the University of Hawaii suddenly needed a new president. Hubert Humphrey, who ran the Oceans Commission, was about to become President of the United States, he thought, and because he was about to become President of the United States he started to set up his cabinet and his organization of his officers. They went in and set up an agency called the 'National Oceanic and Atmospheric Administration' (NOAA) and it was going to be in the Department of the Interior. The Secretary of the Interior called me over to his office and said, "Craven, I know you're the chief scientist of Polaris and you're involved with the Navy and things of that kind. But when Mr. Humphrey is elected President, we want you either to be the head or the deputy head of NOAA. We're telling

you now because what you might want to do is to prepare for this.” The way I was supposed to prepare for it was to disassociate myself from the Navy. The way I decided to disassociate myself from the Navy was to take the equivalent of a sabbatical leave and go up and teach MIT for a year.

INTERVIEWER: Was that still during the deep submergence and Man in the Sea programs or was it after that? Was it at the same time?

DR. CRAVEN: It was 1968 to 1970. Nixon was elected in 1968. I spent a year at MIT in 1969 and 1970. We did not think that NOAA was going to be established until 1970, and it wasn't until 1970. I had decided that as far as my management was concerned of both the Deep Submergence and Polaris programs, I had done my job. That is, at that point, we had developed a saturation diving capability. We built the *NR-1*, the deep submergence rescue vehicle (DSRV), and all those things. My innovator's job with all those programs was over and Admiral Smith was very strong about the fact that innovators were wonderful during the period of innovation. As a matter of fact, I'll tell an anecdote that happened at that time because it's important for me.

After the USS *Thresher* went down, the Navy set up a committee in the force called the Stephan Committee. The Stephan Committee was to look at what caused the *Thresher* to go down. What the Navy should have had was a set of programs to take advantage of the technologies that had been neglected as a result of the *Thresher*. At that time the line officers of the Navy were disappointed with the performance of the engineering duty officers who had designed and operated the *Thresher* because a number of things were done wrong that contributed to, or were involved with, the loss of the *Thresher*.

At this point, there's no fault to be found. They were fabulous men, but the errors were made. The errors were made and the line officers knew that the errors were made. The errors were made. They were made basically through Ship Systems Command and the Bureau of Ships, so

when Stephan decided to establish the Deep Submergence Program, he made the strange and unusual choice of putting it into the Special Projects Office instead of putting it into the Ship Systems Command.

The lawyers pointed out to them that it was perfectly possible to take a civilian and give him the full status of a commanding officer of the United States Navy, and that the only thing that it would have entailed was that he would not be subject to military discipline. You couldn't have court-martialed him. But he would make out fitness reports. He would have all the other emoluments of a commanding officer in the Navy. They did that with the guys in the Army in the Vietnam War. There is a book I have about an Army guy who actually carried out the role of a general in the Army even though he wasn't a general in the Army. He was in some other agency or organization. I knew that I had the status of a commanding officer. I knew that I had to make out the fitness reports for the lower line officers, but I still did not understand the scope of command.

At that point I was going to have to establish the office independently and have to take people from the Special Projects Office and move them over to my office and I knew I was going to have to take some of the Special Projects Office's best people. I went and met with Admiral Smith and said, "Admiral, I've got a terrible job. I've got to take some of your best people and move them." He said, "That's fine." I asked, "Why is that?" He said, "the people that you want to take are the innovators in Polaris. We are out of the innovation phase, and the last thing that you want in management is to have innovators. Innovators are born to innovate. They are not going to stop innovating because they are the kind of guys they are. I'm going to give you these innovators but I'm also going to do the following thing. We're going to have a contract with you and these innovators. Any time that I need them I can call them back. We're going to keep you on, legally, as

chief scientist of the Polaris program even though you're not going to be carrying out the duties of chief scientist, but I want to be able to call you back any time I need you.”

Then we had a following problem, and that was that when you moved the guys who were all GS-16s, 17s, and 18s over to your project, they did not qualify under civil service rules and regulations for that thing. He went and arranged a meeting with Mason , the head of the Civil Service Commission. He got a waiver and an exemption so that when these guys transferred to my organization, they retained their civil service ranks. That's a very important story in the whole management organization of innovation in the Navy.

I was feeling very comfortable with that. I was feeling comfortable, but there were no other civilians. I had Navy officers in my organization but no other civilians that had the status of a naval officer. I was the only one.

While I was out in Bethesda, Maryland, all of a sudden Brad Mooney, who later became Admiral Brad Mooney, was commander and said, “By the way, I've got a picture of this organization. Maybe I can show it to you today.” He showed up at my office in Bethesda and said, “I'm here to report for duty,” and he had a whole bunch of naval officers with him and a whole bunch of enlisted men. I asked, “Reporting for duty for what?” He said, “We're going to operate your submarines.” I said, “There must be some mistake. I'm not in operational command. He said, “Well, here are my orders, see?” I said, “Well, you go away and I'll check into it.”

I called up the Pentagon and talked to a captain there who was at the submarine desk and I told him, “There must be some mistake. These guys were sent to me and I'm not in operational command. What are you going to do about me? Don't you have a submarine development group on the west coast?” The answer was that they did not have a submarine development group on the west coast. I asked, “You don't have a submarine development group on the west coast?” He said,

“You can't establish a submarine development group overnight, and so there was no submarine development group when you got them.” I said, “No, I don't have them.”

I then called up Captain Hallfinger, who later became the head of the ONI. He's was a good friend. He's Commander of a flotilla there in San Diego. I said, “Hey, Captain, how would you like to have a bunch of good Navy lads on your command?” I told him what I had and said, “Why don't we just shift them over to your command?”

He said, “No, you don't. I don't have any billets. I don't have any money and I don't have the organization.” I said, “Gee, I don't what to do.” I called my Navy lawyer and said, “Hey, how to I get out of this pickle?” He said, “Well, I've got the following news for you. The good news is that you're the commanding officer and you are a field station, which means that you can have an office anywhere in the world.” I said, “Why am I a field station?” It was because we had moved out. He said, “Because your office is outside the beltway.”

INTERVIEWER: It was outside only slightly.

DR. CRAVEN: It was slightly outside, that's right, about a half mile out of the District, which made you not a field office, and as a field office, you could relocate these guys to San Diego. You could as commanding officer, and you could carry out everything that was assigned.

INTERVIEWER: Was one of those things establishing a submarine development group?

DR. CRAVEN: We haven't done that yet. I told him that if we got one barracks for the SeaLab people, because they were included in this whole contention...

INTERVIEWER: Was that part of the reason for moving to San Diego? SeaLab had already been...

DR. CRAVEN: SeaLab was going to be in San Diego but the *Halibut* was also going to be in San Diego. The *Halibut* was going to operate out of the Pacific. It was also going to be in the command,

allegedly. In other words, the command was the embryo for the submarine development group and whoever did it, knew that, I think. They knew that but they didn't know what to do because they couldn't establish a submarine development group right off the bat and they needed to get the impetus for it. I gave them the impetus the following way. I told Commander Mooney to go and spend the entire next month sanding the floors, varnishing them, putting white cordage around the building, and making the thing look entirely like a Navy installation, absolutely ship-shape in every way. All the officers and men were to get involved and do it.

INTERVIEWER: That was at Ballast Point?

DR. CRAVEN: It was at Ballast Point. We were going to have a commissioning ceremony. At the commissioning ceremony we were going to have the Navy band, we were going to invite Congressman Pete Wilson to come and give the opening remarks and we were just going to have a formal commissioning ceremony. Mooney was aghast and he said, "This will ruin my career." I said, "Commander, it probably will ruin your career, but this is an order."

They did that and we put on the show and it was front-page news in the San Diego paper. Wait until you see the picture. I've got it. It is of all guys these in whites and swords and everything else and this whole ceremony. I was left out of the picture deliberately, but Brad Mooney was commanding officer of this unit. As soon as it happened, I got a call from the Pentagon. They said, "Craven, what have you done?" I said, "What do you mean, 'what have I done?' What could I do?" Immediately, they established Submarine Development Group One. I mean, almost overnight they established Submarine Development Group One took all those guys and put them in that group. Now, you see, as far as my career was concerned, one more thing that could free me for the program was now gone. That is, this group had that been established didn't exist before and it was

going to operate all these submarines that were involved, at least in the intelligence programs, so on and so forth.

[NR-1]

There's one other thing I've got to talk about which is relevant, and it has to do with the *NR-1*. The history of the *NR-1* goes back to the fact that Admiral Rayburn started a program right at the start of Polaris called the 'Advanced Sea-Based Deterrent Program.' He wanted to look at what was going to follow Polaris at the same time he started Polaris, and I was put in charge of the Advanced Sea-Based Deterrent Program. I got ten to fifteen million dollars a year to study whatever I wanted to study. One day, I got a call from an officer in the Bureau of Ships and he said, "I want to look at a small, nuclear powered submarine that I think can be built as a part of the Advanced Sea-Based Deterrent component. Would you pay for a study of this to be done?"

I knew that Admiral Rickover would not approve of that because he was the only guy who did studies of that kind, and I knew this guy knew that but figured if he got money from me, he could do the study. I said yes. I gave him the money to start the study and pretty soon, Admiral Rayburn was called over by Admiral Rickover. Rickover said, "Admiral, you're doing this study. It's in my province, and I want it stopped." Rayburn asked, "What study is that?" Rickover said, "I won't tell you." Rayburn came to see me and asked, "Do you have any idea what study this is?" I said, "Oh, yes, I know what study this is. This is the study of a small nuclear powered submarine." Rayburn said, "Well, I guess we've got to stop it." I said, "Admiral," and these are my words, "You're three stars, he's three stars, and you're senior to him."

INTERVIEWER: He was only a three-star admiral at the time?

DR. CRAVEN: He was only a three-star admiral. Rickover was only a three-star at the time. I said, “and you're senior to him. Are you going to let a junior admiral tell you what you can do and what you can't do?” He said, “What am I going to do?” I said, “I'll tell you what you're going to do.” It was as follows. When we started the Advanced Sea-Based Deterrent Program I called up Admiral Rickover and said, “Will you come and brief us as to what we can study and what we can't study that's in your area?” Rickover said, “Of course. I won't come over and brief you, but I will send over a Commander Barnes and Commander Barnes will tell you.” We arranged to have a court reporter record all the words of Commander Barnes and grilled him the entire morning just like — — today. The other time, we recorded everything he said. I prepared a memorandum for Admiral Rayburn's signature that read that the study was going to be carried out in accordance with the agreement between your office and our office, as made by Commander Barnes as follows, and then we quoted all of the things that were in it.

Rickover knew when he had been beaten on a thing like that, and Rickover knew he had been beaten. I figured he would retaliate for something like that but, anyhow, he assigned a man to that study. That man continued to write reports to the Secretary of Navy about what a lousy study this was, how bad it was, and when it was all over there was a big blast. He went to the Secretary of the Navy. He said, “We're going to shelve this incompetent study.”

All of a sudden I got a call from Dennis Wilkinson , who was the first commanding officer of the USS *Nautilus* and who was then an admiral over in the Pentagon. Dennis knew me for my connection with work on the *Nautilus*, but he called me and said, “Hey, Craven, you know that crazy submarine that you were designing and working on?” I said yes. He said, “Well, Rickover and I know how to build it.” I said fine. He said, “the admiral wants to know that if we design and build it, will you, Craven, be the project manager?” I said yes. That was how I became the project

manager. Why? There were several reasons as to why. One reason was that if he had wanted it done by the Ship Systems Command, he would have had to get a Naval Academy guy to be the project manager. By moving it over to the Deep Submergence Systems Project, he could get a non-Naval Academy guy to be project manager. He got a civilian to be project manager. I think it was more than that, though, because Rickover did a lot more research than we give him credit for doing and I think that there were several factors involved. One factor that I'm certain of was my role in the solution of the resonance problem on the submarine *Nautilus*. Dennis Wilkinson got to see me in action in one of those situations that I call 'situations in which you're under fire and you've got to perform or serious things would happen.'

When that happened, Rickover never got involved, so he never showed up at all during that whole scene. I knew that Dennis was reporting to him on a daily basis as to what was happening on that program. He must have reported to him that this Craven guy knew technology or something like that.

The thing that I'm not sure of was that there were two links between Rickover, the past and myself. One link was that when Rickover was a midshipman, the Navy was very small and slightly senior to him and his fellow officers were Frank and Fritz Craven. Frances Craven was a naval officer in the Rickover mold. He would make all of his officers play volleyball on the high seas with a medicine ball. It was known as a 'hernia ball' because you would take this 16-pound ball and you had to toss it over the net while the ship was pitching and rolling at sea. He did all sorts of crazy things like that, like making up fitness reports that were unusual and so on and so forth.

INTERVIEWER: What kind of relation was he?

DR. CRAVEN: He was my father's cousin and my hero.

INTERVIEWER: He was the same cousin?

DR. CRAVEN: He was the same cousin we're talking about cruiser *Nashville*. That's right. The answer is that Rickover had to know the Craven brothers. The other thing that he may or may not have known was the fact that Rickover and I both served on the battleship *New Mexico* and that was his turning point in the Navy. He was the engineering duty officer on the battleship *New Mexico* many years before. At that time, the *New Mexico* won the engineering efficiency pennant and was named Queen of the Fleet for the years that Rickover was there as engineering duty officer. But they all hated him on board the *New Mexico* because he put plugs in the shower so as to save water. He did things like that. He left there to take his first command at sea, and when he got his first command at sea, he was put in charge of a gunboat on the Yangtze River and knew that at that point, his career was over. That was why he switched to engineering duty officer. The only way to stay in the Navy was to become an EDO. When the war came he was put in charge of all electrical systems for the U.S. Navy and immediately moved into a dictator role, with respect to industry and developed all of his techniques. The beauty of it was that at the end of the war the finest systems in the fleet were the electrical systems out and away. Everyone knew that. You had all the line officers in the United States Navy who saw Rickover as their hero. I mean, that's why Gus Ebor was able to repair the radar when it landed on the rocks and he had to have it rescued and they sent the USS *Goddard* in, but the *Goddard* couldn't go in because the radar wasn't working at that point. Gus Ebor worked for me as my deputy there. He went in and he was able to fix the radar because he had the training and the spare parts and everything else. They fixed it just in time so they didn't run onto the rocks themselves and were able to rescue the guys. It was three submarines working together.

The key to that story was submarine electrical systems and Rickover was the master of that. So again you had the situation in which Rickover was not promoted to Admiral. The line officers

were as angry as the Congress and the press because they did not care about what a jerk he was. What they cared about was that Rickover got the Navy doing the engineering efficiency pennant on the battleship *New Mexico* and that Rickover was in charge, in a dictatorial way, and was successful. How much of that featured in Rickover's decision, or how much of it was as a happenstance over the fact that I was not a Naval Academy graduate and things of that kind, I do not know. Also, how much was due to the fact that he wanted that submarine to be part of the Deep Submergence Project?

In other words, he was being left out of deep submergence by not having a nuclear-powered submarine. I don't know why. Anyhow, there I had a tremendously interesting time, and as far as significance to naval history goes, our design procedure, when we started out, Rickover said that everything that was not under nuclear had to be MILSPEC, military spec. I told him, "Admiral, if it's military spec, it isn't going to work. It's got to be advanced component, advanced technology, and there isn't time to spec that technology. It's going to technology obtained from the other part of the Deep Submergence Program." We had a real confrontation, which appears in the books. I'll tell you that it was again. The confrontation had to do with project management. He called me over and said, "Craven, we're now going to manage the project together. When we got together, the first thing he said to me was, "How are we going to solve the problem of not MILSPEC?" I said, "Well, on the classified program, I built a large number of secret pressure facilities that can be used to test materials down to depths to 20,000 feet." He said okay. We invoked the two-and-twenty rule. Everything that was on the outside of that submarine was going to be tested for 15,000 cycles at 20,000 feet. The components failed in the fourteen thousandth cycle. We made the manufacturer do it over again. Everything on the outside of that submarine was tested to that. It turned out that the *NR-1* was just about coming up to the 14,000 or 15,000 cycles. The *NR-1* is the oldest operating

submarine in the service of the United States today. It still has almost all its original parts to the whole thing and they've all stood up to this day.

INTERVIEWER: They were built to last.

DR. CRAVEN: They're built to last but the secret of their being built to last was the design testing, which was very, very, very inexpensive. I had come to the point at which we had finished all our stuff for the *NR-1* but still had not gone out on his first test of any kind. SeaLab III was over with its apparent disaster. I knew that there was a new program going on in the back but there was no reason for me to be involved with that new program because there was no innovation in that new program. The DSRV was about to be completed and it performed magnificently. I do not think I was there in 1970 with the DSRV, but it went through a longer development process than anything else because it went through a conventional development process. That was fine because by going through a conventional development process, we had one process with which we provided the base for all the technology that was used elsewhere, like in command and controls, integrated controls, displays and all the various components. I wasn't involved with the advanced Polaris and Poseidon programs.

At that point I said to myself "Okay, I've done my job and I'm now ready to go and move into the civilian world." Then a funny thing happened in 1968 on the way to the presidency. It was not Florida but California's Orange County election. Nixon had set up a black list of people who he would not let work with his administration. He also set up a good list that most people don't know about. The way you knew you were on the good list was if you got a Nixon Christmas card. What happened to me was that I ended up being on Nixon's good list. This is a very important part of the story. One of the first bad things that happened to Nixon was the Santa Barbara oil spill. When the Santa Barbara oil spill came I was still with the special projects office and I got a call from John

Calhoun , who was the President of the University of Texas. He said, “Craven, I remind you of the Hatch Act, which says that you can't tell me whether you're Republican or Democrat. Don't tell me if you're Republican or a Democrat.” I knew he was being humorous, but I did not know why. I said, “Well, I won't tell you. Why are you calling? He said, “The president wants me to set up a commission to look at the Santa Barbara oil spill. The ground rules are that they have to be experts on ocean technology or oil technology, they can't have worked for the oil companies, they can't be environmentalists, and they must be Republicans. He said, “So, if you tell me you're a Democrat, I won't have anybody on that commission.” I said, “well, I won't tell you.” He said okay.

INTERVIEWER: That was the original ‘don't ask, don't tell.’

DR. CRAVEN: Yes. It was the original ‘don't ask, don't tell.’ He said, “Okay, I'll put you on the commission.” We were on the commission. We got out there and were pilloried by both sides. We were pilloried by the oil companies and by the press, but we carried out our role and mission, and then we were re-commissioned to do the second study for that whole thing. As a result, I didn't realize that I was put on the Nixon good list.

Then I went up to MIT and someone decided that I was eligible to be on the defense intelligence side of the advisory board. I was nominated to the defense intelligence side of the advisory board and, at that point, I got a letter from Senator Brooke, the Republican senator, a black guy from Massachusetts. Brooke wrote me a letter and said, “Dr. Craven, I've been asked whether you are, essentially, politically acceptable to be on the defense intelligence agency side of the advisory board. I hope that you will not be angry with me if I indicate that you are politically acceptable.” I said, “That's wonderful. That's great.” I was then appointed to the defense intelligence agency side of the advisory board.

The next thing that happened was that Nixon set up 17 commissions to look at the reorganization of the federal government and one of the commissions he set up was the Wakely Commission to look at the ocean, named for the former Undersecretary of Commerce under a Republican administration, Jim Wakely. I got a call from Jim Wakely. He said, "Hey, John, I want you to be on the commission." I said "Hey, Jim, I can't be on the commission. I'm a good Democrat and one rule of the game is that you have to be a Republican." He said, "Craven, I got your name from the White House. I want you whether you're a Democrat or not." I said all right. I went to the commission and suddenly discovered a link between this commission and some of the classified programs involved, which was that the commission was told at the start that it was just do things without any restraints.

We started out by taking the democratically produced document, *Our Nation and the Sea*, cutting it up, passing it out to everybody, and said, "Now, write a Republican version." We were writing Republican versions of this Democratic report when we came back, and then it was Halderman or Ehrlichman, I don't know who, came in and said, "Gentlemen, we want to change your ground rules and the ground rules we want to change are as follows. One, the oceans are not of commercial importance to the United States of America." What they wanted to do was to keep all the research on the oceans in the classified military arena. They walked out of the room and that committee was completely baffled; all these good Republicans were all set for all sorts of commercial programs and they don't know what to do. I didn't say anything. I just said, "That's interesting." What happened was that we put out a nondescript report but did recommend that NOAA be established and that it be set up in the Department of the Interior.

Now, there was an overall committee in the front of it called the Ash Committee and it was over all the things. The Ash Committee took our recommendations and bought them and

recommended to the White House that NOAA be set up through the Department of the Interior. At that point Nixon was sore at the Secretary of the Interior because of the Santa Barbara oil spill and because the Secretary complained that he couldn't get to see the President when he wanted to, and that was headline news.

The Ash Committee made the recommendation that it be in the Department of the Interior and the White House came back and said, "Oh, no, it's not in the Department of Interior. It's going somewhere else." The Ash Committee came back and said, "I told you once it's the Department of the Interior, I told you twice it's the Department of the Interior," and the White House said "No, no, no, it's going to be somewhere else." The Ash Committee said, "Well, if it's somewhere else you decide where it's going to be." With one week's notice, Congress was told that it had NOAA. As soon as they did that there was obviously nothing for me in NOAA, even though I was on the Nixon list, because there was nobody in Congress who knew anything about the oceans. I found myself at MIT, being on the Nixon good list for all these commissions and things of that kind.

INTERVIEWER: In spite of yourself?

DR. CRAVEN: In spite of myself, that's right.

DR. CRAVEN: Now, we will backtrack in time, just a little bit, to the time just before 1968, before the election. What happened was that I suddenly got a visit from a Catholic priest in Hawaii. He was really a political animal there, and was Chairman of the Board of Regents for the University of Hawaii and had all sorts of other political appointments from the governor, because Governor Burns was a good Catholic. The guy said, "This is Father Kakamoto and I'm calling to see if I could meet with you." I asked, "Why are you calling me?" He said, "I'm calling to meet with you because I'm looking for candidates to be the next President of the University of Hawaii." I said, "I

don't understand why you're calling me. I don't want to be President of the University of Hawaii. I don't know anything about being President of the University of Hawaii.”

The remark I then made was, “I'm as likely to become President of the University of Hawaii as Spiro Agnew is becoming Vice President of the United States.” He said, “Well, you're probably right, but Tap Pryor gave your name to the governor and I'm visiting some other people here in Washington, so I might as well visit you and you might as well visit me.” I said, “All right.” I met him at the Admiral's Club and we had a few drinks and I took him to lunch at the Cosmos Club and we stayed and talked for hours. The guy had the best collection of off-color jokes that I had ever heard from a Catholic priest, but he was a wonderful guy. He really was. He was a tremendous guy.

When it was over he said, “You know, Craven, I think that you should be the President of the University of Hawaii.” I said, “Ha, ha, ha.” He went back, and I got a call from the governor, and the governor said, “You know, we want you to come and we want you to meet with the Board of Regents because we think we want you to be the President of the University of Hawaii.”

INTERVIEWER: You had only met Governor Burns on your previous trip out here when he invited you over.

DR. CRAVEN: That's right. The only things he knew about me were through Tap Pryor. That was all he knew. I came out and met with the Board of Regents but did not meet with this student committee, and I did not meet with the faculty committee. I asked, “Isn't there a student-faculty committee that's going to review the candidates?” They said, “Oh, yes, yes.”

Then they met with me and talked with the governor, and I met with the governor in the afternoon. The governor said, “You're going to be the next President of the University of Hawaii.” I said, “Governor, I might accept, because it's such an interesting offer. But I don't see how I'm going to be President of the University of Hawaii. There's the Vietnam War going on. The people are

picketing my office at MIT because of my association with the Pentagon and things of that kind. There's no way that they're going to accept me as President of the University of Hawaii.” He said, “There are ten candidates on this list and they list you as number ten,” so I got the job. They made me the President of the University of Hawaii. But I talked it over with Dorothy and this occurred just before...

INTERVIEWER: It occurred before MIT? You were in Washington?

DR. CRAVEN: I was in Washington, yes.

INTERVIEWER: You were with the family?

DR. CRAVEN: I was in Washington with the family. We were preparing to go to MIT. It was before the presidential election in 1968. That was why we got Spiro Agnew. Agnew was being considered as the Vice President, but he was not. I suddenly got a call from Kakamoto. He said, “Oh, Dr. Craven, there's some bad news.” I asked, “what's that?” He said, “The faculty-student committee decided that there were nine qualified candidates and there was one who was unqualified, and you are not qualified to be the President of the University of Hawaii.” I said, “Well, that's not a surprise to me. That's fine.” He said, “No, no, no, the Governor is furious.” The governor said that they had not interviewed me he said he knew if they interviewed me, they would select me. The governor wanted to know if I would come out and meet with the student-faculty committee. I said, “Of course.”

I came out and met with the student-faculty committee, and I was good at those kinds of things and we met all morning and half the afternoon. I went and met with the governor in the afternoon. The Governor asked, “How was it?” I said, “I felt like a black man being interviewed for pastor of a Southern Baptist church. That's the way I felt and that's the way it is.” He looked at me

and nodded his head. He said, "I guess you're right. Don't worry, Craven. We're going to get you anyhow."

Anyhow, they selected Harland Cleveland and he had a military background. He was former Ambassador to the North Atlantic Trade Organization but had come out against the Vietnam War, and since he had come out publicly against the war, he certainly was a hero for all of the Vietnamese protestors. They selected Harland Cleveland as the President of the University of Hawaii and Then one year later, the U.S. government had a brand new report, *Our Nation and the Sea*. But Governor Burns had done a study called *Hawaii and the Sea*. I got a call from the governor and he said, "Craven, we want you to come out and head up the state effort on *Hawaii and the Sea*. We want you to come out and be the Dean of Marine Programs, a new job we're setting up at the university and, by the way, there's nobody who can object to your coming out and being the Dean of Marine Programs." I said, "Well, that's interesting, but I'm going to have to get the same salary that I'll get here and you don't pay that kind of a salary to anybody." He said, "Oh, yes, we do." Just like the new president, I got paid the highest salary in the State of Hawaii, which was \$35,000 a year. I came out as leader of the program. During the first week I was out here, they were going to select a marine affairs coordinator for the state. When they had selected the marine affairs coordinator of the state, I thought, "They're going to select retired Admiral Chick Haley ." Harland Cleveland and I went down to meet with the governor. I said, "Governor, who are you going to get for marine affairs coordinator for the state? Are you going to get Admiral Haley? No? Who are you going to get?" He said, "You."

INTERVIEWER: Was that you?

DR. CRAVEN: That was me and he was grunting in my direction and going "Umph, umph," so as we left, I said to Harland Cleveland, "Do you think I'm the marine affairs coordinator of the state?"

Harland said, "I don't know. I think you are." That afternoon, there was a press release from the governor's office. "Dr. Craven has been appointed marine affairs coordinator of the state," it read.

INTERVIEWER: 'Appointed' doesn't necessarily mean 'accepted,' but I guess it does?

DR. CRAVEN: I was the marine affairs coordinator of the state of Hawaii, whatever that meant, and the Dean of Marine Programs. Tap Pryor had to give a talk to a meeting of the west coast chapter of the American Institute of Architects, AIA, so all these west coast architects were coming out for this big meeting and Tap Pryor was going to be the banquet speaker. Tap told me, "Hey, Craven, I can't give the banquet speech. I've got to go out of town," so and so forth. He said, "I want you to give the speech for me." I figured, "Well, I'll give a speech." I figured that no one was going to really cover the speech because no one covered my speeches in Washington. Why would they cover my speeches in Hawaii?

INTERVIEWER: These were architects.

DR. CRAVEN: That's right. I gave a speech entitled 'I Have A Dream,' taking after what's his name, and my dream was of a floating city for Hawaii. Why did I have that dream? I had that dream because in the middle of the Vietnam War, the Undersecretary of the Navy for Research and Development called me in. I got called in with two other guys, one from the west coast and the other from the Naval Research Laboratory, and he said to us, "We're having trouble with logistics in Vietnam. When we carry things into the ports at Vietnam, one-third goes to the enemy, one-third goes to the black market, one-third goes to our troops, and we need a solution." The three of us came up with a solution. The solution was to have a floating logistics base offshore that would be served by ships. We started a government program called MOBS, or Mobile Ocean Basing System, and we started a program to develop the ship that resulted in the USS *Carmelina*, which was out here.

At that time, I was no longer with the federal government but had also been involved with another program of interest and that was with the National Science Foundation. It was doing a project called MOHO. MOHO consisted of a floating platform and a drill that was going to drill to what was called 'the MOHO discontinuity' down to the molten lava to see what was going on, geophysically. The problem with the MOHO was that Brown & Root was building it and they were getting very expensive. It was using up all of the National Science Foundation's spare money. It was eating into their research program.

INTERVIEWER: When was this?

DR. CRAVEN: Johnson was still President at the time, but this was the end of his term. The reason it was significant was because they set up a commission within the federal government to decide what to do about MOHO, whether we should continue the project under some other agency or do away with it. I made chairman of that commission and when I made chairman of that commission, I was advised that Lyndon Johnson wanted us to kill the project. The reason he did was because the Republicans were going to make a political situation out of the fact that the contract was given to Brown & Root. The reason that Johnson didn't care whether it got killed was because Brown & Root was getting all of the Vietnam programs that it could handle, so the company wasn't going to lose anything, in all likelihood, by killing the MOHO program. I came up with the recommendation that they should kill the MOHO program immediately and take all of the equipment and things they had and make it available to universities, if the universities could use it in any way for ocean research.

Now, you can see that a Machiavellian thought was taking place in my mind. I came up with 'I Have a Dream,' and my dream was of floating cities off of Waikiki. I wanted to have a high-density core out of Waikiki so that the shore could be made into beach areas and have it

connected with the ships. I described this whole concept and did so in a very flamboyant way. The *Advertiser* and the *Star-Bulletin* covered it. The next morning, those papers had a headline, 'Hawaii to Get Floating City.' At that point, I said, "Wow, what a way to start." I immediately got a call from the governor and he said, "Hey, what is this floating city I'm hearing about?" I started to tell him. Do you know what he said to me? He said, "That's a great idea, great idea. I'll tell you what. We're supposed to have a World's Fair here in 1976, so why don't we have a floating city as a demonstration to the World's Fair? That's the 200th anniversary of the discovery of the Hawaiian islands by Captain Cook." I said, "That's fine. I've got to do a study." He said, "Well, I'll tell you what. You can use some of my funds to do the study, some of the marine affairs coordinator's funds for the study. Maybe you can get the sea grant program to support the rest of it." I was the Dean of Marine Programs and Jack Davidson worked for me and he was great for the sea grant. I asked him, "Why don't we get a sea grant to support the study of the floating city?" We started to do a study.

INTERVIEWER: That was all associated with the MOBS?

DR. CRAVEN: No, it they were not yet associated. However, I pointed out that, as we started the study, we could rely on the oval ocean basin system study that was done by the Navy and we ought to be able to recover material from MOHO to build a first model of the floating city. I knew that if a university requested it, we could get it done. We started the project when I suddenly got a call from the school of architecture and they said, "We have this Japanese architect named Kikutaki. He's a world famous architect and has decided, independently of knowing anything, to come to Hawaii for one year to study ocean cities here. Would you like to use him as your architect?"

INTERVIEWER: That was before or after the AIA speech?

DR. CRAVEN: That was all after the AIA speech. In other words, none of this would have happened if it weren't for the AIA speech. The AIA speech set the local press in motion about the fact that Hawaii was going to have a floating city. The Governor affirmed it by talking about it and the sea grant program reaffirmed it. We set up a whole project team and covered every aspect of a floating city. We had an architect and I served as the project manager and the chief engineer. We got the students so enthusiastic about it that they were wearing floating city t-shirts. We designed this floating city, which was later on used for the design of the oil platforms, which consisted of these big concrete things and we decided that we'd build a model. We were going to build a model and had \$25,000 in order to build an 80-ton model that was going to float.

INTERVIEWER: Was that too much money?

DR. CRAVEN: No, it wasn't. It was no money at all.

INTERVIEWER: It doesn't sound like much.

DR. CRAVEN: It was no money at all. At that point, I called up the federal government, which had responsibility for what they did with the platform, and I told them, "Hey, I think we want steel for that, U.S. Steel. We need more than the steel for it. We don't have the capability here of rolling the cylinders and shaping the heads for each one of these bottles." We wondered if the Department of Defense, in connection with the *Nautilus* Program, would be willing to do that, and the answer was, "Of course, of course, of course." The Air Force molded the things at the bottom and the Navy welded them all together to make the basic floating columns. Then we had to put in the overhead structure. At that point, I went to the unions and said, "Would the union like to do this as a project?"

The indoor welders decided that they would do all the welding on that and put the rest of it together and I suddenly got a call from the big union boss, who was furious. He said, "I am furious

because you're having indoor welders do a job that belongs to the outdoor welders." I said, "Oh, if you want the outdoor welders to do it, they'll do it for nothing." He said, "Well, let the outdoor welders do it, see." "Oh," I said, "Well, we'll let the indoor welders do it." We did that and then we got volunteer teams to work on it, paint it, and build it. Essentially, we built this 80-ton floating model for 25,000 bucks, but it was all done through volunteer work and we were all excited about it.

Now, what happened to the floating city is really relevant to this whole story because it's relevant to the U.S. international relations. What happened to the floating city was that when it was finished, Kikutaki was very excited and said, "We're going to have a Oceans Fair in Okinawa in 1974. Why don't we have this as a U.S.-Japanese exhibit at the Oceans Fair in 1974?" Okinawa was reverting to Japan and the Okinawans did not want to revert to Japan. But in order to placate them, the Okinawans were being given a big convention site, built by Japan, and they built a nuclear power plant to make Okinawa into a great tourist attraction. They were baiting Okinawa with this idea and as they were baiting it, they started adding the idea of a floating city demonstration.

INTERVIEWER: They were reverting from having been what, exactly?

DR. CRAVEN: They were reverting to Japanese control. Okinawa was under Japanese sovereignty in World War II and Then we took over Okinawa.

INTERVIEWER: They only reverted in the mid-seventies?

DR. CRAVEN: They only reverted in the mid-seventies. That's right.

INTERVIEWER: Well, that was thirty years ago, but had they become so blatant about trying to kick all the U.S. forces off since, and they were talking about putting a sea base facility off of there and they didn't want any part of that, either.

DR. CRAVEN: Well, at that time, the Okinawans were not as angry with the Americans as they were with the Japanese. In other words, the Okinawans did not regard themselves as Japanese. They regarded themselves as Okinawans, and that means that they considered themselves a mixture of the Chinese and Japanese peoples who had moved there years ago. They had their own culture. They had their own traditions. They had all these various type of things. They did not want to be part of Japan. What happened was that we started the political movement with the idea that the floating city would be built in Okinawa in 1974 and then floated to Hawaii for the Oceans Fair in 1976.

INTERVIEWER: Was it an Oceans Fair or World Fair?

DR. CRAVEN: It was a World's Fair.

INTERVIEWER: Was it really a World's Fair that was here? No.

DR. CRAVEN: No, there was not, but there was a World's Fair in Okinawa. In 1974, Okinawa had this 'World's Ocean Fair.' We would never have had it in 1976 anyhow, because the Hawaiians were objecting to it because of Captain Cook. They regarded Captain Cook as an enemy, not as a hero. That wasn't the thing that really killed it. What killed it was U.S. and Japanese relations. Kikutaki moved back to Japan and while he was back, a whole bunch of students came to our ocean engineering department from Nihon University and got interested in the floating city, also. They went back to Japan and talked to their dean of architecture and decided that there would be a floating city in Okinawa but that they would run it. They would be the architects. But Kikutaki was going to have the floating city there and he was going to be the architect. In Japan, this split occurred all the time because there were two big organizations, Mitsui and Mitsubishi, and Nihon University was associated with Mitsubishi and Kikutaki was associated with Mitsui. Basically,

there was then a cooperation to get a floating city going but also a competition between Nihon University and Kikutaki, with respect to the floating city.

There was also a political drive to make this a U.S.-Japanese exhibit, so Kikutaki said to me, “Look, I can get through to Prime Minister Tanaka and through the hierarchy in Japan. Nihon University said they could get through to Prime Minister Tanaka and the hierarchy in Japan. Can you get through the U.S. bureaucracy up to President Nixon?”

INTERVIEWER: Were you still on the Christmas card list?

DR. CRAVEN: Oh, yes, absolutely. As a matter of fact, I was put on the first NACOA as a result of our Republican senator here for the same reason. When he put me on NACOA, he called me in and I said, “Hey, you can't put me on NACOA. I'm a Democrat and you're a Republican.” He said, “I didn't know that. Well, I'm going to put you on anyhow.” I said, “All right.” He said, “Just don't embarrass me politically.” Yes, I was still on the good list but also on the list of the Kissinger decision to keep oceanic developments out of the commercial world and the non-military world. In other words, at that point, *Halibut* was very successful and the *Halibut's* missions with putting saturation diving on *Halibut*. I'll only cite a following unclassified statement.

At a public hearing many years later, the head of the Central Intelligence Agency at that time, Mr. Gates, made a public statement that said in winning the Cold War, the U.S. Navy intelligence program was the key factor. That's not my statement. That's his statement and he made it because he wanted to tell me, basically, that Kissinger wanted to protect the program and they still wanted to protect the program. That publicly announced the first shot fired in the war was fired from a submarine. Did you see that in the paper?

INTERVIEWER: Our submarine ...

DR. CRAVEN: That's right. It was the shot heard around the world. I said, "Okay, I'm going to go to Sea Grant because they sponsored this program. From Sea Grant I'll go to the secretary of commerce and the secretary of commerce will then go up to the White House. They did that and the secretary of commerce was very enthusiastic and went to the White House and was intercepted by the Halderman-Ehrlichman crowd. They told him, "When we want ideas from you we'll ask. We don't want any ideas from you." I said, "All right." I decided hey, I would go through the president's science advisor. I called the president's science advisor and tried to go through him. He said, "That's a good idea, but I hate to tell you, I've just been fired." I decided I would go through the head of the Scripps Institute with a guy named Nierenberg . Now, Nierenberg was a solid, solid Republican, and not only that. He was the head of NACOA and thought he was in solid with the administration and everybody else.

INTERVIEWER: Now, what was NACOA?

DR. CRAVEN: It was the National Advisory Committee for Oceans and Atmosphere, which was killed, by the way. The reason I didn't go to Nierenberg before was because I did not want to share the project. I now had to share the project with Nierenberg because Scripps had been working with floating cities and things of that kind. If I went to Nierenberg, I was going to have to cut them into the project. I figured, "Okay, it's worth it." I went to Nierenberg and he got all excited about the whole thing. Then Nierenberg called me back and said that he went to Nixon's science advisor and told me the science advisor has just been fired. I lost my access to the president. I figured, "That doesn't stop me."

INTERVIEWER: Did you send another person?

DR. CRAVEN: Well, no, I said, "I will now go to Kissinger," because I'd known him from all these other associations. I wrote to Kissinger. He said, "Craven. I think it sounds interesting. I want you

to go to the executive office of the White House. I've got a guy there who will meet with you and he's also the editor of the Naval Institute Proceedings, and you know him." I went to see him and he was very interested, but at the time, Watergate was coming apart. While I was there, one of the guys suddenly had to leave immediately and he said, "Somehow, they think I'm involved with this Watergate thing." He was involved up to his ears in Watergate, but I didn't know that at that time. I just remembered that he had to leave.

At that time, we had a very interesting coincidence. The Naval Institute Proceedings published a book called *The Hunt for Red October*. Why did the Naval Institute Proceedings publish a book called *The Hunt for Red October* when it had never published a book of any kind before?

INTERVIEWER: It was the first novel.

DR. CRAVEN: It was the first novel, yes, and why would the editor of the Naval Institute Proceedings, at that time, be on the executive officer of the president, reporting directly to Mr. Kissinger? Wasn't it a coincidence that Mr. Kissinger should have been orchestrating the *Halibut* mission?

Anyway, I talked to this guy and he said, "Well, it's very interesting. I'll see what I can do." He wrote to Kissinger and Kissinger wrote to me, "Look, Craven, we'll put this issue on the alternate agenda when Nixon meets Tanaka in Hawaii. He's supposed to meet Tanaka in Hawaii. We'll put it on the alternate agenda." I said, "Well, that's fine." I did not give up.

At that time, Nixon was running for a second term and the man I mentioned before, Sam Pryor, Vice President of Pan Am, was a very big guy in the Republican Party and he was going down to the convention in Miami. I talked to him. He said, "I'll go down there. I'll talk to the president and we'll get everything squared away." He went down and he said, "I tried to talk to the

president but they referred me to the secretary of commerce and the secretary of commerce told me that he couldn't do anything." I said that was fine. I didn't give up and, at that point, there was a lady named Clare Booth Luce. Do you know who Clare Booth Luce was?

INTERVIEWER: Yes, I sure do.

DR. CRAVEN: She was living down here on Kahala Avenue and was a good friend of mine. She had been the U.S. Ambassador to Rome. As a matter of fact, she was advising on the National Security Council, so she was a really big wheel in the Republican Party. While Nixon was meeting with Tanaka, Nixon was going to stay at her place. I went out and talked to her about it and she said, "Don't worry about it, Craven. Leave it to me."

INTERVIEWER: It's not what you know. It's who you know.

DR. CRAVEN: Oh, of course it is. At that point, she had him over for dinner. He stayed over and the next morning, she had a private reception for him to which she invited the people who were going to be there. Dorothy and I were invited to the reception and when we got there, we stood in the reception line. I looked at Clare Booth Luce and she was putting her thumbs up in the 'okay sign.' I got up and met the President and she said, "Mr. President, this is the man that I was telling you about last night." He said to me, and I'll quote him exactly, "Oh, you're the ocean man, are you?" I said, "I suppose I am." He said, "Don't you think that the oceans of the Bahamas are nicer than the oceans of Hawaii?" Is that a showstopper?

INTERVIEWER: What did you say?

DR. CRAVEN: Nothing happened at the Nixon-Tanaka talks.

(Whereupon, the PROCEEDINGS were continued.)

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UNDERSEA & HYPERBARIC MEDICAL SOCIETY

ORAL HISTORY OF THE MAJOR PARTICIPANTS
IN U.S. NAVY UNDERSEA TECHNICAL DEVELOPMENTS

INTERVIEW OF SIR JOHN RAWLINS

PROCEEDINGS

INTERVIEWER: This is the interview of Sir John Rawlins.

SIR JOHN RAWLINS: I was born in England on 12 May 1922.

INTERVIEWER: Where did you go to school?

SIR JOHN RAWLINS: I went to school at Wellington College, Berkshire, in England.

INTERVIEWER: Did you play sports or participate in any extra-curricular activities?

SIR JOHN RAWLINS: We had to take part in all team games, like rugby, football and cricket. I was also in the Natural History Club and whenever possible, went fishing, including poaching.

INTERVIEWER: What influenced you to join the Royal Navy or begin this career?

SIR JOHN RAWLINS: That's an extraordinary story. I do have to explain that a bit. I was at the London Chest Hospital doing my second intern job, a so-called B job. You were only allowed two 6-month intern appointments before being called-up for the Armed Forces, but in exceptional cases could get three. Mine was exceptional because one of the consultant surgeons, let us call him Mr D, couldn't cope with an operation that he was performing. He had lost his nerve after two of his patients had died on the operating table. So I finished it for him.

We got to the absurd situation in which I and the Surgical Registrar, carried out Mr D's surgery and he assisted. That went on for the allowed period, six months for my second appointment as an intern, by which time I was doing quite major chest surgery, thoraco-plasties and things like that. But I then needed to apply for a third job, a so-called 'B-2' job, which meant a full year at another hospital. I knew where I wanted to go. But Mr D was due to become chief surgeon at a new hospital that was under construction and he couldn't do it without me. He got into a panic. I said, "Look, sir, I've got to apply for a B2 job." He said, "No, we'll think of something. Don't apply." He came back two days later and said that it was all quite simple. He

said, "We'll go in front of the Central Medical War Committee and apply for an extension of your present appointment". They did indeed extend it by three months. Thus I did nine months in that appointment at the London Chest Hospital, which was unheard of in those days of National Service.

When we reached the end of the nine months, they hadn't opened the new hospital yet. I said, "Now, I really have to go." He said, "No, no, you can't. I promise you that I'll find something. He tore up the application that I was working on and came back the following day and said, "It's quite simple. It's all been fixed. You just apply for the same job again." I said, "That's not possible." He said, "Yes, it's all fixed. Trust me." So I applied for the job and duly reported at the London Clinic where all the applicants were interviewed. I felt that it was appalling for them that it had all been fixed in advance. They went in ahead of me; I was the last applicant. The interview board consisted of all the London Chest Hospital consultants - with the exception of Mr. D. The chairman said, "Well, we all know Mr. Rawlins. Anybody got any questions?" To my amazement, they just sat there gazing at their navels. Then, he said, "Well, thank you." I went outside. He came out and said, "What on earth are you doing here? There is no way we can extend your stay." I said, "Mr. D told me it had all been arranged." He said, "He never said a word to us and he's gone off on leave." Four days later I received my call-up summons. It was for the Army.

I didn't want to go in the Army. I knew all about the Army. I came from an Army family. But I was interested in airplanes because we had lived at Farnborough, which was the birthplace of British aviation. But Army families in those days never socialized with the Royal Air Force. I went to the Air Force and said, "I'm a doctor and I'm being called-up. Could I join the Air

Force?" He said, "No. We don't take national servicemen." That left me with the Navy, about which I knew absolutely nothing.

I got into a taxi and said, "Could you take me to the Admiralty?" He asked, "What part?" I didn't know there was more than one part. I said, "Well, I'm a doctor" He said, "You need Queen Anne's Mansions." He took me to there.. The porter asked me what I wanted. I said, "I want to join the navy as a doctor." He replied, "You need Surgeon Captain Madill." I was sent up to him on the fifth floor. He was a huge man and looked rather like an orangutan with about four chins. He was very Irish. He asked, "What can I do for you, my boy?" I said, "Sir, I have to do my national service. I wanted to see if I could go into your navy." "Oh," he said, "We don't usually take National Service doctors. It's usually for short service commissions. Where were you educated?" I said, "Oxford University and Bart's."(St. Bartholomew's Hospital, London) "Oh," he said, "We don't get many of them. Why is it you want to go into the navy?" I said, "Well, sir, I come of an old Army family...." He said, "Say no more, me boy, say no more." That was my interview. I was going into the Navy. That was how I got in.

To add one little bit. About two weeks later I got a book of thirty clothing coupons with instructions to buy an Army uniform. I panicked and rang up Surgeon Captain Madill. He said, "Buy a naval uniform me boy, that will fox them!" That was how I got into the Royal Navy.

INTERVIEWER: What year was that?

SIR JOHN RAWLINS: That was 1947.

INTERVIEWER: Why have you agreed to be interviewed?

SIR JOHN RAWLINS: Why not?

INTERVIEWER: Why not? How did you get into diving?

SIR JOHN RAWLINS: I think you said this is about gaps in history. There is one, which I will tell you about. How did I first get into diving?

INTERVIEWER: Let's go back to get some history, then.

SIR JOHN RAWLINS: No. You'll see that a little later on.

INTERVIEWER: Oh, okay.

SIR JOHN RAWLINS: It goes into some things that have never been reported. At Portsmouth, where all National Service officer-entrants received their basic training, there was a course on aviation medicine. I had never heard of aviation medicine, but when on parade with a heavy hangover, somebody shouted an order: the officer beside me stepped forward so I stepped forward and found that I had applied for the course. I was the most junior officer on it but I came out top. Subsequently, I got an appointment to an aircraft carrier, HMS Triumph, which was in Malta. I went out there. I loved the aircraft carrier and flew from the deck whenever I could.

When our ship went to Toulon the Commander (Air) said, "You ought to get yourself a snorkel, mask and flippers." I had never heard of anything like that and I was a rotten swimmer. But another officer and I visited a man whose name is well known amongst spear-fishermen, M. Kramerenko. He sold us fins, masks, snorkels and one spring harpoon-gun. When we first swam in the sea and saw that it was full of fish, we were amazed. Both of us were natural-born hunter-gatherers and we became spear-fishing addicts.

About a year later, Jimmy Hodges, who had served in X-craft - midget submarines - during the War, turned-up in Malta. He was then a free-lance diver. He'd offered to hang onto the outside of a submarine while a torpedo was being fired, and film it. Because in that way it

should be possible for naval scientists to determine the drag pattern. The Navy had said no diver could do that: he would be crushed by the compressed-air shock wave. Jimmy Hodges also said he could dive to 180 feet with his home-made self-contained compressed-air breathing apparatus. The Navy said, "Rubbish. That's impossible."

I met Jimmy Hodges by chance (I have a copy of the film he made when he photographed the torpedo) and took him spear-fishing, - he had never done anything like that before. I chased a fish down about thirty feet. The fish went deeper. Jimmy Hodges swam on down out of my sight! Next day he showed me his diving apparatus and explained the principles of it. I decided I'd build one. It took me a considerable time before I got an opportunity. I could make certain things in the ship but couldn't fabricate the housing for the valve. Fortuitously a Royal Air Force bomber crashed on the top of Monte Christo Island. I was sent there with a rescue team to bring back the crew - or their bodies. In fact, they were bodies. They had been burned to death. The bodies were all in the 'pugilistic attitude' that characterizes the bodies of people who have been burnt to death..

I hoped to have somebody to give me a hand in chopping the arms and legs off those bodies so that we could put them in body bags and bring them back. My young Sick Berth Attendant (SBA) was sick the moment I chopped the first arm off so I had to perform the necessary post-mortem amputations myself. But in the course of all this my attention was caught by a small metal box amongst the wreckage, which I picked up. Not very long afterward, I had made my first diving apparatus. Having done that, I had to teach myself to dive.

I finished my National Service time and tried to go back to the London Chest Hospital. . But by then, the new National Health Service had taken over and the hospital no longer had any say as to whom to take on. They told me there was a queue of 70 people for the job I wanted

(none of whom had any experience of chest-surgery), and said there was nothing they could do about it

I was determined to get back into chest-surgery and hence for two years I was out of work, with a wife and two children, living on the bread-line as an unpaid supernumerary demonstrator in anatomy at two medical schools, waiting for a chance to re-apply.

Then there was a meeting at a London hotel where 700 out-of work-doctors turned up. We were told by the Minister of Health that there were no jobs going in England, nor any job possibilities in England for the foreseeable future. But there were jobs going in Egypt and Palestine and if anyone wanted to go there his Ministry would be ready to help them.

I gave up. I went to the Marine Biological Laboratory at Plymouth. I used to go there when I was a schoolboy. They remembered me because I was very keen on marine biology. I said, "Would you be interested in a makee-learn marine biologist with a medical degree and a diving apparatus?" They said, "Yes, we certainly would. Drive on to St. Mawes, in Cornwall. Go now. Go and see Robert Foster. He's built a diving apparatus too. To have somebody to dive with him would be wonderful."

There was no such thing as a sub-aqua club, or anything like that in those days. I saw Robert Foster and spent the night on board his boat. He was enthusiastic. I had a job at last

I drove back home. My wife said, "The Navy wants to get in touch with you. Surgeon Captain Jan Steele-Perkins, whose wife collapsed with an acute asthmatic attack in Malta and you saved her life, called." I called him back. He said, "We heard you were at the meeting at the Rembrandt Hotel." I said, "Yes, I was." He said, "Did you ever consider re-joining the Navy?" I said "No". Then, they made me an offer I couldn't refuse. The Naval Medical Department promised me that if I rejoined, they'd give me the Acting Rank of Surgeon Lieutenant

Commander. But I would have to sign-on for a permanent commission. An ex-naval secretary whom I knew well said, "Get that in writing." I said, "I can't possibly tell the Medical Director-General to put it in writing."

They also promised to send me to the Royal Air Force Institute of Aviation Medicine (IAM) at Farnborough for not less than 3 years, because they knew I was interested in flying.

So I did the re-enlistment course at Portsmouth and then reported to IAM. There, the Naval Medical Department got in touch with me again. They said, "We've reconsidered this. We're not going to give you an Acting Rank, but instead we are going to make you our first Specialist in Aviation Medicine and we're going to give you another five shillings a day."!! That was my introduction to the regular navy. My ex-naval secretary friend had been right.

My new life at Farnborough was very exciting, lots of flying and all manner of experimental research. After a time I started using underwater techniques to solve certain aviation problems. I was not qualified as a diver as far as the Navy was concerned. I had no qualification of any sort.. But that was how my official diving activities started.

INTERVIEWER: That was the start of your affiliation with navy diving? You were not a Navy diver?

SIR JOHN RAWLINS: No, not at all. I taught myself.

INTERVIEWER: Were you always motivated to go into diving?

SIR JOHN RAWLINS: Well, as you see, it just grew up on me..

INTERVIEWER: Who was the person you admired most in your diving career and why?

SIR JOHN RAWLINS: Well, I admired Jimmy Hodges because he was the man from whom I got the idea and as I said, the Navy just didn't believe that he could do those things.

VIEWER: He did influence your career?

SIR JOHN RAWLINS: Oh, yes. If it hadn't been for him, I would never have become a diver.

INTERVIEWER: In your personal experience, who had the greatest influence on you and on Navy diving?

SIR JOHN RAWLINS: No one in the Royal Navy had much influence on me. But years later, when I was appointed as a Naval Medical Exchange Officer with the U.S. Navy a number of people had, not all of them in the Navy.

When I arrived in D.C. my appointment was in submarine medicine. But I was sent for by a Captain (MC) in BuMed.

INTERVIEWER: Was that Hastings?

SIR JOHN RAWLINS: Yes, Ben Hastings. I had been put on a submarine course, and doctors on the submarine course had to learn diving. I was sent to the diving school. Forty-eight hours later, Ben Hastings said, "They tell me that you know more about diving than they do. We're going to take you out of submarines and put you into diving research" That was SeaLab III. So that in that way, Ben Hastings certainly had a great influence.

INTERVIEWER: During your diving experience, were there any people you consider extraordinary whom you associated with?

SIR JOHN RAWLINS: Yes. For example there was Mark Terrell who spoke at the HDS Annual Meeting last year. He was my first standby diver when I started the work on the use of ejection systems to get people out of sunken airplanes. Mark was a remarkable diver and he is an extraordinarily brilliant person who is presently working on the development of an artificial brain! Bob Workman certainly had a big effect on me while I was working for him. He was a marvelous person. Sylvia Earle had a big effect, of course, because much of what has happened to me since I retired from the Navy has been due to my ties with Sylvia whom I originally met

underwater at St. Thomas in the Virgin Islands when she was in Tektite II. Years later I became chairman of Deep Ocean Technology and Deep Ocean Engineering of which she and Graham Hawkes were the founders

Dick Long certainly had an effect. Dick always said I helped to put DUI on the map, because when I was working on thermal protection systems for SeaLab III, I was the one who backed Dick Long. Then there was also John Tauber at NMRI. He was a mathematician, a very good doctor and a great personality generally, and it was he and I who worked together on underwater thermal protection.

INTERVIEWER: Were there any others, apart from these extraordinary individuals?

SIR JOHN RAWLINS: Apart from them, there were none.

INTERVIEWER: I want to get into a lot of different diving schools and specialized courses in your underwater career. In your opinion, what was the best school you attended?

SIR JOHN RAWLINS: I never did. When I was already using my own diving technique and another Scuba which I had built in Farnborough to solve some other problems in aviation, I discovered that if you were a Naval diver, you got paid. I went to HMS Vernon, the naval diving and gunnery school, and did a fortnight's course there. A Lt. Cdr. Hugh Oswell and I were put on a special course. (He had also built a diving set and later had his own company, which made diving apparatus). It was called an 'acquaint' course and our instructor was a Petty Officer Rogers. What he did was put us through all the different types of diving apparatus they had, including standard diving, oxygen diving, and mixed-gas diving. Also underwater cutting and welding, the whole shooting match. That was the only course I took, but it made me a qualified diver. From then on, I could claim payment by the minute underwater. At one time, I had more hours underwater than anybody else in the navy.

INTERVIEWER: During your training, who was the particular person or thing that made the most lasting impression?

SIR JOHN RAWLINS: Well, there was just the one, Petty Officer Rogers. Perhaps there is something just worth mentioning which we will hear more about tomorrow. One day, he said, "Right, get your boots on, everybody." We were to dive in Portsmouth harbor, wearing weighted boots and oxygen breathing apparatus. He said, "Just get underwater, look around, and if you find anything interesting, bring it up."

We didn't know what he was talking about. A whole bunch of us went into the water. There was zero visibility. We didn't find anything. One chap got lost. He got into an old ship's boiler. He was absolutely petrified. He thought he was in a sewer. He finally found his way out but he would never dive again. We all came up and the news broke that evening. What they were hoping we'd find was the body of Crabbe, the Frogman who disappeared.

INTERVIEWER: Oh.

SIR JOHN RAWLINS: There's another little story about Rogers. The Horsea Torpedo Lake is an artificial lake in which torpedoes used to be tested. It was taken over for diver training. Rogers said, "Right, gentlemen. Operation Awkward". You had to get yourself into a dry suit as fast as you could, then swim the length of the lake and back.. They were neck-entry suits, no zippers or anything. It was a difficult job just to get dressed without help. As fast as you could, you were to get into the water and fin down to the other end and back, and he'd be watching with a stopwatch. Well, Hugh got into his gear quicker than I did and got into the water. I got in and went after him. I reckoned that I was fitter than he was and I stormed after him. God, I must have gone like a rocket. I roared down to the end, got to the old gates at the end of the lake and turned back. No sign of him. Just as I was about fifty yards from the jetty where we had started, Hugh

Oswell suddenly appeared. He'd been hiding under a bush which hung over the water! He came out with me. I had to be helped out of the water because I was so exhausted. Rogers said, "Well, that was a very fast time, gentlemen. And Commander Oswell is not even out of breath!"

INTERVIEWER: What was Roger's first name?

SIR JOHN RAWLINS: No idea. Officers don't usually know the names of ratings. But that was a tough spot of diver training. That certainly was.

INTERVIEWER: How about the highlights of your Navy diving career?

SIR JOHN RAWLINS: Well, there were several highlights. The whole of the aircraft underwater escape program was a highlight, and you have heard something of that. But from it I produced a much better, safer system. All that was brought up again with regard to the recent hostilities in Iraq in which Royal Navy aircraft were involved. Because the system which I had developed was never put into service, owing to action by Sir James Martin of Martin-Baker Ltd.

Because Ed Beckman, Cdr.(MC) USN, Surgeon Lt Donald McNutt and I had done underwater seat-ejections with full charges of cordite and survived them, Jimmy Martin saw no need for my improved system. But what actually happened was that we could get out of the aircraft but we all experienced a momentary loss of consciousness and were unable to release ourselves from the sinking ejection-seat. The automatic seat-release system that was designed for airborne ejection wouldn't work underwater.

Then, he introduced a new ejection-seat for the Buccaneer strike aircraft and I worked on that from the aviation aspect in at the US Naval Ordnance Test Station (NOTS), China Lake. Using the supersonic track there I demonstrated that the system was no good for airborne escape. The ejecting aircrew would not clear the aircraft's tail. So Martin Baker put in a heavier charge. Then, I had to see whether or not that was survivable in an underwater ejection

Well, carried out tests in the 40ft deep Mining Tank at HMS Vernon which had a moving floor... We used anesthetized goats as subjects. It was the underwater blast I was worried about, not the velocity of the ejection. A ramp was erected on the floor of the tank up which the Buccaneer ejection-seat could be fired when the floor was submerged. A second seat was installed on the back of the ramp and positioned so that it would be back-to-back with the moving seat when the latter separated from the seat gun. Thus the stationery seat, containing the anaesthetized goat, would be subjected to the same underwater blast as a dummy pilot in the moving seat.

Well, we damaged the sheep quite a lot. They got liver ruptures and had lung hemorrhages, but of course they were unconscious at the time. Sheep don't have very strong chests, and I decided that it was a risk that I could take because I would be ready for the explosion with muscles tensed. The seat was fired. Twenty-four quarter-inch bolts in the seat I was in were sheared and I was lifted four inches from the seat, despite the fact I was totally strapped in. When I got out of the water and we went down to the Wardroom, I had a cough and a sharp pain in the tip of my right shoulder, which is typical of a gallbladder lesion.. I probably had a minor tear of the gallbladder suspensory ligament, but it all cleared up within 48 hours.

Then, an engineer from the Aircraft Company, Blackburn Aircraft, saw the setup and said, "I wonder if they got the geometry right." We'd given all the details to naval engineers but it turned out that the stationary seat was eleven inches higher than it should have been. In other words, the gun discharge was a little lower than it should have been and hence less focussed on the subject in the stationary seat, although it had wrecked the seat. We put it down eleven inches higher and I was going to have a go but Dr. Cameron Wright from the Naval Physiological Laboratory said, "No, we must do one more goat." We did one more goat. Cameron did the post-

mortem and certified that the injuries would have proved fatal. Underwater escape using the Buccaneer ejection-seat was clearly not on.

I guess that project was one of the highlights. Of course, the development of my much better compressed-air underwater ejection system was another, even though it was never put into service.

There are two other things which I regard as highlights which I'll address immediately. Of course, SeaLab III was in itself a highlight. Another piece of research I carried out was an investigation into "Deprivation of the Environment". My boss, Group Captain W.K.Stewart AFC RAF , had heard that the Russians were using deprivation of the environment to brainwash people . He asked me, "Could you dream something up that is one hundred percent deprivation of the environment?" I did. I worked with a young engineer. We set up a system by which you could float subjects underwater. They wore cotton undersuits, which are usually used with Naval dry-suits, with little weights attached and little floats and were kept three feet below the surface by attachment to a 56 lb sinker. The water temperature was 93 degrees Fahrenheit. With an absolutely silent breathing system, you could feel nothing, see nothing and hear nothing. It was total deprivation of the environment. I did the first runs of up to two hours. We had 12 diver volunteers, one naval doctor who had done a lot of experimental work but nothing involving diving, and an Royal Air Force (RAF) doctor who had also done a lot of research in aviation medicine but nothing involving diving. For me, it was fine. I would just go to sleep, thinking of the minutes I was putting in underwater and the money I was earning thereby. All the other divers did the same. But then, we put in Surgeon Commander Ian Colley. He had been in the water less than ten minutes when he got into an absolute panic and fought to get out of the water.

What had happened? He said, “You were tricking me. You were tricking me. You were running the water out of the tank.” It was, of course, an illusion.

Wing Commander Tom Whiteside was out in less than ten minutes and also in a complete panic and it was difficult to control him. He was truly manic. I asked, “What was the matter?” He said, “You were spinning me round and round.”

The analysis I originally produced was that the central nervous system engenders “noise” as well as receiving signals. As you know, if you shut your eyes, you don't see nothing; you see colors. If you deliberately cut a decompression time, or know that it has been cut, you are almost certain to get pain in your legs. You can think of many other examples. Our sensory impressions depend upon the sound-to-noise ratio. I don't hear the tinnitus in my ears until I think about it because the sounds we normally hear overcome the noise in the auditory system. When there is no sound, the sound-to-noise ratio is absolute in favor of noise. Therefore, when people experience sensations underwater under those conditions, they may not be able to recognize that their sensations are not genuine.

At first, I thought this was a neat analysis but then it occurred to me that it was not, because in both cases it had happened so quickly. If my analysis had been right, some time would have elapsed before the subjects began to be deceived. I realized that deprivation of the environment per se is no problem. You deliberately experience it each night when you retire to bed. You shut the window. You shut the door. You turn out the light. The church bells, attractive in daytime, are a nuisance at night. You tell the other person in the bed to shut-up and go to sleep. You sleep yourself. It's a deliberate deprivation of the environment. But while you're asleep, a tiny noise might wake you. If there is a rustle or some other small noise when you wake suddenly, it might set your heart pounding.

Why sensory deprivation got to those two was because they were stressed from the moment they got into the water. They were frightened of the experiment. When they thought something was happening, it was totally real to them and they imagined all sorts of other things. I gave a lecture on this at Stockholm and it was reprinted in two countries behind the Iron Curtain amongst others. I had suggested that the same thing was happening in Russia and in some other countries. People were scared, and hence stressed, there. Russian people were frightened of a NATO invasion because they were never allowed to hear any news from outside. All they got was what was generated inside. They believed they were under threat from Europe, which was not true, but they had no means of knowing that it was untrue. This was deprivation of the environment on a national scale. It's long story, but that was certainly a highlight of my work.

INTERVIEWER: Your first experience underwater was diving in Toulon, right?

SIR JOHN RAWLINS: No, it was in Malta.

SIR JOHN RAWLINS: Well, I guess that the underwater escape system, in a way, was one of my memorable experiences. The deprivation of environment, which I think was very important, came later.

INTERVIEWER: Which physicians, you've answered that.

SIR JOHN RAWLINS: I'm sorry, where? What number?

INTERVIEWER: The number 31.

SIR JOHN RAWLINS: We've gone down there already. Bob Workman was the only one.

INTERVIEWER: Are there other projects you would have liked to undertake?

SIR JOHN RAWLINS: Absolutely. In the practical area, what I wanted to work on was connected to some extent with what I'd gone through in Scotland. Underwater communications

between divers were rotten. I had carried out the first noise survey of an aircraft carrier. Subsequently, a physiologist, a psychologist and I were responsible for introducing the magnetic-loop Flight Deck Communications System whereby a broadcast was sent into a magnetic loop and the flight deck crew were equipped with receiver-transmitters with which the magnetic radiations were converted into speech, into audio. The system became standard not only on carrier flight decks but also on the bridges of all Royal Navy warships.

I believed that you could do the same thing underwater. If you had people working in a limited area, you could lay a magnetic loop around it and get really good communication from a free-swimming diver into the loop and thence up to the surface. None of the existing systems of underwater communications were good and the hydrophones and bone-conduction systems worked poorly. I had plans for developing an underwater magnetic loop system. Alan Burrows, who had worked with me on the Flight Deck Communication System, was, at that time, working with Douglas Aircraft in America. He was coming back to England. He was due to arrive on a Monday. On the Saturday, I said to some of my colleagues, "We're now going to raise a glass to Alan Burrows. Alan has got an appointment at the Admiralty Experimental Laboratory. He and I are going into business again and we'll develop a new underwater communications system." He never came. He died in mysterious circumstances the day before he was due to arrive.

Then, of course, the next step in deep submergence would eventually be to get the diver out of the water. People operate best under normal circumstances. In other words, you should always be at one atmosphere in things such as the vehicles that Graham Hawkes is working on. That's the way to go.

INTERVIEWER: You mean ocean floor habitation.

SIR JOHN RAWLINS: No. Not habitation as in SeaLab III. I mean in vehicles and work-stations from which inspections could be made and operations controlled without the diver having to get out into the water. In SeaLab III Berry Cannon was said to have perished because the responsible Petty Officer had failed to check the breathing sets. In the set that Berry was said to have used, the Petty Officer hadn't put in the baralyme. That was the cause of Berry Cannon's death, it was said. It wasn't.

That particular set came back to Washington to the diving school. I happened to be there and a set had just arrived. I asked what it was. They said it was the set that Berry Cannon had used and it was wet. It didn't have any baralyme in it. I was very interested and examined it. One of the tubes had semi-circular tear at the connection with the canister. I know how that happened because I demonstrated it subsequently to John Tauber. Take one of those closed-circuit sets with an empty canister, shut off the mouthpiece, put it in a chamber and compress it. The tubes will shrivel up and then, bit by bit, they get driven into the canister and eventually one of them will tear on the edge of the canister connection.

That was what happened. It could not have happened while he was wearing it. He couldn't have worn it in the water and swam over to the habitat because the moment he submerged, it would have flooded. When they first went in, they came out because Berry Cannon and the other diver were shivering with cold.

INTERVIEWER: Do you mean Barth?

SIR JOHN RAWLINS: Yes. That's right. It was Barth. They were absolutely shivering with cold and breathing very heavily. They were classic cases of hypothermia. I wasn't allowed to go out there even though I had been responsible for the development of the thermal protection equipment. I was an alien.

The two divers were transferred under pressure to the deck chamber and put under warm showers. Warm showers are not the way to deal with hypothermia, particularly in a chamber with a helium/oxygen atmosphere in it. Putting someone in a hot bath is quite different. The outside temperature was 56 degrees Fahrenheit, which would have been the temperature of the atmosphere inside the chamber, leading to a serious exchange of heat due to the thermal-conductivity of helium. On the second dive, a narrower tube was used to supply the hot water; which, of course, meant that the flow would have diminished. John Tauber and I had shown that it was the volume of flow that counted. The greater the volume of flow, the more efficient was the heat transfer and thermal protection.

I think what actually happened was that Berry Cannon collapsed with carbon dioxide poisoning as a result of the hypothermia.

Prior to the subsequent inquiry, George Bond circulated an unofficial account of the disaster and said was that they were going to have to find Chief Petty Officer Wells guilty. He said, "I'm afraid that's what it's going to have to be." Walt Mazzone told me that at the Board of Inquiry he was so worried about the case that he insisted on having have his lawyer with him because, he said, George sat on both the witness side and the inquiry side of the table. I think it is a very sad story. But you can figure out what you like. As I said, I saw that set and there is absolutely no question that the set that was not the one that Berry Cannon used. You couldn't have gone into the water with that tear. It would have flooded immediately.

If Berry Cannon had not died, what would the Navy have developed from the SeaLab III experiments? Actually, what would have developed is approximately what happened in due course. In other words, regular saturation diving and all that went with it would have happened earlier.

INTERVIEWER: The Deep Submergence Rescue Vehicles (DSRV) are going out of service. They are being replaced by another type of submarine rescue system.

SIR JOHN RAWLINS: Yes. Well, I don't know about the SRDS. I don't know whether the DSRVs were successful, but they seemed to me to be a first class idea. I do think one could develop a better system for connection, because if a submarine had rolled to one side, you would have a problem mating DSRV to the boat. But that could surely have been designed out. I think that the principle of the thing was very good, but I can't comment because I don't know what the SRDS is.

INTERVIEWER: What is your opinion of equipment that was developed for submarine rescue, such as the one atmosphere diving suit and submarine escape immersion equipment?

SIR JOHN RAWLINS: Obviously, the one-atmosphere diving suit does give the opportunity to get down and do things in tremendous depths. But I'm not quite sure how that would help in submarine rescue. If you've got a diver down there in a one-atmosphere suit, what does he do?

INTERVIEWER: I could tell you later.

SIR JOHN RAWLINS: Well, I know you won't. Submarine escape immersion equipment.....

INTERVIEWER: I'm not sure to what that refers.

SIR JOHN RAWLINS: The system that we had for individual submarine escape worked very well. George Bond carried out an escape from 200 feet from a submarine en route to the UK, right? Something like that or a bit deeper - Yes. I think that as far it went, it was a good system. But all sorts of errors have been made nearly every time there has been a submarine disaster.

INTERVIEWER: In your particular field, in aviation medicine, what is your most important contribution?

SIR JOHN RAWLINS: That is terribly difficult. You see, we had produced the underwater escape system. It could have saved 29 lives which would not have been saved by the zero-zero rocket ejection-seat . There is a report of mine on that to the Flying Personnel Research Committee

All this was raised recently with the present Admiral commanding the Royal Navy Fleet Air Arm Air. However, it transpires that, with vertical takeoff and landing, there are now no “ditching” accidents. The person who knows most about it in the US Navy is Captain Channing Ewing (MC) USN . He lives in New Orleans. George Bond did a single underwater ejection from a submarine deck using a reduced charge. The seat was buckled after it. He said, “No way.” Well, the fact was that every time we used it, the seat buckled. The things I really achieved were all in the field of aviation medicine.

INTERVIEWER: What experience, job, or operation are you most proud of?

SIR JOHN RAWLINS: Well, I'm basically responsible for all the helmets you see people wearing today, for motorcycles and so on. . I produced the first crash helmet ever to be based on a study of the mechanisms of skull and brain injury.

It was very difficult to get it accepted. The RAF wouldn't accept it. A celebrated wartime consultant had told them that if you made a helmet that was strong enough to significantly protect the head, and the pilot pulled G, the pilot's head would be forced onto his knees. Moreover, if he crashed, it would break his neck. They believed that.

I had to take on the development of the crash helmet because the Korean War was on and a naval pilot had been scalped when his aircraft went into the flight deck barrier. I was sent a U.S. Navy aircrew crash helmet . It was a lovely gold thing. I had no idea about its construction. It was on the shelf in my office when I reached up for a book and it fell off the shelf, hit the

concrete floor, and cracked! Ed Beckman told me that they were being sent back to ACEL at Johnsville, PA marked 'U.S. Navy crash helmet. Fragile. Do not drop.' It was made of fiberglass with an inner helmet, which carried the telephones and oxygen-mask fittings. In due course I produced the Mark I Protective Helmet for the Fleet Air Arm, constructed of layers of knitted nylon laminated with phenol-formaldehyde resin and a shock-absorbing harness – which was promptly adopted by the RAF! I subsequently produced a version of it for motorcyclists. The British police initially opposed it but now you see them everywhere. I worked with the British Standards Institute on the establishment of an official Standard for motorcyclists' helmets.. When we got out the Standard, it was accepted by 32 countries, including two behind the Iron Curtain. I'm certainly proud of that.

INTERVIEWER: What do you think was your most important contribution to diving?

SIR JOHN RAWLINS: Oh, I think it was the work that John Tauber and I did on hypothermia. We were the first people to point out the respiratory heat loss when using a helium/oxygen breathing mixture.

Another thing that was important was my work on underwater blast. As a result of that work, for which I received the Nobel Award of the Institute of Explosives Engineers, I was invited by the Marine Technology Department to be a specialist author for the present Guidelines for the Safe Use of Explosives Underwater. I'm pretty proud of that.

INTERVIEWER: Is there a story or incident that you've never told?

SIR JOHN RAWLINS: There are too many, including some very frightening ones.

INTERVIEWER: Can you tell one now?

SIR JOHN RAWLINS:.. There was an incident at the Admiralty Hydro-Ballistics Research Establishment (AHBRE) at Glen Fruin, Scotland. We were advising pilots that they could use

the aircraft oxygen system if they went into the water. You could breathe on that. (This was before we worked on the use of ejection-seats to escape). If the oxygen system was properly modified and you went down with it, it would give the pilot time to get the cockpit canopy off and get out of the plane. But we found that you couldn't get the canopy off until the cockpit was flooded. The pressure differential would be too great otherwise. An automatic means of flooding the cockpit was essential

We worked on that and I had to do just one more run. It was nearly night-time. Everybody was saying, "Let's just do this one and then, we're finished with the program." I got into the aircraft fuselage we had there, strapped in, closed the canopy and the crane started to let it down in the water. It flooded up. I was quite happy, breathing on the oxygen system and waiting for the cockpit to flood up sufficiently for me to get the canopy off.

Then, quite suddenly, there was nothing to breathe. I thought, "What the heck is going on?" I was wearing a naval immersion suit, which was made out of cotton. It was a very clever design but it stiffened up when immersed, which made it quite difficult to move. I managed to reach over and press the emergency valve on the oxygen supply system on the aircraft but that didn't work. I tried pushing on the oxygen mask because there had been some trouble with the mask's expiratory valve and I wondered whether that was the cause of the problem. I pressed it onto my face and blew out hard. So that I had empty lungs and the fuselage was still going down. At that point, I panicked. I repeated the procedure, went through it all again. A typical panic reaction. Finally, I gave a thumbs-down signal, which was seen by my winger, Surgeon Lt. Cdr. Sandy Davidson, who yelled to the crane crew to bring the fuselage up as fast as possible. When they got it out of water, it was horrid. I was in the cockpit and couldn't manage to release the harness. The water was above my head. You can drown in four inches of water. Sandy, thinking

quickly, yelled to them to raise the forward crane so that it tilted the fuselage so that the water level was below my chin. When I got out my nerve was absolutely shattered. I had quite forgotten was that we had put an emergency air-breathing system in the cockpit which was available. I could have put it in my mouth. It was a classic example of panic.

There was a pressure-equalizing valve going in the oxygen system that I had specifically ordered to be blanked off. The engineer had confirmed that it was blanked-off but in fact it wasn't and the oxygen system had flooded. I heard later that Ed Beckman had had a similar nerve-wracking experience. The engineers had failed to blank it off on that occasion too. It was because it never occurred to me that that could be the reason for the oxygen flow failure, that I took the wrong actions.

INTERVIEWER: Do you have any regrets?

SIR JOHN RAWLINS: The only thing I regret was the fact that I developed a vastly improved underwater escape system, which was a hundred percent reliable, but was never installed in Naval aircraft. Jimmy Martin, the amazing character who was responsible for ejection-seats in the UK, USA and other countries was in many ways a great man, but he was also a rogue. He wrote a personal letter to the chairman of Rolls Royce to convey to the First Sea Lord that I was ruining his business and taking away his only means of livelihood, because he didn't have a patent on his aircraft underwater escape system. It's not a very nice story.

It was a real disappointment that my system was never accepted, and one day I'll send you a report on the subject. It's shattering, in a way. If I had the opportunity again, would I do it? Yes, of course, I would. If I had to live my life again, thinking of the constraints under which my career developed, what personal decision would I change and why? 'None' is the answer to that.

INTERVIEWER: That's good. Your career is one of those targeted for inclusion in this catalogue of historical events.

SIR JOHN RAWLINS: Yes, you're right.

INTERVIEWER: It focuses on molding the direction the Navy took in underwater technology

SIR JOHN RAWLINS: To me it was a novelty because it was a unique setup and there was no way to find a role model in that situation..

INTERVIEWER: When they made you, they broke the mold.

SIR JOHN RAWLINS: I was just responding to aviation and underwater problems as they happened. As I said, mine was not a regular diving career.

INTERVIEWER: That's right.

INTERVIEWER: What do you consider the most significant achievement made in the underwater field in the recent past?

SIR JOHN RAWLINS: Well, it's saturation diving. But there's another story to that, of which I've brought the evidence.

INTERVIEWER: Can you describe any significant events in diving history that occurred during your career?

SIR JOHN RAWLINS: You mean in my own experience? There was interesting event in Key West where they were trying to develop an aircraft underwater escape system. I went to have a look at it. What they were doing was sinking a fuselage, with a dummy pilot in it. Then the canopy would implode. The question was whether the pilot was going to be able to get out after that had happened

They didn't know really what happened when the implosion took place. I said, "Let me sit on the nose of the aircraft when we it submerges and I'll be able to see what just what happens.

I'll take a camera down." They said, "You'll be killed by the explosion." I said, "I think not. I've done lots of these things before." I didn't have an official naval qualification in that respect. But I was wearing a Rolex watch. The chap who was in charge there asked, "Where did you get that Rolex watch?" I said, "The Queen gave me it for diving." They said, "She did? Oh, all right, then." I sat on the nose of the fuselage and witnessed the collapse of the canopy. Subsequently, I discovered that the whole set-up they'd built was wrong. One of the engineers had blanked off the cockpit pressure-equalization valve. In the cockpit of every pressurized aircraft there is a valve, which ensures that, as it descends into higher atmospheric pressure when about to land, air can flow in. Otherwise, the cockpit pressure would still be at altitude. That hadn't told me it was blanked off. All their work was valueless up to that point.

As regards my other research, thermal protection, of course, was very important.

INTERVIEWER: Think back upon your career in undersea technology. If all barriers had been removed, what would you have done?

SIR JOHN RAWLINS: I would have stayed on as Medical Officer in Charge at the Institute of Naval Medicine and would never have become Medical Director General of the Royal Navy.

INTERVIEWER: We're looking at important steps in the history of diving?

SIR JOHN RAWLINS: Well of course, the most important thing was the understanding of decompression sickness. This was a thing, once it was really understood, that made an enormous difference. That was the biggest thing ever. Of course, also very important was the development of the air pump. My ancestor, John Rennie's, dive chamber, with which some of the harbors here in England were built incorporated an air pump. Decades later the introduction of self-contained breathing apparatus, other than the oxygen apparatus, opened up diving to everybody.

INTERVIEWER: For the first half of the century, the Navy was the world leader in diving...

SIR JOHN RAWLINS: It was simply that the Navy had the divers, and of course, in your country, there were Army divers, too. We don't have any of those now, although it was the Army that had first taught the Navy to dive. The Navy was the diving business for many years.. Of course, it has now moved out into commercial life. Now, you have people trained from scratch for commercial diving. We get so many of these divers. After retiring from the Navy, I worked with many ex-RN divers who are still operating in various ways. They are part of my group. I communicate with these people all the time. The things some of them are doing now are amazing. Some are working on clearing minefields,- landmine fields. They're doing things like rendering mines safe in Bosnia, Ruwanda, etc. They are unsung heroes. But that is no longer with the Navy, of course. It is now a commercial operation.

INTERVIEWER: Based on our hundred-year history of where we have been in undersea technology, what do you consider the greatest development?

SIR JOHN RAWLINS: As I said before, with systems available by which man can take his natural environment with him, people should not be exposed to high pressure. Now, it's perfectly simple to use modern technology to have the guy down there, operating sophisticated engineering systems to provide what he wants, with him in full control and at atmospheric pressure.

INTERVIEWER: A number of achievements have been commercialized...

SIR JOHN RAWLINS: Among the important developments were submarine rescue chambers, mixed gas diving, of course, and SCUBA. Underwater habitats looked quite interesting but had no commercial importance. Saturation bell diving was important. Semi-closed circuit breathing systems are used for all our mine clearance in the RN. They work because they are non-magnetic and very easy to use. In terms of commercial diving equipment, mixed gas diving is, of course,

very important. But, as I say, it is all leading to the point at which we ought to be able to get the diver out of those hostile situations.

INTERVIEWER: 55 is a repeat of 51.

SIR JOHN RAWLINS: Saturation diving was the most important thing. I had a major role in that, not only from the point of view of thermal protection and that type of thing; I was also developing a thermal protection suit for the U.S. Marines Recon personnel. But it was something far more significant than that. Where do you reckon saturation diving started in the States? Who or what was it? That's the whole point of something I have to show you. I'm going to put it off for a moment. Let me read a message that George Bond sent to Surgeon Commander Stanley Miles in 1958. It reads, "New London. Placed mice at 200 feet for 14 days. They died of convulsions. Oxygen"?

Stanley Miles replied, "The partial pressure of oxygen would have been about 1.6 atmospheres so that a proportion of oxygen convulsions would be expected. Does nitrogen at that pressure cause cumulative damage? It would be interesting to repeat the experiments, preferably with something bigger, e.g. rats. If convulsions result, lower the oxygen partial pressure, holding the nitrogen partial pressure constant (plus or minus helium replacement of the nitrogen) and repeat. In rats, reaction to electric shock is diminished by nitrogen narcosis. This might be used to follow the onset of nitrogen narcosis. Also, watch the basal metabolic rate and if possible, tissue oxygenation."

This was the point at which George Bond got into saturation diving. I had mentioned to him, when visiting him in New London in connection with a death in their submarine-training tank, that my proposal to the Director of the Royal Naval Physiological Laboratory (RNPL), that rats should be used to investigate the possibilities of saturation diving, had been turned down

because it was not an official naval requirement. George was interested and said he could do it, starting with mice. Subsequently, after the rats had all survived after breathing oxy-helium, I went again to New London and George had then carried out the first exposure of people to saturation. The 'Dive' was to about thirty feet in a tank and he showed me where there had been a gas leak and he had taken a sledgehammer and belted a leaking copper pipe flat in order to stop it!

The subjects came out after being at pressure for, I don't know, maybe ten days or a fortnight, and he practically had the world and his wife there to welcome them. From then on, he proceeded down the same path, as it were, that the rats had taken.

That is the truth as to how the SeaLab program and saturation diving started.

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UNDERSEA & HYPERBARIC MEDICAL SOCIETY

INTERVIEW OF
CHIEF KEVIN LUNDGREN

Kensington, Maryland
Friday, September 5, 2003

PROCEEDINGS

INTERVIEWER: I'm at the Naval Special Clearance Team (NSCT) One with Chief Kevin Lundgren. You are an operations specialist chief?

CHIEF LUNDGREN: That's correct.

INTERVIEWER: How long have you been in the Navy?

CHIEF LUNDGREN: I've been in the Navy 13 years, sir.

INTERVIEWER: How many years have you been in the Navy as a diver?

CHIEF LUNDGREN: That would be eleven years, sir.

INTERVIEWER: Before you began to dive, what did you do?

CHIEF LUNDGREN: I came into the military in 1989. I did, of course, boot camp up in Great Lakes, did a Pre-Com unit, the USS *Monterey* out of Mayport, Florida. I did shipboard time out of the buildup time at the yards in Bath, Maine. I did two years on there as an operations specialist, at which time I got orders to EOD school.

INTERVIEWER: After EOD school, what unit did you serve in?

CHIEF LUNDGREN: The first unit I went to was MOB Unit 3. I was attached to detachment 13, which was a shipboard detachment. I was out at San Diego at, again, MOB Unit 3.

INTERVIEWER: From there, where did you go?

CHIEF LUNDGREN: I finished a cruise, a six-month cruise. I left from there and I went to MOB Unit 3, the Mark 7 Marine Mammal System at Point Loma.

INTERVIEWER: Then, you came here?

CHIEF LUNDGREN: Actually, I left there and went to the Scientific and Technology Intelligence Liaison Office at the NAVU Detective, where I worked as one of the office members who did ordnance acquisition and intelligence gathering. I did that for three years.

INTERVIEWER: Oh, that's great. Then, you came here?

CHIEF LUNDGREN: Once I left the NAVU Detective, Naval Explosive Ordnance Disposal Technology Division, I came here and I worked in the dive platoon. I picked up chief shortly

thereafter and was moved to the requirements department, where I have been for the last two years. Just recently, I was moved down to the Bravo Dive Platoon as leading chief petty officer.

INTERVIEWER: Tell me about your time here at VSW and Special Clearance Team One.

CHIEF LUNDGREN: The time has been spent mostly on the research side of the house, trying to identify what types of dry suits work for, you know, long duration dives of three hours. I've been working with STV teams, trying to understand how they dive and how they keep warm.

One of the biggest issues for us is finding a suit that is easy to put on and keeps you dry and warm in the field and easily transitions to E&E. What I mean by that is if you take off a dry suit and are wet and you are going into a cold environment, you are not going to last very long. If you come out with a dry suit on and you have your cammies underneath that, if you pull it off and you're dry, you have a better chance of survival. Along with that, I've been working on our insertion craft, which is probably a \$3 million project, identifying what we are going to get from the ship of opportunity to the work site, bringing the dive platoon, the mammals platoon or the underwater unmanned vehicles, to their work site.

There are also other projects that deal with diving, like the integrated navigation sonar sensor, which is soon going to be replaced by the underwater imaging system, which is a handheld Doppler navigation sonar that you can use to locate and identify and mark mine-like contacts or obstacles. Along with that, there's the development of the magneto inductive firing device, which uses some of the same parts as the acoustic firing device. However, the magneto inductive firing device uses magnetic signatures or magnetic signals. It won't be as limited to the environment as the acoustic firing device.

Down the road, as far as requirements are concerned, we hope to maybe use the magnetic wavelength that we found or that was identified, to be able to communicate with divers through a control boat that might be five miles away, which is a big issue for us. Those are some of the issues on which I have been working, sir.

INTERVIEWER: Now, you have left requirements and you're back leading a dive platoon?

CHIEF LUNDGREN: Yes, sir, and that is where I wanted to be in the first place.

INTERVIEWER: What's the diving like in this unit?

CHIEF LUNDGREN: The diving with this unit depends upon our mission and that's changing. Our tactics are changing. There was recently a diver vulnerability study done down at Panama City and the results are not out yet. They might be classified. But I believe that's going to steer us away from some of the current tactics that we use to having a better understanding how a man functions, what a mine is looking for and how actually a diver will affect that mine.

Along with that, we have the diving on a standard mission. We plan for three-hour dives in the ten to forty foot deep zone and limited excursions of ten minutes down to fifty feet.

However, there are requirements not yet on paper, not in the rock and pile. They are going to bring us to dive deeper, or a requirement to dive deeper, meaning NSCT 1 will be able to react on marks that the mammals place at 200 feet, using the MK 16 Mod 1, which is where certain people here believe we need to go.

Right now, the limitations are ten to forty feet, which was originally established upon conception of the deck and the VSW zone, ten to forty feet was sufficient at that time. However, now we understand that setting us to certain numbers doesn't work. The forty-foot zone can be the fifty-foot zone, or the fifty-foot zone can be the forty-foot zone, depending upon the tide. One night, I might be in the extreme high tide. It might be fifty feet. The next day, in the regular high tide, it might be 45 or forty feet. It can be the other way around, and that puts our divers in an unsafe environment.

The dives are very slow and very methodical. We go from scan station to scan station, again, using the integrated navigation sonar sensor to try to identify and locate mines on the bottom. You can go to a scan station and be there for up to five minutes, at which time you are being tossed back and forth because of the tides in and out. Again, that brings us back to a point at which we are looking at a different suit. A dry suit is great. It can only keep you so warm, though, especially when you start getting down into the forties and fifties. Your dive times drop considerably. That's why we're trying to identify a better suit for our mission, because it is so long. You are not moving.

Originally, the command was set up under a concept of a combat diver, who would turtleback in, turtleback out, constantly kicking. The Viper rig, which we use currently, has a flow rate of 4.5 liters per minute, and that is a force fed rig, unlike the 16, which worked great for a combat swimmer diver. They didn't have any issues.

However, the issues with the divers now are that it's giving us chipmunk cheeks. You can't breath the gas and the AUV valve isn't getting rid of enough gas. At times, when it does get rid of enough gas, you lose your three-hour duration because you're off-gassing too much. By the time you get two and one half-hours, you're out of gas. We are constantly trying to develop. The NSCT 1 is a test detachment. We still have certain avenues to monies. As long as we can identify a requirement, getting certain things changed can happen, and we are currently working with NEBU and Dr. Clarke to drop that flow rate. We have some issues. We do not have a way to command detonate. Obviously, before an amphibious landing it's important to be able to control the situation when something goes off.

INTERVIEWER: That's the magneto induction device?

CHIEF LUNDGREN: Yes. The induction fire device will give us that capability. Right now, we don't have it. We don't even have a low MEU firing device. The Mark 148 is hot and in certain conditions it starts throwing up a lot of red flags. Marines and SEALs will look at that and say, "Hey, this is a hot item. It really changes our tactics, techniques and some of the procedures that we use."

As soon as we can get a low MEU firing device, some of the command detonation will grow and be able to advance. I believe that in the next five or six years, the world will have a certain picture of what NSCT 1 can do and where they think we'll be at. Right now, we are currently below what the rest of the world thinks we can do. In five to six years, I think with all the development of everything that is coming out, I believe that we'll surpass what the rest of the world actually thinks we can do and be able to improve and develop into something better.

INTERVIEWER: A couple of guys I talked to think that the future is going to be unmanned underwater vehicles. Divers and even mammals will come out of the water and most of it will be done remotely. Do you think that's true?

CHIEF LUNDGREN: I believe it will happen on certain bottom types, like a flat bottom or in a permissive environment, or even in a non-permissive environment. That's where the technology is going. I have been in EOD for 11 years. I've heard about taking the man out of the minefield. I've heard about taking man out of any situation. The IED is going to be a robot. It's not going to happen in our time. It's not going to happen in my time.

Of course, the crawlers are being developed, the mine neutralization Unmanned Underwater Vehicles (UUV). That's where we are trying to get. I believe that eventually, the UUV will be able to do that with certain types of bottoms. If you are dealing with a heavy bottom in which there's a lot of coral and a lot of dense material, I think the only way you are going to get through that is with a diver. That is, unless you have a way of taking an image and looking at that and saying, "Okay, that's a rock. That's a mine." That is very difficult. I haven't seen anything that can do that yet. Eventually, that's where they want to go. Right now, I don't foresee it in my lifetime, or at least my career.

INTERVIEWER: Well, we'll see. The guys who ran the UUVs seem very, very confident in their ability. They see the sensors only getting better, which will probably be true.

CHIEF LUNDGREN: Well, there are a couple of the issues with laying charges next to mines. How they are going to keep it from drifting is an issue. How are you going to attach a charge to a floating mine? That's very difficult. It's in the water column. A UUV can't really go up to it because the mine is moving back and forth. Going in and placing a charge next to a mine on a flat bottom with very little current isn't that difficult. But to be able to do that efficiently in a high current area with high surges, or with moored mines, is difficult. Those are very, very uncertain issues.

INTERVIEWER: What about Operation Iraqi Freedom? What was your deployment there like?

CHIEF LUNDGREN: I was actually in the third plane out. Of course, tensions were high with everyone, you know, trying to get to the ship, trying to find out where everything was, trying to get everything set up. Luckily, by the time we got there, people like Senior Chief Carr had everything pretty much under control. It was just stepping into an already functioning environment that was, you know, already in the works. I spent the first month or so aboard ship, on the USS *Gunston Hall*, working in the TOC, or tactical operations center, as the tactical operations watch officer. I usually stood the evening watch starting at six until about two in the morning, in rotation with two other guys.

Once we were called to head in to Umm Qasr, the three personnel left and they kept me on board for roughly two weeks. Then, I was asked to come in. When I got in, I realized that we had a couple of people who were getting ready to leave. They liked to fill their spots, so I worked in the tactical office of the TOC during the night sometimes.

During the day, I was working in what they called the 'data organization group,' or the doghouse. We basically gathered the information from the EODs, the divers, or from the mammals, coordinated it, organized it and then usually passed it out to the people with the next task. We'd send out messages about what we needed to do or what area we needed to clear.

The first few nights there, it was very difficult to sleep. If you heard anything, it was a good thing you had your M-16 lying by your side and your sidearm underneath your pillow or just something close. We each thought, "Hey, if I'm sleeping here and the door is there, where's the best place to sleep to try to get coverage, just in case?" You never know. When I got there, they told me there was a firefight over the wall just a few days ago.

Two or three nights before I left the ship, there was an e-mail from the Commander, 5th Fleet that read to expect seersucker attacks and that they were imminent in Umm Qasr.

INTERVIEWER: What's a seersucker attack?

CHIEF LUNDGREN: A seersucker is a guided missile, a surface-to-surface missile. From what I understand, the main and allied forces moved forward and found, behind the lines, buried enemy missiles, rockets and weapons. From what I understand, the enemy's intent was to try to come

back and take over Umm Qasr, or at least take out as many people left in Umm Qasr as possible, where I was in a CT-1. Thus, the commander of the 5th Fleet sent out the intelligence that we received. I remember talking to the commanding officer over the radio, telling him about that. There was this pause and he then he just said, “Roger that.” What else can you say?

INTERVIEWER: Was it pretty stressful then, being on the ground in Umm Qasr?

CHIEF LUNDGREN: At that time, sir, yes, it was. When you got there and actually moved around and saw what was around you, you realized that we had a lot of issues with force protection. There were dive platoons out on the post for force protection, which was not what we were trained to do and not what we were worked up for. We didn't have the correct weapons for everything.

Of course, we were nervous. The detects were not there for force protection, but you had a reconnaissance Marine or a SEAL coming to you and saying, “Hey, it's easy to get through these lines if you go here or there,” and pointing out the issues. It didn't give you a warm and fuzzy feeling. Probably the easiest way I kept calm over there was at night, when I was on watch, I kept the dog with me sometimes. I don't know if you've heard about him yet.

INTERVIEWER: No.

CHIEF LUNDGREN: Iraqi Jack is a little puppy. Petty Officer Turpey gathered him up after a firefight. PO Turpey was actually in Umm Qasr before the rest of the ship was forward deployed. We kept the dog with us throughout our time in Umm Qasr. The day we were getting ready to leave Umm Qasr, I put Iraqi Jack on a helicopter and he was flown to Bahrain. We met up with him down there and they actually bought him back to the United States.

INTERVIEWER: Oh, that's great.

CHIEF LUNDGREN: We got a dog back. If we did anything, we got a dog out of it. There were a lot of dogs. There were tons of dogs, tons of puppies running around, just like rats over here. Those dogs were friendly and just like any other dog you run into here.

As we began to finish things in Umm Qasr, there was a sign of relief that we were almost done. But then we received tasking to go clear Az Zubayr. A few other personnel and I loaded up

in a truck and went to Az Zubayr to set up a FOB there. We ended up setting it up with the British, who were very easy to work with, and very nice guys. We set up our operations tent there and the British and Australians would come to us for a daily brief. They would be diving along the quay wall and the mud. We'd give them some debriefs. I was basically running the data organization group up in Az Zubayr.

The days were very, very long and there was not much to do. It was tough to fill some gaps in there. We sat around for 11 hours and maybe did an hour's worth of work a day, and that was trying to find work. That was just the way it was. There was just nothing to do until information came in. If we were not finding any mines or locating something, there was nothing to do.

INTERVIEWER: After those two jobs were completed, what did you do?

CHIEF LUNDGREN: Once those two jobs were completed, I loaded up on the barges that they had there, the dive boats, and actually transited down the Kaa River, jumped off the boat and loaded the switch personnel back on the *Gunston Hall*.

INTERVIEWER: That pretty much ended the deployment for you?

CHIEF LUNDGREN: Yes, sir.

INTERVIEWER: Is there anything we didn't discuss that we ought to bring up, or something I forgot to ask but should have?

CHIEF LUNDGREN: There is nothing that I can think of. Again, we realized a lot of things when we were there. We realized we had a lot of areas in which we were lacking. Things that the commanding officer was told would never happen did occur. He was told that we would never have to provide our own force protection and we would never have to operate off of land.

INTERVIEWER: Doctrinally, you weren't set up to do those things.

CHIEF LUNDGREN: That's right.

INTERVIEWER: You were flexible.

CHIEF LUNDGREN: Well, being flexible is a perfect example. It just sticks out in my mind. In Az Zubayr, a super net was being powered by a spliced wire that was run to the battery in a car

that happened to be hot-wired by the Marines. That was how we ran our super net. We didn't have the equipment. We didn't have the communications. They were bad. Half the time, they were down or the heat was so bad they were shutting off. A lot of people say that it's funny when you don't want to talk about an air-conditioned space in Umm Qasr. When you're talking about using radios and amps to be able to get in touch with people who you need to get in touch with, sometimes that equipment has to operate in 120 degrees in the shade.

INTERVIEWER: Did you have heat problems for other pieces of equipment?

CHIEF LUNDGREN: I don't know of anything else that was affected. It was mainly the radios.

INTERVIEWER: You guys ended up providing force protection for the British and Australians, for the whole Umm Qasr area, right?

CHIEF LUNDGREN: Actually, they did provide personnel to assist with the guarding. The British, Australians and NSCT-1 all stayed in a large warehouse. Each group had a section. I think the northern section was the NSCT-1's portion. I think the British and Australians were around the far end. The main compound was surrounded with twenty-foot mil vans that were out there. They were not military. It was a port and they were just lying around. We had all those stacked up in a U-shape around us so as to provide a barrier or wall for the rest of the port and towers around us. Right in the middle of the compound, we had personnel in the towers twenty-four hours a day, seven days a week with NVGs at night. We didn't have enough radios. We had to borrow British and Australian radios just so we could keep communications. We were not prepared to operate in that type of environment. I was glad to hear that when we got back, the commanding officer, Commander Rodgers, made one comment, and it was that he would never believe in never.

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UNDERSEA & HYPERBARIC MEDICAL SOCIETY

INTERVIEW OF
EM1 LEEROY SHIRLEY

Kensington, Maryland
Thursday, September 4, 2003

PROCEEDINGS

INTERVIEWER: Our interview is at Navy Special Clearance Team One with EM1 Leeroy Shirley, who is a Navy SEAL assigned to the Charley Dive Platoon. You're assigned to the dive platoon?

EM1 SHIRLEY: Yes, sir.

INTERVIEWER: How long have you been in the Navy?

EM1 SHIRLEY: I've been in the Navy seventeen and a half years.

INTERVIEWER: How long have you been a SEAL?

EM1 SHIRLEY: I've been a SEAL since 1997, so that would be about six years.

INTERVIEWER: Oh, you got into the teams late?

EM1 SHIRLEY: Yes, sir.

INTERVIEWER: You must have been one of the older guys in your class, huh?

EM1 SHIRLEY: Oh, yes.

INTERVIEWER: How old were you when you went through BUDS?

EM1 SHIRLEY: I was thirty.

INTERVIEWER: You were thirty? You needed a waiver, then?

EM1 SHIRLEY: Actually, no, I did not. I actually turned thirty during the first phase. The requirement is that they get your package before you turn 29, and they got my package before I turned 29. By the time my class convened, I was 29, and I turned thirty during the first phase.

INTERVIEWER: What were you before you went into the SEALs?

EM1 SHIRLEY: I was an electrician's mate.

INTERVIEWER: Was that for the surface?

EM1 SHIRLEY: Yes, sir.

INTERVIEWER: After BUDS, where did you go?

EM1 SHIRLEY: From BUDS, I went to SEAL Team Three.

INTERVIEWER: What did you do there?

EM1 SHIRLEY: I served in two platoons, the Alpha Platoon and Echo Platoon. After there, I did log suit.

INTERVIEWER: What's log suit?

EM1 SHIRLEY: It's logistical support for teams, like on the west coast. It's logistical support unit one. Basically, they do all the supply and some of the training, so it's not per team. It's just one unit that takes care of all that, the logistical support side.

INTERVIEWER: What got you interested in coming to the clearance team?

EM1 SHIRLEY: I was interested in something different, a different dive medium and a different mission. I heard about it when I was here. I went on and took it. This is my last tour. I wanted to go out learning something different.

INTERVIEWER: You were with the Charley Platoon when you guys went to Operation Iraqi Freedom.

EM1 SHIRLEY: I was with the Dive Platoon.

INTERVIEWER: Oh, you were with the dive platoon. Okay.

EM1 SHIRLEY: When we went, we were at one platoon, which was just dive platoon and mammals. Now, since we have been back, we have developed three different platoons, or three different options. You had Alpha, Bravo and Charley. So, for the deployment, it was just dive platoon, mammals, and UAVs. I think that was it.

INTERVIEWER: Yes. I talked to Gunny Doss and Charlie Beil. They said you guys mostly did a lot of force protection, but you said you also got to do a dive.

EM1 SHIRLEY: Yes. A couple of guys and I did a dive. Basically, it was in the channel and just to verify there was no mines there. That was it. I just had one dive. A couple of other guys got to dive on different days. For the rest of the time, it was force protection. That was about it.

INTERVIEWER: You were diving for VSW?

EM1 SHIRLEY: Yes, sir. I was diving for the INSS. It was a little bit different than what we had been doing as far as training, like clearing lanes for a beach. It was different. A single guy went down for the INSS and scanned the area. They were looking for contacts in 360 degrees, and

they would have moved in on the contacts were there something there. Luckily, there was nothing there. I was happy about that, but there's a big difference when there's a stronger possibility that there's something there. When you are training, you know that there's nothing there.

INTERVIEWER: Normally, when you train, you train to clear an assault lane, right?

EM1 SHIRLEY: Yes, sir.

INTERVIEWER: How do you do that?

EM1 SHIRLEY: Basically, you have your master and your slave and those are set up like a grid.

INTERVIEWER: The master and slave are transponders?

EM1 SHIRLEY: Yes, sir. Basically, your INSS works off of those two.

INTERVIEWER: What does INSS stand for?

EM1 SHIRLEY: I think it's Integrated Navigation Sonar System. I believe that is what it is.

Don't quote me on that, but I think that's what it is. Basically, it's a sonar and you use it. It picks up the two transponders. I can give you a global positioning system (GPS) reading of where you are in the field, off of a set with those two transponders. It lets you know where you are. It lets you know a bearing. It lets you know your depth. It lets you know your water temperature. It sets up a sonar screen as a sweep, just like any radar would do. Basically, it picks up a contact by a shadow, sending out the sonar and then coming back. That gives you a range, depending on how you set it on the scale. You set it on a scale. You have a range. Through training, you learn what you're looking for. You know, you have a trained eye to see what you believe is or is not a contact.

INTERVIEWER: It gives you a visual display?

EM1 SHIRLEY: It doesn't give you one in detail. It'll give you something. It'll give you a shadow, basically. There will be a mass there, or sometime it could ping in various colors. But you will be able to recognize whether it is something you need to go check out. You can tell if it's something that's moving or not. If it is, it's marine life. But in doubt, you go check it out. You go check that out. You can come back. You come back to the position that you started, safe

in, safe out. Then, you move into your next station. The INSS shows you each lane and a scan station. At a certain distance, you stop and you scan. You make sure that path is clear and then you move on to your next station.

If you find something, you plant a charge to it and you move on to the next item. There are other methods you use, like mammal markings. INSS can also pick up the signal for mammal markings. They send a little signal, a ping or whatnot, and you set the INSS to pick up that transponder's ping as a certain numbers frequency. It picks that up. You can then move in on that, on what a mammal has planted, which believes it to be a mine. You move on from there.

INTERVIEWER: The dive platoon doesn't have mammals assigned to it. You work with the mammal platoon?

EM1 SHIRLEY: No. The dive platoon doesn't have mammals assigned. That's a whole different platoon.

INTERVIEWER: The mammal platoon would run the mammals, and then you would go in on the pingers?

EM1 SHIRLEY: That's right. Basically, you use UADs, or underwater sonar. They can go look and it's a machine. You can have the mammals go in they figure what they think it is. You were asking if the dive platoon has mammals?

INTERVIEWER: Yes. The answer was no, so you work with the mammal platoon?

EM1 SHIRLEY: No. I don't work with them.

INTERVIEWER: Does the dive platoon work with the mammal platoon, to follow up on their contacts?

EM1 SHIRLEY: That's right. We do that afterward. That would be a whole different briefing. The mammals go in and mark anything that they think is a mine. It could be anything from an actual mine to a trash can to somebody throwing a shopping cart over the side. It could be a shopping cart, for example, a big square item. It definitely doesn't look natural.

When we come in with the INSS and we can pick that up, we also use the transponder to get into the general vicinity of where the object is that the dolphin thinks is a mine. We come up on it and we find that it's just a shopping cart. It's not an actual mine.

INTERVIEWER: While you are diving, is there a way to mark on your INSS that the object is not a mine? Can you characterize it?

EM1 SHIRLEY: Yes, you can do that. With the INSS, you can go through a scroll to a different screen and mark it. They have different phrases, like if it's a mine-like item, if it's a contact influence, et cetera, et cetera, and then you can actually put a different type of shape on it and you label it. If there's any doubt, you are still going to put a charge on it. But if you don't get that close to it, you will still put a charge to it, and take care of it, eliminate it. You know, if in doubt, take it out. That is about how it works. We did not use that tactic in OIF overseas. We couldn't use lanes, so basically it was dropped down at a certain GPS point, based on what the markings were, whether it was Joy Bs or the mammals identifying something. You are dropping that area and then go ahead and scan your 360 degrees on a particular scale. It could be a thirty or forty-yard scale, or whatever. You pick up a lot of trash down there. You verify that the object is not a mine and you go on from there.

INTERVIEWER: When you are doing the beach lanes, what's the typical dive's duration?

EM1 SHIRLEY: Do you mean time-wise?

INTERVIEWER: Yes. I don't want to get into classified information. That's fine.

EM1 SHIRLEY: You know, it can vary. It can change on the distance, how much space you have to cover. There are human limitations with the water temperature and stuff like that, and what kind of equipment you actually have. If you are in a very cold area, there could be limitations to that. In a very hot area, it's the same thing.

INTERVIEWER: You said most of what you ended up doing was providing security for the mammal teams and the British.

EM1 SHIRLEY: That's right.

INTERVIEWER: What did you do to provide security?

EM1 SHIRLEY: I maintained post four. I was one of the guys who stood on the wall. Basically, it was a port, a regular Navy port. Of course, it had security walls and gates and stuff. They had watchtowers already in place. We basically took over those watchtowers and maintained an influence. My post was post four. With that post, we also had Naval Coastal Security on station. They came in a few days after we had been on that post. They had a whole different set of equipment that could do more, like it could pick up thermal energy. It was very, very impressive.

We would maintain a particular road that came down to the post. We kept security along that wall and that road and made sure that even the locals did not get too close to the wall, because you just didn't know what might happen.

Most of the time, people were asking for food and water and stuff. You couldn't help them because that would just lead to more and more requests. You just had to say, "no, stay away from the wall." They would most likely pass that word on, "Hey, don't get near to the wall. They have security up on the wall." That was about it. We were making sure everything was done. We had a rotation that would happen every two or three days. We'd rotate out, get cleaned up, get a little bit of rest and get back out on post.

INTERVIEWER: How hot was it?

EM1 SHIRLEY: Actually, I have a thermometer on my watch and I believe I checked the temperature and it was 109 degrees Fahrenheit on one particular day. That was during the cool season and it was 109 degrees. It was pretty high every day. A couple of times we had wind storms. We had two nights of rainstorms. Most of the time, it was hot, but you got acclimated. We were there for a good little while and we got adjusted to the temperature. That was about it.

INTERVIEWER: Is there anything that I didn't ask you that we ought to talk about?

EM1 SHIRLEY: We should talk about morale. I don't know if you talked to anybody about the morale.

INTERVIEWER: No.

EM1 SHIRLEY: Despite how everything went down, the morale was still good amongst the guys. There was camaraderie. We all knew that we had something to do and went to go do it,

despite the fact that it was different than what we were trained to do. Even though we did go there and a lot of guys didn't die or search for mines but had to enforce protection, we still kept our heads up and performed professionally. We still got the job done. That was very impressive. I'm very proud to be part of that.

INTERVIEWER: Was it disappointing for the guys who were doing force protection that they weren't diving?

EM1 SHIRLEY: Actually, you know of what the command consists. Basically, the disappointment was that the guys are shooters and movers, and they were not actually getting into the fight when your buddies were getting rounds down range. We all spend our livelihood training to get rounds down range. Aside from that, doing what we do, the guys were still professional about doing their job. They realized, "Hey, this is the mission we're in right now."

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UNDERSEA & HYPERBARIC MEDICAL SOCIETY

**Interview of
Admiral Malcolm Mac Kinnon III**

Annapolis, Maryland
Thursday, March 11, 2004

PROCEEDINGS

INTERVIEWER: It's March 11, 2004. I'm here with Admiral Mal Mac Kinnon at the U.S. Naval Academy.

Admiral Mac Kinnon, first off, thank you for agreeing to the interview, and I was wondering if perhaps you could just start out, give us a little bit of information about your background, where you were born, where you grew up.

ADM. MAC KINNON: Oh boy, okay.

INTERVIEWER: Just start from the very beginning.

ADM. MAC KINNON: I was born in Newark, New Jersey. I was raised outside of Newark, in a town in New Jersey called Maplewood. I graduated from Columbia High School in Maplewood, New Jersey and went right to the Naval Academy.

I guess of interest is that I was a competitive swimmer and was captain of the swimming team in high school, and came to the Naval Academy and swam varsity for four years. I lettered my plebe year and had enjoyed my swimming career.

The rest of the time in the Naval Academy, I suppose significant was that during my four years, I discovered that there was such a thing as an engineering duty officer community in the Navy, and that part of that was the opportunity to go to MIT for three years of graduate school. I had wanted to be an engineer before I entered the Naval Academy, and this looked like an ideal opportunity, so I had --

INTERVIEWER: Could you go directly from the Naval Academy to ED?

ADM. MAC KINNON: No. You could if you were physically disqualified. I found out about Engineering Duty through Huntley Boyd, who later was Supervisor of Salvage but was also on the

swimming team with me. Huntley was colorblind, so he went directly to the ED world, a couple of years at sea, and then to MIT. I followed him by a couple of years.

I went to sea for three years on a the destroyer USS *Benham* (DD-796), knew that the ticket to get to MIT was to serve as chief engineer of the *Benham* and I wrangled my way into the engineering department after a year as CIC officer and became chief engineer for the last year I was aboard.

I did get to MIT, thoroughly enjoyed the academic experience, met my wife in Cambridge, and married, and graduated. While I was at MIT, it was obvious to me and to other classmates that the submarine world was beckoning. So we elected to stay unrestricted line, go to submarine school, and then to a submarine to qualify.

In those days, most of the submarines were diesel-electric, and we all went to diesel-electric submarines. I stayed in New London and went to the USS *Grouper* (AGSS-214), which was a submarine that did experimental sonar work for the Underwater Sound Lab, and I thought that might be somewhat relevant.

I became chief engineer of the *Grouper* two weeks after I reported aboard, non-qualified, but senior. That was a very interesting tour. *Grouper* was the oldest warship in continuous commission in the United States Navy at the time. I guess there were some auxiliaries that were older. She had two main engines removed and operated on two main engines and an auxiliary engine that no one on the ship could remember ever working, so it was a major challenge.

I don't know what people thought I was, having just graduated from MIT. That didn't make me necessarily a practical diesel engineer, but I was thrown into the breach. It was a good tour.

INTERVIEWER: May I ask you what your training was for the submarine service, as far as submarine escape, or did you --

ADM. MAC KINNON: Everybody that went through sub school went through escape training.

INTERVIEWER: Okay.

ADM. MAC KINNON: The tank at New London was utilized, and my recollection was that we did not do a free ascent from 100 feet, we did one from 50 feet, and it didn't seem to be too difficult to me. It was much later that I took up diving. I was a good swimmer, enjoyed the water and it didn't bother me.

INTERVIEWER: Was Bob Barth there then at that time?

ADM. MAC KINNON: No, but Bob Barth is a good friend. He might have been at the tank. We never really connected that. I caused no trouble, so he probably didn't notice me. But, of course, I got to know Bob, and I still talk to Bob at least once a month. But, yeah, we did go through that escape training. Later while sport diving, I ran out of air at over 100 feet one time, and that training just clicked in, and I blew and went and had no trouble. I had never had to do any escape from a submarine, however.

We were preparing for overhaul towards the end of my tour. I was still not qualified, too busy keeping *Grouper* running.

Our skipper was transferred essentially overnight to replace a skipper that had been fired. Our XO flected up to skipper, and I flected up to XO with special permission of COMSUBLANT as a non-qualified executive officer. I am not sure how many of these there were...none since, I'm willing to bet. So we entered overhaul; I was the XO/Navigator, but did find time to finish my qualification during the overhaul.

I left the ship after a hairy swan song as navigator in zero visibility going from New London to Halifax without a decent fix all the way across the Gulf of Maine, and that's a whole another story.

But I left the ship in Halifax to execute orders to San Francisco Naval Shipyard. I believe as soon as I reported, I shifted my designator to 1400 Engineering Duty. I guess the rest then is sort of history.

After a year as Ship Superintendent, I essentially ran submarine overhauls as the submarine type desk officer at Hunters Point, and it was while I was there that the opportunity to become involved in SEALAB and the early saturated diving experiments came my way.

INTERVIEWER: I saw in your bio that you started the ED school --

ADM. MAC KINNON: Uh-huh.

INTERVIEWER: And established the curriculum and so forth?

ADM. MAC KINNON: Right -- right.

INTERVIEWER: What did people go through before?

ADM. MAC KINNON: They went through the school of hard knocks. They went from graduate school to their first shipyard, or as in my case, with a stop in submarines, and were expected to pick up, by osmosis, what ED's did, what they were -- what was expected of them all along the way.

It got to the point in the early '70s, that the material condition of the Navy was not very good, people were really looking critically at the technical side of the Navy, and we ED's were under the gun. One of the conclusions that came out of this was to start the school for engineering duty officers, which I was asked to do.

INTERVIEWER: This was '70 --

ADM. MAC KINNON: '74.

INTERVIEWER: '74 to '76?

ADM. MAC KINNON: Right.

INTERVIEWER: This was not as a result of subsafe or as a result of --

ADM. MAC KINNON: No, it was more the result of Vietnam. It was more the result that the ships were run hard, particularly in 1200-pound steamships. There were a lot of casualties. Three things I think happened almost simultaneously: The ED school started; the Operational Propulsion Examining Board started for surface ships; and a school started in Idaho Falls modeled after Rickover's Nuclear Power School, called Senior Officers Ship Maintenance and Repair Course (SOSMARC).

They were all geared towards making a step improvement in the operational engineering performance of the ships, as well as in the engineering support of the ships. Now the submarines, the discipline from nuclear submarines is sort of what drove these steps to solve the problems.

INTERVIEWER: Could we go back to the '63 to '66 era, when you were in San Francisco Naval Ship Yard?

ADM. MAC KINNON: Yeah.

INTERVIEWER: Of course, that's when you were involved with the SEALAB and the Palomares Operation?

ADM. MAC KINNON: Yes, Palomares followed directly from SEALAB, as a matter of fact. I think it was in early 1965, I was minding my own business as the submarine type desk officer. I had a boss, the planning officer in the yard, Captain Dave Sareker, who was a very interesting guy who kept himself pretty well positioned in different technical areas in the Navy, including, in this case, the Office of Naval Research.

Apparently, the Office of Naval Research was looking around for a way to implement follow-on underwater habitat as part of the Man in the Sea program, which was part of the larger deep submergence program that came out following the loss of the *Thresher*, due to the recommendations of the Deep Submergence Systems Review Group, DSSRG.

Unbeknownst to me, I think my boss had already volunteered me, because I can't remember that I had much of an option. I was asked if I would like to undertake this job to design and build an underwater habitat. Of course I had no idea what they were talking about, but it sounded very interesting.

There had been some facetious comments made about the requirements, "Make it 50 feet long and paint it white." But there was a whole litany of things out of the SEALAB 1 experience that dictated how they wanted this habitat to be designed and operate.

One of my great advantages was that one of my friends at the yard ran the Submarine Support Group there and had been a long-time Navy diver and had been diving with many of the SEALAB 1 aquanauts. He had obtained Dr. George Bond's log from SEALAB 1 and he gave that to me. Here was -- I mean, in simple prose, English prose, the real story behind not only SEALAB 1, but saturated diving, and what the true intent of the man behind all this was for SEALAB 2 -- you know, the Office of Naval Research notwithstanding, but the real mover and shaker was George Bond.

So I did have that advantage. This friend, Herman Kuntz, was a great advisor as we proceeded. SEALAB 1 was a surplus mine defense pontoon that they adapted for the SeaLab I habitat. Among other problems, they tried to pressurize it as they lowered it, and that failed miserably.

The ballast for it was 300-pound railroad axles loaded into trays by the divers. I certainly couldn't understand why. So we said, "We're going to design this with a ballasting system like submarines; there's plenty of salt water out there, it's all free, it can be moved in and out of tanks with air and really in many instances gravity." Submarine philosophy was the real basis for the design.

They wanted it pressurized on the surface, which they didn't need to do, but that led to the selection of an American Society of Mechanical Engineers (ASME) Boiler Code unfired pressure vessel for the design standards. We proceeded along those lines. It was 12 feet in diameter, 50 feet long, and we did paint it white. Weight and stability were pretty straight forward. I had covered these in graduate school. But the ability to provide life support in a helium-oxygen environment was another thing completely.

Some things worked in SEALAB 1 and some things didn't. No one understood why one worked and the other didn't, but we did have it as a basis. We had a very low budget and a very short schedule. Helium is very expensive, and we couldn't do extensive testing in helium. We knew that the heat transfer was a big problem.

The specific heat of helium is about six times that of air, its specific gravity is much less, and the distance between atoms is far greater than air. It had a tendency to leak through places that air didn't leak through. So it presented a whole bunch of challenges that we beat down one by one. INTERVIEWER: Now, I understand that the actual construction of a habitat, that it was pushing the state-of-the-art in construction techniques with the hemispherical --

ADM. MAC KINNON: The ASME Boiler Code required ellipsoidal heads to close this cylinder, and the standard way to get ellipsoidal heads, particularly in the submarine world, is to go to a steel company and have them spin-form them. Simple, relatively inexpensive, quick.

But there was a pending steel strike and orders were backed up incredibly. We needed 30- to 45-day delivery but we were getting quoted six months, so that didn't work. The idea of building them up in an orange peel fashion with gores that would require a lot of welding with a lot of grinding, was a possibility, but it would have taken longer than the allotted schedule would have permitted.

I was blessed with a very bright chief structural engineer and the West Coast Shock Test Facility was an integral part of the shipyard.. I had very little oversight. So I was able to make decisions without any votes. It occurred to all of us that explosive-forming these heads might just work, and I became more convinced that it would work.

So we built a 60-ton die (and I don't see any reason why I can't leave this with you) that was probably about 13 feet in diameter, or maybe a little more. It was backed with concrete a female die, or female form. On top of that we dogged the blank inch-thick mild steel, 13 +feet in diameter. We drew a vacuum underneath it to make sure that the distortion was minimal. Key to the success of this operation was the mathematics of the explosive charge distribution that would give you a planar wave at the blank to avoid any undue rippling.

One hundred (100) pounds of C4 was distributed with a lump in the middle and then two concentric rings. W were also blessed to have the 400-ton battleship gunning crane available to us at Hunters Point.

We lifted the whole thing up and dunked it in San Francisco Bay. We were also blessed by the fact that this was long before any Environmental Impact Statements or any Green Parties. We did not have to do it in the dark of night, I don't even think it was on a weekend. We whumped it and in four milliseconds, we got a perfectly formed dished head that we could trim to fit and weld to the cylinder. That dish head today is displayed at the Naval Underwater Museum in Keyport, Washington.

INTERVIEWER: How about that. Now, was this for both ends?

ADM. MAC KINNON: Yeah, both ends, right -- right.

INTERVIEWER: Where is the other?

ADM. MAC KINNON: That's a good question. You have to ask the museum. They found this one. Somebody saved it for them. I think Bob Sheets, who was the master diver on SEALAB 2, was instrumental in finding it and getting it set aside before he died, but it did wind up at Keyport. One is enough, I think.

INTERVIEWER: Well, I'll have to say that a number of people that I've already interviewed talk about this explosive --

ADM. MAC KINNON: Oh, well, Bob Barth still thinks it's the hottest thing in the world. You know, I had to write this up for his book. Do you have his book?

INTERVIEWER: Yes, I do.

ADM. MAC KINNON: Don't believe everything in it.

INTERVIEWER: Bob's a great guy.

ADM. MAC KINNON: Yeah, don't believe everything in it. The big by-product of SeaLab II was this explosive forming. I got tremendous amount of mileage out of that whole thing. I was made the special assistant to the on-scene commander, who was Capt. Lou Melson, who was the ONR Deputy Chief of Naval Research and funded the operation. I actually rigged SEALAB 2 for dive and pulled the vents and watched it sink, my first design here sinking, not what a conventional Naval Architect would hope for.

INTERVIEWER: I've seen the video with Dr. Bond sitting there --

ADM. MAC KINNON: Yeah.

INTERVIEWER: And there was apparently some leakage --

ADM. MAC KINNON: We had a leak because we had to pressurize it on the surface. We had to get another load of helium, because the helium obviously leaked through the O rings, so we wound up essentially pressurizing it on the way down. But, you know, it was okay -- equalizing the

pressure on the way down. Worked alright. The sea floor was irregular, and we didn't have any provision for leveling, having been told don't worry about it, the bottom is absolutely level.

My original design -- and I shouldn't say mine -- our original design was a barge that was rigged with ballast; it would be ballasted so it was slightly positively ballasted, would be drawn down by a winch and pressurized. It would have achieved a level condition by its positive buoyancy and would have been perfect, no problems.

INTERVIEWER: This is like --

ADM. MAC KINNON: The what?

INTERVIEWER: Are you familiar with the Lochaloopta?

ADM. MAC KINNON: I mean, it's going to see 6.0 psi pressure differential on the bottom so why does it have to be a steel cylinder capable of withstanding 125 psi internal pressure, you know, internal pressure? So it was called the "Tiltin' Hilton;" I got a lot of heat out of that. Navy divers love to give you a lot of heat.

But I did get my first taste of diving there and enjoyed it. To keep the record straight, I should say that I never went to Navy salvage diving school, but I retired with a diving pin. The only other person to be able to wear the pin without going through diving school was Admiral Ike Kidd. So this was one of the greatest honors I think that I could possibly have bestowed upon me.

INTERVIEWER: So your dive training was out there in --

ADM. MAC KINNON: It was ad hoc at SEALAB, and then, of course, I took courses and qualified in sport diving.

INTERVIEWER: Okay.

ADM. MAC KINNON: That was by necessity out there. But again, it didn't -- I mean diving was something that came very naturally, still does.

INTERVIEWER: Well, SEALAB II was obviously a huge success and had a lot of visibility.

ADM. MAC KINNON: There's an interesting twist on these dished heads. There was a major symposium held in Washington, D.C. four months after the experiment ended; a very high-level affair, the Assistant Secretary of the Navy and all involved in Deep Submergence were there. I gave a paper on the design and construction of SEALAB, stressing explosive forming of those heads.

I had found a clipping, a recent clipping, that talked about Martin Company in Denver, with the University of Denver, being given a million dollar contract to develop explosive forming of metals. Apparently they recently were successful in forming ash trays. My ash trays would have taken very large cigars.

INTERVIEWER: That's great.

ADM. MAC KINNON: That whole operation got a lot of press. I was looking the other night at a scrapbook that my wife had kept.. We had Scott Carpenter, the astronaut involved, as you know. He would visit at Hunters Point and shake his head at the conditions that workers worked in. Too much noise, dirt, etc. He's used to aerospace, quiet and clean. He said to me at one point, "Of course we're going to have a mock-up of the entryway." I said, "Excuse me? A mock-up of the entryway?" I said, "You have two choices, either want the mock-up or the entryway; we don't have money to do both."

INTERVIEWER: This is not NASA.

ADM. MAC KINNON: Yeah, this nasa is not NASA. "Of course, you've tested everything in helium?" I said, "Well, we've tested a lot in helium, but not everything." It's the NASA culture. But we did have a lot of fun with Scott. In those days, those original seven astronauts were like rock stars or movie stars. I mean, there was a very fine line between them and show business.

Another side story was – “Scott,” I said, “I'd like you to meet my wife, we should go downtown and have dinner.” And so we agreed, and he said, “Look, I've got to meet friends and we can all get together.” I remember he changed clothes at our quarters, and left his shirt behind. My wife was going to cut it up and sell the pieces. So we go downtown and we're meeting him at the Hungry Eye, and he arrives with a whole entourage. I mean, it was like a medieval parade with tumblers and jesters and this whole thing.

INTERVIEWER: His groupies.

ADM. MAC KINNON: Exactly. It was Scott Carpenter and the Kingston Trio, who were very big in those days, and owned the Hungry Eye. So here we were, two ordinary people with royalty, so it was very interesting. So that was a lot of fun.

All through this, I was still overhauling submarines. We were extremely busy with the submarine workload. They had shut down the repair facility at San Diego, and these diesel submarines required battery removals and interim dockings, and we had just scads and scads of submarines in there.

INTERVIEWER: So the SEALAB was more or less collateral duty?

ADM. MAC KINNON: It was collateral duty, yeah. It sure was, except for the four weeks SeaLab II was on the bottom. I was back and forth in the summer. I was down there I think for two weeks running to get it on the bottom, and then went down there a couple times in between and then down at the end. I really had to do it by kind of commuting.

Just about the time of that symposium in January of '66 for SEALAB is when the Hydrogen Bomb went in off Palomares, Spain, and we paid a little attention to it. We had done a lot of salvaging of experiments during SEALAB, and I had gotten to know the Supervisor of Salvage quite well, another ED, Captain Bill Searle.

Unbeknownst to me, he needed someone in Spain to worry about recovery when and if they ever found the bomb. I got the call on a Friday afternoon to get in an airplane on Monday morning to go to Spain.

I suspect it was about a month into the problem, because by the time I got there, they had essentially formed the task force and we were based on the cruiser, *Boston*.

I was essentially detached from Hunters Point and went over there with a full seabag. I didn't believe that they would ever find the bomb. But I did make the rounds of a couple of West Coast activities to see what was there in the way of recovery devices.

One of the places I went was the Naval Ordnance Test Station (NOTS) Pasadena, which had invented and built the CURV ROV, and had just adapted it for deeper depths. I don't think they were thinking about the bomb, but they adapted CURV to be good to 3000 feet.

So I went there and I got all the dope on it, and if we ever found the bomb, I knew that we had to get CURV in the air. It probably made more sense to get it in the air sooner rather than later, but I didn't believe we were going to find it. So I really waited until we got to Spain. I also looked at a hydrozene lift bag, like a giant toothpaste tube; there was a hydrozene generator at the narrow end, and you energized that, and it expelled the water out of this thing and provided buoyancy to raise stuff.

My buddy at Hunters Point, the diver who had helped me out with George Bond's log, Herman Kuntz, had been doing experiments with the hydrozene lift bag and had been the diving officer at the Weapon Station at Keyport, Washington. He had probably at that point recovered more ordnance deep, more torpedoes deep, than anyone else, using all kinds of techniques, but rudimentary, he was a rudimentary bosun' mate.

So I knew that there were two things I had to do if we ever found the bomb: One, get CURV; and two, get Herman over there. I was made a member of the tactical advisory group, which was largely there for the search, and I was sort of stashed there; three lieutenant commanders: George Martin, who was a classmate and good friend of mine; Art Gilmour (class of '53) who was a sonar expert who had been at the Submarine Development Group during the *Thresher* search with Captain Frank Andrews. Frank was the real brains behind the underwater search business. He led the *Thresher* search and retired by the time the bomb went in, and then was pulled out of retirement to honcho the search.

INTERVIEWER: Was Brad Mooney there?

ADM. MAC KINNON: Brad was there. He was there as the submersible expert.

INTERVIEWER: Okay.

ADM. MAC KINNON: Red Moody was there as the EOD expert.

INTERVIEWER: How much actual man diving was going on, or was there any?

ADM. MAC KINNON: Well, there was a lot of diving in shallow water. They got the SEALAB divers over there. We said it's sort of like if you lose your wallet on a dark night, it's much easier to look under the street light for it. So we had to look where we could. The real key to finding the bomb was the Spanish fisherman, Simo Orts.

When the collision occurred, the four Hydrogen bombs were discharged from the B-52. The remnants of two bombs were found on the beach. Their parachutes did not deploy. Another parachute partially deployed and fragments of that third bomb were found in the surf zone. All three had detonated the high explosive, so it scattered plutonium and chunks of metal around.

The fourth bomb, had its parachute deployed. The prevailing wind was from the northwest, blowing the parachute out to sea to the southeast.

The fisherman saw the bomb go in right where the prevailing wind could have taken it. The fisherman was absolutely certain. Having qualified as a Spanish interpreter at the Naval Academy, I went to interview Senor Orts. He had already been visited and took people out to the site. I went back to see him because the Admiral was beginning to doubt Orts' observation. The Admiral wanted to search closer to shore. We had a hard time convincing the Task Force Commander to get *Alvin* back out there, even after they saw the track of the bomb on the bottom. It got to be pretty dicey.

I went out to see him, up the coast in Ayuillas. The Spanish fisherman, I pictured as Spencer Tracy and the *Old Man and the Sea* rowing his fishing boat. It was just the opposite. Sr. Orts had two or three boats, modern and well equipped with nylon rigging and fish-finding sonars.

I asked him if he kept the sonar trace from that day, figuring that we might see the bomb on his fish finding sonar. Well, he had a bunch of traces, but we couldn't find the right one.

He said, "I know where it went in because that's where I have to pick up my nets to avoid going over the precipice."

INTERVIEWER: Now, how deep is this?

ADM. MAC KINNON: It is 2250 feet at the precipice.

INTERVIEWER: Oh yeah.

ADM. MAC KINNON: It went in at 2150 and was first sighted by *Alvin* at 2550.

We couldn't get CURV there in time. It was en route, so they ad hoc'd it, and it drove me, the Duty Engineer, crazy. They planned to have *Alvin* pick up a grapnel and attach it to the bomb, then the *Mizar* wrench would recover it. They lowered a clump to the bottom from which *Alvin* picked up the grapnel and the lifting line and took it to the chute. They managed to hook it on some shrouds.

The grapnel had to be made so light to allow *Alvin* to handle it, that they actually cut metal out of the throat of the grapnel. Not surprising, it turned inside out like an umbrella when a strain was taken.

We had a destroyer tender there full-time, repairing small boats, primarily since the boats were run very hard supporting operations and providing logistic support. Ninety percent of all the tender's work was repairing small boats.

But the tender also made the grapnel, and I watched the chief shaking his head because he had to make the grapnel lighter and the only way he could was to make it weaker. So they tried to pick the bomb up and it broke loose and fell back down the slope, winding up at 2800 feet, When it was finally recovered, it had slid to 2850 feet.

Once the bomb was refound, *Alvin* and *Aluminaut* babysat it until we could get CURV operations, and it kept moving, and it kept moving, of course, downhill that way.

We had an excellent stretch of the bottom configuration done by Dr. Smith of the Naval Civil Engineering Laboratory (NCEL). He was an interesting guy who chain-smoked Camels, smoking them like a European. He spent three days hiking inland with his shoes off. He said, "Well, you know the condition of the bottom if you know the condition of the earth and its topography inland. I learned a lot from him..

INTERVIEWER: So you were able to look at the terrain?

ADM. MAC KINNON: Yes -- yes -- yes. And he took samples and he knew that it was a nice slick silt, which didn't help keep the bomb from sliding. It provided very low friction.

INTERVIEWER: What was the total length of the operation, from the --

ADM. MAC KINNON: Oh, well, the bomb went in on the 17th of January, and the bomb came up on Good Friday, in April. It was reported in the Madrid newspapers on Easter Sunday as “La Resurrection.”

INTERVIEWER: Now, the technology today, how long would it have taken to --

ADM. MAC KINNON: That's a good question. I think if you believed -- if we had truly believed the fisherman and had put all the resources -- you know, *Alvin* and *Aluminaut* -- that's all that we had out there, we probably would have found it sooner. But the name of the game when we got there was the mathematics of underwater search.

CAPT Frank Andrews planned the search back in Washington, having run the *Thresher* search. He got Dan Wagner on board, who had done a lot of the mathematics for the *Thresher*, based on search effectiveness probability (SEP). Tony Richardson, a young Ph.D. mathematician, was out there with us. Tony's job was to, given the methods of search, the search rate, and the relative effectiveness of the search device, eyeball, sonar, etc., set up the search plans so that we could go to the U.N., to the world, and say we were mathematically 99.9 percent certain that if the bomb was there, we would have found it.

I never thought we would find the bomb until we went back and talked to the fisherman. I managed to get him on board a mine sweep to go back out to the site. In route, he was telling us in the ward room of the mine sweeper how, when we left, he was going to pick up with two fishing boats and a long iron wire and grapnels on the wire, and he was going to catch the chute and pick it up by going back and forth, right where he knew the bomb went in. And he knew the behavior of the bottom, he knew a lot of stuff.

While he was describing how he was going to recover the bomb, I got a call to go to CIC. Brad Mooney was on our tactical net. We had a code, because they were monitoring all our

circuits; it was “Charlie Brown 3” or something like that if they found the bomb. And that was what I heard. So I had to quickly terminate the transit and reverse course. I had to say goodbye to the fisherman. He said, “You find the bomb?” I said, “I cannot say.” He knew that we found the bomb.

INTERVIEWER: Was there any indication that the Russians were there or the Soviets were there?

ADM. MAC KINNON: No, but it's very interesting, because one night after dinner, we were all on the flagship, the cruiser *Albany*, which had relieved the *Boston*. Someone said, “You know, if I were the Russians, I'd bring a nuke device in here in a submarine, launch it out the torpedo tube, have it sit on the bottom, timed to go off. When it did, what would the world think?” Was it Russian or the bomb we were looking for? To prevent that, they had two Spanish destroyers going back and forth out here, and I doubt that they were going to do any good whatsoever, but yes, they were our ASW defense.

INTERVIEWER: You mentioned the *Alvin* and the *Aluminaut*.

ADM. MAC KINNON: Yes.

INTERVIEWER: The *Alvin* actually found it originally?

ADM. MAC KINNON: *Alvin* found it, LCDR George Martin was the guy who put his eyeball on it. That was the key search device, the Mark 1 eyeball. The Mark 1 eyeball, looking through the view ports on *Alvin* and through the optics on the CURV.

Yeah, *Alvin* and *Aluminaut* were the only vehicles that could go deep. We had a Perry Cubmarine there, good for 600 feet. You know, a little yellow submarine that Perry made, and that was good for shallow water contact classification. The mine sweeps had their mine hunting sonars, which were an approximation. When they picked up a contact too deep for divers, Cubmarine and rider's Mk-2 eyeball would classify (identify) it.

We had OBSS, whatever that stood for, an early sidescan sonar. And you know, unless something was really proud of the bottom, it is very hard to get classification out of a sidescan. So we had the problem, we were using Cubmarine and divers when it was shallow enough to go investigate all these contacts.

INTERVIEWER: With this terrain --

ADM. MAC KINNON: Oh yeah.

INTERVIEWER: I guess sonar would have been very difficult; sidescan?

ADM. MAC KINNON: Very difficult, absolutely. I don't even know today with some of this sonar they're developing for littoral warfare, for bottomed submarines – whether you'd get positive deflections. I'm sure you can get a very good picture of the terrain. In Spain we had built a clay relief map that turned out to be relatively accurate and very helpful.

INTERVIEWER: I assume there was a tremendous amount of pressure on a daily basis?

ADM. MAC KINNON: Oh yeah, unbelievable. It was nice to be a lieutenant commander in those days, you know? We LCDR's didn't feel a hell of a lot of pressure. Brad and I wound up handling the communications for a large chunk of this. He was on *Mizar*, I was on the flagship, and we developed our own code. The world press was hovering, thirsty for information. The *Aluminaut* had to go into the port of LaGarrudia with its tender, the *Privateer*.

The word came back to the flagship that Paris Match was offering a full week in Paris, all expenses paid, for any information. I said they're getting close to my price...just kidding. The press were all over everybody, adding to the pressure on the Admiral.

I explained that the bomb was lost and then rolled back down the hill and was found again by *Alvin*. *Alvin* and *Aluminaut* took turns babysitting the bomb. They could each stay down for

probably eight hours, maybe *Aluminaut* for a little more. But as *Alvin's* batteries aged, she was able to stay down less and less. So it finally got to about six hours, I think.

INTERVIEWER: There was no way to attach a buoy or anything to it?

ADM. MAC KINNON: Yeah, we did have a buoy and pingers, but because we lost it, and I think quite rightfully, they wanted an eyeball on it all the time. And it was moving, so a buoy may not have done any good. Visibility wasn't always great. Another fact was that we only saw the parachute, not the bomb, but we did see the track of the bomb, a semi-circular trough in the bottom. Never saw the bomb until it was at 100 feet, and the EOD divers went down to ensure that it was disarmed.

INTERVIEWER: It was covered by the parachute?

ADM. MAC KINNON: It was covered by the parachute. People were saying, that's just silt and mud in there, and we thought, well, you know, we couldn't leave it there no matter what it was. Had it gone deeper into the bottom of that crevice, there would have been no way to get it.

In the process of *Alvin* sitting there, the chute billowed and got sucked into her thrusters -- and damn near trapped her, and that would have been disastrous.

So in the final recovery, the admiral wanted three lines on the bomb, because one had failed. We got two lines on it, and then CURV, in attempting to attach the third line, got sucked into the parachute and was trapped. So the decision wisely was made, and I think it was not made by the flagship, it was made on the *Petrel*, was to bring it all up at once.

So the main capstan of the *Petrel* was used to hoist the CURV's umbilical. The ASR was the best possible platform for this with its capstan, winch, and boom. We brought both lifting lines up together using the winch to raise the bomb.

The whole thing came up like a charm to 100 feet; the divers went down. It was shifted from there to the boom, and the whole bomb came up, broke water, and slick as a whistle, was hoisted on board

INTERVIEWER: So divers actually recovered it --

ADM. MAC KINNON: Yeah, well, the EOD divers went down and opened it and made sure it was disarmed.

INTERVIEWER: Okay.

ADM. MAC KINNON: Then they shifted it from the lifting lines and the parachute to a sling on the bomb itself. You know, my memory is a little weak, but I guess we cut the chute away, because the bomb came on board unwrapped from the chute and hanging from the boom.

INTERVIEWER: Now, the movie, "Men of Honor," I don't know if you've seen that --

ADM. MAC KINNON: Oh, yeah, that was, yeah.

INTERVIEWER: The recovery operation for the bomb, that didn't actually happen?

ADM. MAC KINNON: No -- no -- no.

INTERVIEWER: But, in fact --

ADM. MAC KINNON: Nor was Carl Brashear involved in it.

INTERVIEWER: He was not actually at the scene?

ADM. MAC KINNON: He was at the scene. I was on the *Hoist*.

INTERVIEWER: Okay.

ADM. MAC KINNON: When he lost his leg.

INTERVIEWER: Okay.

ADM. MAC KINNON: When the operation was over, I and Herm Kunz visited him in the hospital. We were both there when he lost his leg, but never should have. Some stupid botswain

mate secured a mike boat across the fantail to a stanchion. As the boat heaved, it pulled the stanchion, broke the weld, the stanchion flew across the deck and caught him right below the knee.

INTERVIEWER: Okay.

ADM. MAC KINNON: But the rest of the movie, you know, it's a great movie.

INTERVIEWER: I don't want to stop you on this. I've got some questions -- some basically your opinion-type questions.

ADM. MAC KINNON: Sure. Let's see, we're in good shape, I guess.

INTERVIEWER: I know, you know, moving on to be chief engineer for the Navy --

ADM. MAC KINNON: Right.

INTERVIEWER: You've seen an awful lot of new technology, and in your opinion, what would you say is the most significant achievement that's been made in the underwater field in the past 50 years?

ADM. MAC KINNON: Good Lord.

INTERVIEWER: Covering a lot of territory.

ADM. MAC KINNON: Covers a lot -- nuclear propulsion, you know, I mean I guess my -- most of my adult life was spent worrying about nuclear submarines, so I suppose that's the snap answer. 50 years is just about right. *Nautilus* went to sea January of '55. That was a snap answer, and probably not *the* one. That is difficult. It's made a lot of things possible, including some remarkable things from NR1, some of which we know about, some we don't.

There's been a lot of interest in NR2. There was when Rickover was still alive, and there has been. But, gosh, I don't know. The ability to remotely go deep and recover sizeable things is probably -- with, you know, CURV 27, not CURV 1, you know, I think is probably pretty remarkable, and what they're doing today with --

INTERVIEWER: 14,000 feet.

ADM. MAC KINNON: Yeah, right. Well, I think 17-5, CH46, using Magellan is probably the deepest in '92. But they did get a -- or maybe that was CURV. Well, anyway, whatever. And the AUVs are pretty remarkable. I think the AUVs will revolutionize submarine warfare, because they will do a lot of things from a mother submarine that the submarine could have been called on to do.

INTERVIEWER: In your career in undersea technology, if all barriers had been removed and you had complete authority, is there anything you would have changed?

ADM. MAC KINNON: A couple things, I never would have built the *Gerald P. Lipscomb*, but this is Rickover Hall and that's another story. I don't know. There were some pretty tough times with Rickover, and we had a class of submarines pretty well conceptually designed that I think would have been every bit as effective as the 688, but smaller, and I think cheaper, but that's -- you know, I mean that's second-guessing. It would be nice to go back and say if I had all the authority, I would probably have done that, and history may have proven me right; maybe not.

We did pretty well. I think maybe that's the answer to your question, that given the whole situation, we did pretty well.

During the Cold War, we pushed those Soviets into a spending race that there was no way they could win, and they came to the conclusion finally that to have a safe submarine that was quiet, you really had to take a lot of time and spent a lot of money. That came to fruition on my watch while I was still on active duty. And that was very pleasing, indeed. But I think in terms of useful work in the ocean and understanding more about it, the instruments, the deep ROVs and the AUVs are going to be good stuff.

INTERVIEWER: We're looking for a 100-year timeline for this book. I think for the first half of the century, the U.S. Navy were really the world leaders in diving.

ADM. MAC KINNON: Oh, yeah.

INTERVIEWER: Saturation and so forth.

ADM. MAC KINNON: Yeah -- yeah.

INTERVIEWER: Since that time, many of the Navy divers have been leaders in the commercial diving field.

ADM. MAC KINNON: Yeah -- yeah.

INTERVIEWER: Currently, neither of these seem to be prevalent, are the fact, in that we've lost our saturation diving capability.

ADM. MAC KINNON: Well, the Navy is still, you know -- I mean the *Monitor* -- the turret was recovered with saturation diving.

INTERVIEWER: Okay.

ADM. MAC KINNON: Jim Wilkens is going to be in the audience. And Dick Fisk.

INTERVIEWER: Yes.

ADM. MAC KINNON: One present and one former supervisor of salvage.

INTERVIEWER: Good.

ADM. MAC KINNON: You know, Dick did a lot of work on the Egypt Air and a bunch of those things.

INTERVIEWER: What would be your prognosis for the future?

ADM. MAC KINNON: Well, the kids were asking me that today, I mean in the classroom. I think other than something like *Monitor*, where you may not want to really -- and it's shallow enough, you can get an awful lot of work out of saturation diving, out of the divers that you wouldn't get if they were surface tended.

There's really no substitute for some of that fragile stuff, to put the human being with the eyeball in there rather than a machine. I think that there will always be a place for them. They're still being used in the North Sea, you know, where it's shallow enough. And I think they were asking me about habitats, I said I think the logistics for a habitat is such that it's better to go up and down with an elevator, you know, the PTC.

But in terms of -- it's sort of like the Mars Rover versus manned space, I think that you can do an awful lot without the man. I mention this here about *Alvin*, some of the final things, lessons learned, unmanned vehicles have a definite role. *Alvin* almost became entangled, CURV was, you know. And I don't say anymore than that, but it's obvious that ROVs have a role. But I also say there was no substitute for the Mark 1 Eyeball, but sidescan sonar had future possibilities.

INTERVIEWER: What should we be looking for in the future? Where do you think the youth of the country need to be looking, and where they should be going and --

ADM. MAC KINNON: Well, that's what these young men were asking me today. There are tremendous challenges. And we talked about this, that the ocean can capture a tremendous amount of imagination, but it certainly hasn't captured the kind of funding that is really needed. I don't know what it is. I thought I was on the trail. I've been doing a lot of consulting on a lot of interesting projects.

I was working over the past couple of years with one of the richest men in America, who wants to be a latter-day Jacques Cousteau and explore the oceans, and yet he is one of the strangest guys. I never did meet him.

I met his vice presidents. I asked, "What does he really want to do?" The reason I got involved, he's building a "luxury submarine" which I chuckled at -- I said that is an oxymoron, but nonetheless, I'll give you the luxury submarine, 10-men, goes as deep as an SSN, but being

designed by tourist submarine guys who hadn't been deeper than 100 and some feet. And so it was a challenge for us to get them on the right track.

I said, "What's he going to do?" He said, "Just look at the ocean." So I said, "Well, it's a luxury submarine, is he going to be willing to take VIPs like congressmen out and convince them they ought to put big money into the ocean?" The response was, "That sounds like a good idea." I said, "The last time we had a billionaire involved in the ocean, it was a cover for a big project -- Howard Hughes." "That sounds like a good idea." I thought, "Oh man!" you know?

There's got to be some synergy, but I'm afraid it's going to be for other people. I did the best I could to try to capture it, and it's going to take something to get some real money back in the Navy, or to science, to do this kind of thing.

INTERVIEWER: Do you think the fact that the oceans are certainly more reachable I guess to us here on this earth than Mars --

ADM. MAC KINNON: Yeah, right.

INTERVIEWER: Should there be a --

ADM. MAC KINNON: A wet NASA?

INTERVIEWER: A wet NASA?

ADM. MAC KINNON: Well, you know, we talked about that 40 years ago. Exactly. Yeah, I suspect there should. I mean, there really should. Climate? You know, we've really just scratched the surface literally and figuratively. Yeah, I think there probably should be a wet NASA.

There certainly should be a national awareness; there should be a national effort, and wet NASA -- NOAA was supposed to be the wet NASA, and I don't know. But there's been some remarkable things done. There's been some remarkable things done that we don't know about.

INTERVIEWER: Well, I think this is probably a good place to stop, and I thank you, Admiral Mac Kinnon.

ADM. MAC KINNON: Well, you're very welcome.

INTERVIEWER: Thank you for your stories and your opinions there.

ADM. MAC KINNON: You can tell, it's a fascinating thing for me.

INTERVIEWER: Absolutely.

(Whereupon, the INTERVIEW was concluded.)

UNDERSEA & HYPERBARIC MEDICAL SOCIETY

ORAL HISTORY INTERVIEW OF
DR. MARK BRADLEY

Kensington, Maryland

PROCEEDINGS

INTERVIEWER: Mark Bradley will be responding to my questions.

DR. BRADLEY: I was born in Baltimore on November 29, 1936.

INTERVIEWER: How about school?

DR. BRADLEY: I went through elementary school all the way up through medical school. In elementary school, I went to public schools for several years and then to a place called Mt. Washington, which was a Catholic military school for boys. For high school, I went to Loyola High School. I graduated in 1962. I then did a year of medicine-surgery internship at the University of Virginia in Charlottesville.

It was during my internship that I realized that I had not applied for any deferment programs and I read in, I think it was the AMA's newsletter, that year they were going to draft 1,500 physicians. I figured I was in the deep yogurt, being single, registered in Baltimore, and just finishing my internship. I thought about it and went to Richmond and applied to join the Naval Reserve and two weeks after that, I got my commission.

INTERVIEWER: You went in the Navy and as a Navy medical officer.

DR. BRADLEY: Actually, it was during my internship that I came up to Washington, D.C. and talked with them to see what was available. There was a destroyer squadron with the Fleet Marines in Okinawa and a little sixty-bed hospital in the Orient, neither of which particularly appealed to me. Then, I got a postcard that read that they were looking for physicians to go into submarine medicine.

So, I volunteered for submarine duty and eventually I was assigned to a FBM submarine. I took some mice aboard to do some research and it was, I think, the third night we were out on patrol and I was back in the sick bay and there was an

announcement over the 1MC, the announcing system for the boat, which said, “Doctor to the missile compartment, Doctor to the missile compartment. The rats are loose.”

I went tearing back there, with the commanding officer (CO) about one step behind me, the executive officer one step behind him, and the weapons officer bringing up the rear, saying, “I told you this was going to happen.” What had happened was that I had six cages of rats, five of which were on the deck, and one cage of ten rats together with a hundred-pound bag of rat food up on the shelf. Although I had tied down the cages, I had forgotten one thing: rats gnaw. I had tied the cages down with light line. We had been taking thirty-degree rolls and this one cage with the hundred pound bag of rat food fell off the shelf and the ten rats went scurrying in different directions. There was fifty or a hundred pounds of rat food rolling from port to starboard. It was like standing on BB Gun ammunition.

The CO of the boat gave me a very inspiring lecture about what my prospects were for the remainder of the patrol unless I found the rats, and they were not good. I spent the next several hours on my hands and knees with a flashlight in one hand and a coat hanger in the other, which I had straightened out and put a hook into it and crawled around retrieving rats.

Fortunately, those rats were not used to being out the cage and didn't go very far or down to the lower or into the upper levels. But I was fishing between electrical buses with 220 or 440 current going through them and as I thought about the rats being loose, I could see them chewing on the electrical wiring and starting a fire, forcing us to abort the patrol. It was back with the old A-1 launch systems and from my previous patrol that the missilemen said things like, “Hey, I want to fire a bird. All I have to do is this, this, and

this, and it's gone." I could see them starting World War III. It's amazing what incentive provides.

INTERVIEWER: You had a few sleepless nights?

DR. BRADLEY: That took me three hours, but I found all the rats, got them back in the cages, tied the cages down with wire, and the remainder of the patrol was relatively uneventful after that, fortunately. But the CO was certainly happy when the last of the rats were gone. The upshot of the study was that wounds didn't heal any differently, at least in rats, while on patrol as opposed to while not on patrol, when the boat was open to the atmosphere. In fact, they seemed to heal a little bit better and it may have been because of the slightly elevated CO₂.

INTERVIEWER: What did you do to make the lesions in the rats?

DR. BRADLEY: What you did was anesthetize the rats, make a wound in the abdominal wall, suture it up, let the wound heal for a certain period of time, take the sutures out, and sacrifice the rats. Then, you had a template that you put over the wound, and you cut out a section. Basically, it was a rectangular section of the wound. You suspended it with two clamps, one above the healing wound and one below, and you attached to the bottom clamp to a polyethylene bottle, which you ran water into at a constant rate.

INTERVIEWER: You ran water?

DR. BRADLEY: Yes. You just ran water in and when the wound disrupted the water, you had a measure, depending on how much water was in the bottle and what the tensile strength of the healing wound was. It was a very simple test.

INTERVIEWER: Well, it's an interesting way to do it, sure.

DR. BRADLEY: Anyway, that earned me a certain notoriety in the submarine

community.

INTERVIEWER: Did they come up with some kind of insignia to wear?

DR. BRADLEY: As the crazy medical officer who went to sea with rats on patrol. Actually, the USS *Lee* had a history of having had animals on board. The previous commanding officer had been given a dog while he was in Scotland and went on patrol with it. It drove the torpedo men crazy because it kept shitting behind the fire control system and they'd have to get back there and clean it up.

One of the previous medical officers had actually gone to sea with a couple of cages of hamsters, a whole bunch of female hamsters and one male hamster. After some weeks he noted that the male hamster was not doing well. It appeared to be extraordinarily fatigued. He couldn't figure out what was going on. It just didn't look well until the CO finally came in and woke him up one night and said, "Doctor, get out of bed and go down and deliver your hamsters." What the missilemen had been doing was taking the male hamster out of his cage and putting it in with the female hamsters.

INTERVIEWER: He screwed himself to death.

MR. BRADLEY: Yes. In fact, during the upkeep of the *Lee* at Mare Island, they apparently found a number of hamster skeletons.

INTERVIEWER: I wonder if that sort of thing goes on now, whether there is still an interest in research with medical officers who are assigned to submarines.

MR. BRADLEY: I don't know.

INTERVIEWER: Well, here is a question. What do you consider your most important contribution to diving? That puts you on the spot, I know. I won't tell anybody.

DR. BRADLEY: I do not think there was one single thing. It's basically just the body of

research that some really first-class researchers and I managed to do over a period of some twenty-odd years.

INTERVIEWER: I can say this. Maybe this should not be included in what's being recorded. I know that people who worked at Naval Medical Research Institute (NMRI) in your lab, in your facility, really felt that they had your total support and thought you were an inspiration to many of the people working in the labs there. It was probably, morale-wise and scientific production-wise, I think, the best years the Navy diving research facility had. I mean that.

DR. BRADLEY: It was not a particularly fun job there. It had some rewards, but the day-to-day, week-to-week drudgery of that much administration and politics was not fun. But I decided fairly early on that rather than spread misery around one person, it could be thoroughly miserable and the other people could hopefully be relatively happy and productive, scientifically.

INTERVIEWER: Did you get the kind of support from the front office at NMRI, let's say, as opposed to BUMED or the research command?

DR. BRADLEY: It was ambivalent at best. Ken Sell was certainly quite supportive when he was there. I think Jim Vorosmarti was supportive when he was the CO, but he was very careful to avoid any conflicts of interest and the impression of favoritism.

INTERVIEWER: Do you feel you had, say, an uphill battle all the time, but you were getting support?

DR. BRADLEY: Well, I never felt BUMED particularly supported biomedical research at all. I felt that they considered researchers second-rate citizens, basically. Essentially, the Navy Medical Department was run by clinicians for clinicians. I never had the

particular feeling that BUMED and the Navy Medical Corps were supportive.

INTERVIEWER: Who at BUMED, at that time, had the responsibility for having the Surgeon General's ear? Who represented just research and not diving?

DR. BRADLEY: Well, it was basically the Research and Development (R&D) command at the time.

INTERVIEWER: But there wasn't someone at BUMED or someone else?

DR. BRADLEY: There was not, as I remember. Once, when R&D command was formed, that function shifted out of BUMED to people like Joe Bloom.

INTERVIEWER: Well, the next question follows on from that. Do you have any regrets or disappointments from your career in undersea activity?

DR. BRADLEY: I certainly have no regrets about the first ten years, which were spent in either operational billets or in out-of-service training. I have real regrets about my association of eleven and a half years with the Navy Medical Department in Bethesda. I mean, it was, in certain ways, rewarding, but also extraordinarily frustrating and debilitating to the point to which after that period of time, I was really burned out. In fact, I was offered the job of CO of the R&D command a few months before I retired.

It was funny because Jim Summit made the offer and it was after he had come out for a tour. I described the program to him and he informed me that what we were basically doing was 'gilding the lily' and that the important work had already been done in diving. I found that disheartening, to say the least, and declined to take Jim up on the offer.

INTERVIEWER: Maybe Jim just didn't read very much or hadn't attended many scientific meetings?

DR. BRADLEY: Well, he had been out of diving for years at that point. He taught ophthalmology and administrative medicine.

INTERVIEWER: How many years did you spend at Bethesda?

DR. BRADLEY: I spent close to eleven and a half years. I arrived there in late August or early September of 1973 and retired in December of 1984.

INTERVIEWER: How long were you in charge of the lab? Was it the total eleven years?

DR. BRADLEY: Well, in one form or another, such as heading the diving group, it was the entire period of time that I was there. It kept morphing into different things while I was there. It started off as the Diving Physiology Division, which became the Environmental Biosciences Department and then morphed into the Diving Medicine or Hyperbaric Medicine and Physiology Department and then into the Hyperbaric Medicine Program Center.

INTERVIEWER: Let me break it down a little bit. You felt that you didn't have the support, personnel-wise, in the way of either diving people to help run the chambers or scientific people? Was it a money problem?

DR. BRADLEY: It was about all of the above. I mean, when I first arrived, there were no diver billets. I mean, there was no one to maintain and operate the chambers except for Wally Bent and Chet Langworthy and people of that sort. I managed to get a couple of billets, but they weren't diver billets but just basically enlisted billets. Then I accumulated billets in a number of ways over a period of years.

One of the things that I think facilitated getting the billets to operate and maintain the chambers was the fact that at that time, the Navy was short on shore-based saturation dive facilities. They had the Experimental Diving Unit and that was it. When the Naval

Medical Research Institute came along with that requirement, people who were out on the various platforms, such as on the USS *Halibut* and the other platform at the time.

INTERVIEWER: There weren't any trained people on the west coast at that time?.

DR. BRADLEY: There were some people out at the Submarine Development Group.

They had the Elk River at that time, but it was waiting for the USS *Pigeon* and the USS *Ortolan* to be built and for them to become operational. Those would have been considered sea billets, too.

INTERVIEWER: No one in New London ——

DR. BRADLEY: No one did, really. Anyway, we accumulated a lot of the diver billets by hook or by crook. I think one of the ways that we picked up about twenty billets was a senior diving medical technician, Chris West, struck up a friendship with a congressional staffer. He managed to convince said staffer and things trickled down from Congress to the Navy. They decided that maybe they ought to put some billets out at Bethesda.

That was one thing. Certainly, one of the things that helped financially was after Bob Bornmann and Jim Vorsmarti had both been very supportive when they were down at the R&D command. After that, I managed to, or had some influence in, get people who had been at NMRI become program managers down in the R&D command. It was very helpful to have graduates of the diving program at NMRI as program managers down at the R&D command. That was how Chris Green, Del Evans and Al Manalabay ended up down there, and they were all very supportive. There was a little bit of political maneuvering that was going on.

INTERVIEWER: That's fine, as long as it was in your favor. Well, I hate to read a question but I will. Your career is one of those targeted for inclusion in this book, along

with major historical events that molded the direction of the Navy and where it took the undersea technology that was being developed. Would you recommend yourself as a career role model to young men today and if so, why? If not, why not?

DR. BRADLEY: I don't think there is that much in the way of diving left in the Navy to recommend it as a career path.

INTERVIEWER: In other words, you wouldn't suggest to some brilliant young medical officers searching around that they should choose diving as an area?

DR. BRADLEY: I would not only say 'no,' but 'heck, no.' I don't think the support is there either monetarily or facility-wise in any way. For somebody who is on active duty, I think it's a dead end path. The Navy Medical Department continues to be run by clinicians, for clinicians.

INTERVIEWER: What advances in diving practices and technology do you believe contributed to the most successful operations over the years, diving practices and technology?

DR. BRADLEY: One of the things the Navy did was basically pioneer the work in saturation diving. The Navy carried it along for a considerable portion of the way. It proved to be extraordinarily useful in a number of things, particularly with some of the black programs out there, and then they dropped it. The last platform was decommissioned this year. Some of that capability will be maintained with the ASDS, the Advance SEAL Delivery System.

INTERVIEWER: Do you think that in diving, the emphasis has slowly shifted to shallow water diving and special warfare?

DR. BRADLEY: Oh, it has absolutely shifted to special warfare. The special operations

folks are ascendant.

INTERVIEWER: What do you think are some of the major problems, medically, that they have to deal with?

DR. BRADLEY: Well, they are the same medical problems that have been there all along, like problems of decompression, problems of thermal stress, and cold stress, in particular. Though now, with some of the diving being done in the Persian Gulf, there is the concern over heat stress and problems of oxygen toxicity. These are not new problems. They are just problems that we haven't solved yet and as Jim and I pointed out in the national plan that we wrote for ONR, the Navy never has maintained a sustained research effort in these areas to solve these problems.

INTERVIEWER: Do you think that the Navy needs someone who is really knowledgeable in diving overseeing programs at ONR, someone 'riding herd,' in essence, who is extremely knowledgeable and could keep the Navy focused?

DR. BRADLEY: The Navy has not had anyone who has done that since Len Webber retired. Len was knowledgeable enough in diving. If you look at what has happened in ONR in the last twenty years, there has been a succession of people with rapid turnover. It was rare if anyone had any background in diving. There is no real coordination with the 6.4 sponsors from OPNAV and NAVSEA. I mean, it has basically been a rudderless ship that has been sinking all the while.

INTERVIEWER: This one will take a little memory on your part. A number of achievements have been made in diving over the last hundred years. I'll call these out to you and again ask you which of these or any other achievements would you characterize as being highly significant. I'll go through them first: air decompression tables,

submarine rescue chambers, mixed gas diving, SCUBA, underwater habitats, closed circuit UBA, saturation bell diving, and equipment improvements. Again, which of these or any other achievements would you characterize as highly significant?

DR. BRADLEY: I think all of those were highly significant.

INTERVIEWER: All of them were highly significant?

DR. BRADLEY: All of them were. Look, for instance, at Paul Weathersby's contribution to the decompression side of things. It has, I think, been enormous, and Paul has brought techniques to looking at problems in decompression that are now used by scientists who work in problems of decompression internationally. They have not only been applied to decompression but to things like the prediction of oxygen toxicity and maintenance. It was an enormous contribution. I think John Hallenbeck's contributions have been enormous and the same goes for Del Evans. The list goes on and on.

INTERVIEWER: Do you think it is sometimes a mistake to take people like Paul Weathersby and John Hallenbeck out of a laboratory and put them in administrative roles?

DR. BRADLEY: Yes. The administrative side of things had gotten so onerous toward the end of my tour at the Naval Medical Research Institute. I remember one of the researchers in another department made the comment that research had become a collateral duty.

INTERVIEWER: Well, I was just wondering because of all your good scientific training over the years at the University of Pennsylvania and Harvard University and so on and whether you had misgivings coming into NMRI as the chief of the lab, limiting your time at the bench.

DR. BRADLEY: It gave me very little time to be at the bench and I frequently made the comment that if the Navy had wanted me to do that, I don't know why they didn't send me to Harvard Business School, rather than to the Harvard School of Public Health.

INTERVIEWER: It's just difficult to find somebody who has the drive and the background and put them into an administrative role like that. There aren't many of those people around. You don't have to comment.

DR. BRADLEY: People who enjoy doing research are frequently not very happy with the administrative side. I mean, I used to dread arriving at work, knowing that there would be a queue lined up outside my office. I often felt that rather than have a Medical Corps device on my left collar, I should put a Chaplain Corps device on.

INTERVIEWER: Or you should have put on a 'money bags' sign. Well, in many ways this probably ends the kinds of questions I wanted to ask you. You may have some closing comments that you would like to make. Maybe you would like to offer some advice to the Navy?

DR. BRADLEY: I don't think the Navy is at all interested or would listen. They have never listened. The line has been much more willing to listen and be helpful than the Navy Medical Department ever was. I really enjoyed much of my Navy career and found it quite rewarding, but I was very happy to divorce myself from the Navy Medical Department, which as far as I can tell, has not improved at all.

INTERVIEWER: Yes. I can remember that many years ago, there was an ALLNAV that I think came out from the Surgeon General, where they were going to take medical officers in operational billets and move them into clinical billets. We were going to cut back those people who were directly involved in operational medical issues.

DR. BRADLEY: Well, no. That's the Navy Medical Department. It is primarily interested in its hospitals, training programs and maintaining its certifications. Research is totally an afterthought.

INTERVIEWER: Well, Mark, I appreciate very much you taking the time.

DR. BRADLEY: It's good to see you, Lee.

INTERVIEWER: Do you think I missed anything?

DR. BRADLEY: No, but I could tell you sea stories.

* * * * *

U. S. NAVY DIVERS CONGRESSIONAL METAL OF HONOR



Chief Gunner's Mate Thomas Eadie

"For display of extraordinary heroism in the line of his profession above and beyond the call of duty on 18 December 1927, during the diving operations in connection with the sinking of the U.S.S. *S-4* with all on board, as a result of a collision off Provincetown, Mass. On this occasion when MICHELS, Chief Torpedoman, United States Navy, while attempting to connect an air line to the submarine at a depth of 102 feet became seriously fouled, EADIE, under the most adverse diving conditions, deliberately, knowingly and willingly took his own life in his hands by promptly descending to the rescue in response to the desperate need of his companion diver. After two hours of extremely dangerous and heartbreaking work, by his cool, calculating and skillful labors, he succeeded in his mission and brought MICHELS safely to the surface."

Thomas Eadie was born on 8 April 1887 in Scotland. He enlisted in the Navy in 1909, became a Gunner's Mate and was also trained as a diver. While serving as a Chief Gunner's Mate in the 1920s, he assisted in salvage work on the sunken submarines *S-51* (SS-162) and *S-4* (SS-109), receiving the Navy Cross for each operation, and the Medal of Honor for extraordinary heroism in rescuing a fellow diver on the *S-4* on 18 December 1927.

Eadie retired from active duty in 1939, but returned to service during World War II, receiving appointment as Chief Gunner (Warrant Officer). He later became a Commissioned Officer and retired in the rank of Lieutenant.



Chief Machinist's Mate William Badders

"For extraordinary heroism in the line of his profession during the rescue and salvage operations following the sinking of the U.S.S. *Squalus* on 23 May 1939. During the rescue operations, BADDERS, as senior member of the rescue chamber crew, made the last extremely hazardous trip of the rescue chamber to attempt to rescue any possible survivors in the flooded after portion of the *Squalus*. He was fully aware of the great danger involved in that if he and his assistant became incapacitated, there was no way in which either could be rescued. During the salvage operations, BADDERS made important and difficult dives under the most hazardous conditions. His outstanding performance of duty contributed much to the success of the operations and characterizes conduct far above and beyond the ordinary call of duty."

William Badders was born in Harrisburg, Illinois, on 15 September 1901. He enrolled in the Naval Reserve in August 1918 and transferred to the regular Navy in December 1919. Later trained as a diver, Badders was awarded the Navy Cross for "extraordinary heroism and devotion to duty" during the salvage of USS *S-51* (SS-162) in 1926. He was designated a Master Diver in April 1931 and received commendations for his diving work in salvaging USS *S-4* (SS-109) in 1928 and the Japanese steamship *Kaku Maru* in 1932, and for clearing the propeller of USS *Bittern* (AM-36) at sea in 1933. Chief Machinist's Mate Badders was awarded the Medal of Honor for heroism during the rescue of survivors of USS *Squalus* (SS-192) and subsequent salvage of that submarine in 1939. He transferred to the Fleet Reserve in March 1940.



Chief Boatswain's Mate Orson L. Crandall

"For extraordinary heroism in the line of his profession as a master diver throughout the rescue and salvage operations following the sinking of the U.S.S. *Squalus* on 23 May 1939. His leadership and devotion to duty in directing diving operations and in making important and difficult dives under the most hazardous conditions characterize conduct far above and beyond the ordinary call of duty."

Orson Leon Crandall was born on 2 February 1903 at St. Joseph, Missouri. He enlisted in the Navy in June 1922, serving in several ships over the next decade. Trained as a diver in 1932-33 and designated a Master Diver in March 1939, he was serving in USS *Falcon* (ASR-2) when she supported the rescue and salvage effort on the sunken submarine *Squalus* (SS-192) in May-September 1939. Chief Boatswain's Mate Crandall was awarded the Medal of Honor for heroism as Master Diver during that operation. During World War II, Crandall became a commissioned officer and served in a variety of salvage and diving-related positions. He transferred to the Fleet Reserve in June 1946 and retired in December 1952. Lieutenant Orson L. Crandall died in May 1960.

USS *Crandall* (YHLC-2), 1967-1993, was named in honor of Lieutenant Crandall.



Chief Machinist's Mate James Harper McDonald

"For extraordinary heroism in the line of his profession as a Master Diver throughout the rescue and salvage operations following the sinking of the U.S.S. *Squalus* on 23 May 1939. His leadership, masterly skill, general efficiency and untiring devotion to duty in directing diving operations, and in making important and difficult dives under the most hazardous conditions, characterize conduct far above and beyond the ordinary call of duty."

James Harper McDonald was born at New Mand, Scotland on 15 July 1902. He enlisted in the U.S. Navy in October 1920, was discharged three years later and reenlisted in February 1926. Trained as a metalsmith, and later as a diver, he was commended in 1928 and 1930 for his excellent diving work. McDonald was designated a Master Diver in October 1934. In May-September 1939, he was heavily involved in rescue and salvage efforts on the sunken submarine USS *Squalus* (SS-192). For his heroism and leadership during that operation, Chief Metalsmith McDonald was awarded the Medal of Honor. Continuing his Naval service into World War II, McDonald became a commissioned officer. He retired after the war with the rank of Lieutenant.



Chief Torpedoman John Mihalowski

"For extraordinary heroism in the line of his profession during the rescue and salvage operations following the sinking of the U.S.S. *Squalus* on 23 May 1939. MIHALOWSKI, as a member of the rescue chamber crew, made the last extremely hazardous trip of the rescue chamber to attempt to rescue any possible survivors in the flooded after portion of the *Squalus*. He was fully aware of the great danger involved, in that, if he and the other member of the crew became incapacitated, there was no way in which either could be rescued. During the salvage operations MIHALOWSKI made important and difficult dives under the most hazardous conditions. His outstanding performance of duty contributed much to the success of the operations and characterizes conduct far above and beyond the ordinary call of duty."

John Mihalowski was born in Worcester, Massachusetts, on 12 August 1910. He enlisted in the Navy in December 1927, rising to the rank of Chief Torpedoman during the next decade. Trained as a diver in 1932-33, he served with the Experimental Diving Unit in 1933-37 and then as a member of the crew of USS *Falcon* (ASR-2) into 1941. While serving in *Falcon*, he played an important role in the rescue of survivors of USS *Squalus* (SS-192) and the subsequent salvage of that submarine in 1939. For his heroism during that effort, Chief Torpedoman Mihalowski was awarded the Medal of Honor. In 1942, Mihalowski was appointed a warrant officer and became a commissioned officer later in the War. He participated in rescue and salvage operations on six LSTs that had exploded in Pearl Harbor in 1944, and, while Executive Officer of USS

Shackle (ARS-9), on damaged ships during the Okinawa campaign in 1945. Following the War, he took part the harbor clearance in Japan and in salvage efforts during the 1946 "Crossroads" atomic bomb tests at Bikini. He was Executive Officer of USS *Gypsy* (ARSD-1) in 1947-48, before transferring to the Fleet Reserve in January 1948. Recalled to active duty in September 1950 as a Chief Torpedoman, Mihalowski was reinstated as a Lieutenant the following year. He was assigned to the Naval Gun Factory, Washington, D.C., in 1952 and was promoted to the rank of Lieutenant Commander in February 1954. LCdr. John Mihalowski retired from active Naval service in about 1958.



Chief Gunner's Mate Frank W. Crilley

“For display of extraordinary heroism in the line of his profession above and beyond the call of duty during the diving operations in connection with the sinking in a depth of water 304 feet, of the U.S.S. F-4 with all on board, as a result of loss of depth control, which occurred off Honolulu, T.H., on 25 March 1915. On 17 April 1915, William F. Loughman, chief gunner's mate, U.S. Navy, who had descended to the wreck and had examined one of the wire hawsers attached to it, upon starting his ascent, and when at a depth of 250 feet beneath the surface of the water, had his lifeline and air hose so badly fouled by this hawser that he was unable to free himself; he could neither ascend nor descend. On account of the length of time that Loughman had already been subjected to the great pressure due to the depth of water, and of the uncertainty of the additional time he would have to be subjected to this pressure before he could be brought to the surface, it was imperative that steps be taken at once to clear him. Instantly, realizing the desperate case of his comrade, Crilley volunteered to go to his aid, immediately donned a diving suit and descended. After a lapse of time of 2 hours and 11 minutes, Crilley was brought to the surface, having by a superb exhibition of skill, coolness, endurance and fortitude, untangled the snarl of lines and cleared his imperiled comrade, so that he was brought, still alive, to the surface.”

Frank William Crilley was born in Trenton, New Jersey, on 13 September 1883. Following enlistment in the Navy in March 1900, he became a Gunner's Mate and received additional training as a diver. In 1915, while a Chief Gunner's Mate, he made dives to over 300 feet during salvage operations on the sunken Submarine F-4 (SS-23) off Honolulu, Hawaii. On 17 April 1915 he rescued a fellow diver who

had become entangled at a depth of 250 feet. For his heroism on this occasion, he was awarded the Medal of Honor in 1929. In 1917, Crilley was appointed to the rank of Gunner (T), and in February 1918 became an Ensign in the Naval Reserve. He commanded USS *Salvor* in 1919 and left active duty in July of that year. In the mid-1920s, he was involved with salvaging USS S-51 (SS-162), and returned to active Naval service in 1927-28 to work on the recovery of USS S-4 (SS-109). He was awarded the Navy Cross for his actions as a diver during that operation.

In 1931, Frank Crilley served as Second Officer and Master Diver during the Arctic expedition of the civilian submarine *Nautilus*. Also in 1931, he assisted with the salvage of USS *Mayflower* (PY-1). Transferred to the Retired List in May 1932, he was again employed on Navy work in 1939, during the salvage of USS *Squalus* (SS-192). Ensign Frank W. Crilley died at the Naval Hospital, Brooklyn, New York, on 23 November 1947.

USS *Crilley* (YHLC-1), 1967-1993, was named in honor of Ensign Frank W. Crilley.

UNDERSEA & HYPERBARIC MEDICAL SOCIETY

INTERVIEW OF
EM1 PAUL ROBINSON

Kensington, Maryland
Thursday, September 4, 2003

PROCEEDINGS

INTERVIEWER: I'm here at Navy Special Clearance Team One with EM1 Paul Robinson, a Navy SEAL.

INTERVIEWER: How long have you been here at the special clearance team?

BM1 ROBINSON: I've been here for two years.

INTERVIEWER: You've been here for two years? What was your assignment here?

BM1 ROBINSON: Initially, I specifically came over with the idea that I wanted to handle animals. I got here and that was what I ended up doing. I ended being Heffy's handler, who is a 450 pound Atlantic bottlenose dolphin.

INTERVIEWER: What is Heffy trained to do?

BM1 ROBINSON: Heffy was part of a group called EX8 when I got here. EX8 was an experimental program then. It hadn't yet become a marked system. Now, it's called Mark 8. What they are trained to do is clandestine work, basically search or what we call 'recon,' as well as clearance.

INTERVIEWER: They are searching for mines in the very shallow water environment?

BM1 ROBINSON: That's right.

INTERVIEWER: Very shallow water is defined as what?

BM1 ROBINSON: We have a zone that is considered from the forty-foot mark to the ten-foot mark.

INTERVIEWER: You were assigned as Heffy's handler?

BM1 ROBINSON: That's correct.

INTERVIEWER: Are there several handlers, or is there one guy who's assigned as the primary guy for that animal?

BM1 ROBINSON: You basically have a primary handler and a secondary handler. The secondary handler handles meets the basic needs of the animal, for example, while I am away at some type of school or something of that nature. That's what his role is. But primarily, I handle the animal. I would be the guy out on the water if he were employed.

INTERVIEWER: Now, you said you came to the Special Clearance Team because you wanted to handle mammals. What sparked your interest in that?

BM1 ROBINSON: You know, I don't really know. I guess I was looking to diversify my career, or for something different. I've always tried to do that. My first experience was at SEAL Team Three, where I did special operations platoons. I did four of those. After four of them, I realized that I wanted something different, so I switched over and I did desert patrol vehicles for a while. I switched over. When I left there, I went to the United States Navy Parachute Team and jumped with the Leap Frogs for two years.

INTERVIEWER: Oh, that's neat.

BM1 ROBINSON: Then, I went and did an instructor duty. Following that, I was looking once again, keeping my eyes on the horizon offered to my community that was different. That was kind of what set it off.

INTERVIEWER: How long did you train Heffy?

BM1 ROBINSON: Well, I didn't start out with Heffy. I started out with Conar. She was our 'new guy animal,' I guess you'd call her. She had all kinds of things that she would do. If you could learn to handle her, then you could migrate to another system easily. She had all the little quirks that you could get in an animal. I started on her and once I was proficient at handling her, I just moved over to Heffy. I had him for a little over a year.

INTERVIEWER: When you went over to Operation Iraqi Freedom, you took Heffy?

BM1 ROBINSON: That's right.

INTERVIEWER: You said you trained to clear assault lanes for Marines and for amphibious assault. But what you did in *Imposter* was a little bit different mission. It was a harbor clearance, right?

BM1 ROBINSON: That's right. Actually, it was a harbor clearance. My animal was not employed. Mark 7 seemed to be the animal of choice.

INTERVIEWER: What is the Mark 7 system?

BM1 ROBINSON: The Mark 7 was designed a little bit more for administrative mine clearance. We do what is called a 'scan search' and they do what is called a 'circle search.' The animal is cued to go and do a sweep, and I can't give you the distances, of an area and then come back and report whether there's something there.

Our animal is designed to be on the move and constantly sweeping. Then, when they locate something, they report. Our designation, or our design, was so that you can get a larger area done in a shorter period of time, but with a little less accuracy. The Mark 7 takes a little bit more time because you're slowly moving step by step.

INTERVIEWER: You were saying that because the mission in Iraq was different than what you normally train for, you did some special training with your dolphin to get ready for it. Is that right?

BM1 ROBINSON: That's right. Well, what we were doing was, as the news started trickling down to us that we would be deployed, there was only one area that we looked at that we could really be utilized. We figured with the terrain change, what we had to do was shift our training from what we were used to doing, coastal lanes for landings, and focus and try to revamp the animals to adapt to doing a scan search in a channelized area. It changed the perspective on the way the animal looks for things because of the topography and whatnot at the bottom. They are used to kind of going in and having a gradient going up and then out.

Well, now you had things that were peripheral. You knew you were going down the center with slopes on both sides. It offered some challenges and we worked on it for probably about four months or so.

INTERVIEWER: How hard is it for the animal to adapt to a new scenario like that?

BM1 ROBINSON: The animal is pretty good at shifting over and taking already-learned behaviors and modifying them for a particular task. The hardest thing, I guess, was just to have that behavior solidified on such a consistent level that you can say, "Yes, this animal is rock solid and ready to perform this task in combat." You can only get to a certain point. I guess that was probably not quite at the point at which we wanted to be.

INTERVIEWER: How difficult is it to transport the animals? You had to bring them from the west coast all the way to the Middle East.

BM1 ROBINSON: That was probably the biggest hurdle that we had to overcome. The SOPs in the movement of the animals had already been done and proven in the experimental stage. But we had never done it with that quantity of animals, because we took nine systems with us over there.

INTERVIEWER: Each animal is considered a system?

BM1 ROBINSON: That's right. There were nine animals total. It was pretty complicated and it involved a C-130 flight that had two in-flight refueling stops. Following that, we had to transport the animals to flatbeds on their Animal Transport Carriers (ATC). We had to move those onto flatbeds and then crane them into the well deck of a ship.

It was a pretty complicated evolution because you had to maintain water quality, keep them fed and at the right temperature, because they are sensitive. It was quite the evolution within itself, just getting there.

INTERVIEWER: How did the animals respond to being shipped? You fly them over in pools, right?

BM1 ROBINSON: Well, no. We fly them over in ATCs. ATCs are actually, I guess I don't know the exact material that they are made out of, but they are boxes that hold about nine inches of water and have two poles that run the length of the boxes. The animals are actually slung and sitting in a barrier of water so that if the aircraft, when it takes off and lands suddenly, the animals aren't thrown or injured in any way. It's kind of a cradle type thing mixed with water.

INTERVIEWER: How do the animals like being in that?

BM1 ROBINSON: We can't really train that all the time, but they are used to being in confined spaces. We keep them in pens and stuff and we do transports with them pretty routinely. They are accustomed to it, but I can't say that they are just totally happy about doing it. There are certain indicators that can tell you how an animal is doing. They have certain aggressive-type behaviors, like chirping, and their heart and respiration rate go up if they are angry or in distress.

Those things are constantly monitored when we are doing it. What I would say is that they fared very well in going over there. Their attitudes were halfway decent. The obstacle, really, in the training portion, came after we had arrived there.

INTERVIEWER: How was that?

BM1 ROBINSON: Well, our original plan was to work out of pens. Instead, what we found when we got there was that we would be working off the back of a well deck. We aren't designed to work off the back of a well deck. We never really knew what the limitation was because we never pushed it quite that far.

Shipboard pools are very small and when we keep them in pens they can use their sonar to look way out and it keeps them more entertained. I guess the philosophy is that in training, the build a trust relationship with the animals.

We do everything off of operant conditioning, which means they get positive reinforcement for doing what we request. When you ask them to beach up and get in the boat, suddenly throw them in a container and take them for thirty hours in that container and throw them in a tiny pool halfway around the world with a radical temperature change, there is an impact on the animal.

INTERVIEWER: Is it because you have sort of violated that trust?

BM1 ROBINSON: That's right.

INTERVIEWER: You tricked them?

BM1 ROBINSON: Essentially, yes. Well, we're not tricking them intentionally, but they just don't know and I don't have a way to communicate that. It breaks down the trust barrier a little bit. You end up with an animal that is now looking at you, second-guessing, wondering, "What's coming next? What's next in your plan for me, because everything you've done to me so far has been pretty good, but now what are you going to do?" We went out to sea and experienced some control issues with the animals.

INTERVIEWER: What do you mean by 'control issues?'

BM1 ROBINSON: When you put the animal in open water want it to be right with you and attentive and alert, and you want the animal to beach up when you request it to beach up. We had a few of our systems, including mine, have some problems. I had my animal run for four days while we were out there.

INTERVIEWER: For four days, he wouldn't come back to the boat?

BM1 ROBINSON: That's right.

INTERVIEWER: Did you know where he was during the four days? Could you track him?

BM1 ROBINSON: We tracked him for 24 hours. Then, we lost contact with him. We sat on watch for 24 hours, around the clock, with what's called a 'recall pinger' in the water. On day four, he finally showed up and we had to kind of work with him to get him in the boat. He was more coerced than volunteering, you know.

That was unfortunate and I kind of blame it on the fact that we didn't put him in pens. We knew that transition, the long transport, if we had put them in pens and let them acclimate for about a week or so in pens, it would've been easier. It was kind of like if I body-snatched you, but I put you in a luxury hotel, you might think, "Well, I guess that wasn't so bad," but when I do that to you and I stick you in a closet, it changes your perspective on things. I think that was where we were at with them.

INTERVIEWER: It wasn't just Heffy? It was several of the systems?

BM1 ROBINSON: Several of the systems had problems. He probably reacted the worst to it. All of them exhibited a few control issues, but after a period of time they adapted and realized. Once we had them in a cycle moving back to the shipboard pools and then back out into open water and back and forth, they realized they were going to get in open water again and they weren't so hesitant to go back to their pools. They overcame a threshold that was a big concern as a group, but it took some time. It wasn't immediate. We just can't throw them out there and run with them when we do stuff like that. We kind of have to do it stage by stage it. It's kind of a tedious process.

INTERVIEWER: How long did you go to school to become a mammal handler?

BM1 ROBINSON: The school itself is only about a month long. But that teaches you basic husbandry skills and basic operant conditioning. Where you really start to learn how to handle an animal is here. Every session that we do here and abroad has a technical representative who is a bonafide trainer. They watch your moves and they coach you along the way. So, you get that one-on-one, which is really where you learn the most. The training is basically just to give you the do's and don'ts so that you assure the safety and health of the animal. After that, as you progress, you get better and better from that one-on-one coaching.

INTERVIEWER: You're pretty happy with your choice of coming here?

BM1 ROBINSON: Yes. Like anyone, you want to do more and you want to get your hands in the pot and whatnot. But it was an interesting experience to see them do it. They definitely have the potential. Not everybody is born with bioecho location, with they can locate things just by rattling a sound off of an object and receiving the sound back. Katrina was one of our animals that we took to an exercise that we did up at Camp Pendleton. She did five hours of work on one small bucket of food and cleared 98 percent, which is incredible for five hours.

INTERVIEWER: How long would it take a team of human MCM divers to do that?

BM1 ROBINSON: I can't even conceive of how long it would take. It would take days, if not weeks, to get every single mine in that amount of time.

INTERVIEWER: She did it in five hours?

BM1 ROBINSON: She did it in five hours. When they are on, they are on. Unfortunately, there's a lot of maintenance and upkeep associated with them. They are not as flexible as you would like them to be. They're not like a machine gun, with which you load it up, charge the handle and pull the trigger and it works. They've got to be coddled along and they've got to be made to feel comfortable. You've got to keep that trust factor going. As long as you keep all those things lined up, they're pretty good. The problem is that the military operates on a timeline and animals have a thing called the 'free will factor.'

INTERVIEWER: Is there anything else we should talk about?

BM1 ROBINSON: I guess the only thing that is pertinent was that over there we did a lot of adaptation with the animals in Umm Qasr. The area around Umm Qasr was incredibly bad. To work the area, they had to improvise things never done so that they could keep the animals in pools right there in warehouses in Umm Qasr.

INTERVIEWER: They had to stay there, instead of in the pens that they preferred?

BM1 ROBINSON: Yes, and you couldn't put the pens there because of the current and the poor quality of the water. There were things that guys just improvised on the spot to make it happen. It was pretty impressive work. Everybody got their chances to do different jobs. I ended up fulfilling kind of a SEAL team role holding. We were doing force protection for our own people. We were under the impression when we went in there, other forces were going to provide force protection and we would just focus on the clearance.

INTERVIEWER: Doctrinally, you guys aren't structured to do force protection.

BM1 ROBINSON: No. The reason that we have special operators and other guys is because we are not really designed for force protection. We were supposed to be giving tactical input into the design and the workings of the MCM mission, clandestine-type operations. However, as it turned out, we ended up picking up errant arms and holding the fort as it was so that we could get the job done.

INTERVIEWER: You guys were pretty flexible. You had to do a lot to compensate for the animals because they were doing something that wasn't their normal mission. They were also being housed in a way that made them uncomfortable and in water that was less than optimal.

BM1 ROBINSON: That's right.

INTERVIEWER: Then, you had to provide your own force protection.

BM1 ROBINSON: That's right.

INTERVIEWER: That took a lot of flexibility on your part.

BM1 ROBINSON: That's right. I guess what we had anticipated if everything went perfectly, the job could have gotten done probably a lot more quickly. But there were a lot of shortcomings. It

wasn't necessarily from our end. Getting to the area was a chore in itself. I want to say it took something like, and Gunny Beller knows the exact number, fifty plus CH-53 flights.

INTERVIEWER: Those were from the *Gunston Hall*?

BM1 ROBINSON: They were from the *Gunston Hall*.

INTERVIEWER: They were to make ship to shore movements.

BM1 ROBINSON: Yes, they were to get us in there. When they first started moving stuff in, there was a lot of stuff still happening. Forces were moving through. Every night, there was stuff going on. So, it provided us some definite challenges. But I felt that overall we were very successful in what we did. We found that there was nothing there, as it turned out. But we cleared it. Without question, there was nothing there when we got done.

INTERVIEWER: Were your animals happy to be back in Coronado?

BM1 ROBINSON: Yes, I think they were. Well, that was primarily because when they got home and hit their pens, they were in familiar waters. They were definitely happy but they didn't show it too much. There was a period during which we moved the animals off station when we went off task to Kuwait. We actually put pens in the water in Kuwait. They had some time in pens in Kuwait after coming off task. That time in the pens instantaneously improved the control issues with the animals. The ideal way to do it would be to get to the area of operation, set up your pens, acclimate, work your animals on some local training fields that you set up and then go do your mission when you are called. But you live and you learn.

INTERVIEWER: That's great. Is there anything else?

BM1 ROBINSON: No.

INTERVIEWER: Thank you very much.

BM1 ROBINSON: You are welcome, sir.

* * * * *

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Pearl Harbor Raid, 7 December 1941 - Post-attack Ship Salvage

Divers standing in front of a recompression chamber, while they were working to salvage ships sunk in the 7 December 1941 Japanese air raid on Pearl Harbor.



During the weeks following the Japanese raid, a great deal of repair work was done by the Pearl Harbor Navy Yard, assisted by tenders and ships' crewmen. These efforts, lasting into February 1942, put the battleships PENNSYLVANIA, MARYLAND, and TENNESSEE, cruisers HONOLULU, HELENA, and RALEIGH; destroyers HELM and SHAW, seaplane tender CRTISS, repair ship VESTAL and the floating drydock YFD 2 back into service, or at least got them ready to steam to the mainland for final repairs.

The most seriously damaged of these ships, RALEIGH and SHAW, were returned to active duty by mid-1942. Five more battleships, two destroyers, a target ship and a minelayer were sunk, or so severely damaged as to represent nearly total losses. These required much more extensive work just to get them to a point where repairs could begin.

Starting in December 1941 and continuing into February 1942, the Navy Yard stripped the destroyers CASSIN and DOWNES of serviceable weapons, machinery and equipment. This materiel was sent to California, where it was installed in new hulls. These two ships came back into the fleet in late 1943 and early 1944.

To work on the remaining seven ships, all of them sunk, a salvage organization was formally established a week after the raid to begin what would clearly be a huge job. Commanded from early January 1942 by Captain Homer N. Wallin, previously a member of the Battle Force Staff. This Salvage Division labored hard and productively for over two years to re-float five ships and remove weapons and equipment from the other two. Among its accomplishments were the re-floating of the battleships NEVADA in February 1942, CALIFORNIA in March, and WEST VIRGINIA in June, plus the minelayer OGLALA during April-July 1942.



USS OKLAHOMA (BB-37) Ship righted to about 30 degrees, on 29 March 1943, while she was under salvage at Pearl Harbor. She had capsized and sunk after receiving massive torpedo damage during the 7 December 1941 Japanese air raid. Ford Island is at right and the Pearl Harbor Navy Yard is in the left distance.

After extensive shipyard repairs, these four ships were placed back in the active fleet in time to help defeat Japan. The Salvage Division also righted and re-floated the capsized battleship OKLAHOMA, partially righted the capsized target ship UTAH and recovered materiel from the wreck of the battleship ARIZONA. However, these three ships were not returned to service, and the hulls of the last two remain in Pearl Harbor to this day. All this represented one of history's greatest salvage jobs. Seeing it to completion required that Navy and civilian divers spend about 20,000 hours underwater in about 5000 dives.

Long and exhausting efforts were expended in recovering human remains, documents, ammunition and other items from the oil-fouled interiors of ships that had been under water for months. Uncounted hours went into cleaning the ships and otherwise getting them ready for shipyard repair. Much of this work had to be carried out in gas masks, to guard against the ever-present risk of toxic gasses, and nearly all of it was extremely dirty.

UNDERSEA & HYPERBARIC MEDICAL SOCIETY

ORAL HISTORY OF THE MAJOR PARTICIPANTS
IN U.S. NAVY UNDERSEA TECHNICAL DEVELOPMENTS

INTERVIEW OF PETER BARNARD

PROCEEDINGS

INTERVIEWER: When and where were you born?

DR. BARNARD: I was born on February 22, 1927, in Highbury, London.

INTERVIEWER: Where did you go to school?

DR. BARNARD: I went to school in about ten different places in the U.K. and in Australia because my father was an electrical generating engineer and we moved to various places around London, Then I was sent to Australia in 1939. I took part in various sports, soccer, rugby and athletics. When I went to Australia, they tried to teach me Australian-rules football, which I found totally baffling, so I took up hockey.

What influenced me to join the Navy? Well, I was influenced by the government, which called me up.

INTERVIEWER: When was that?

DR. BARNARD: It was in 1956 that I got called up for a short service commission in the Navy. I preferred that, rather than 18 months in the Royal Air Force, because I wasn't interested in flying. Once in the Navy, they sent me to a carrier, HMS Bulwark, and I found that flying was actually quite interesting.

“Why have I agreed to be interviewed?” I had a good lunch and I don't like to disappoint old friends.

I got into diving research because after being Medical Officer to HMS Reclaim, the Deep Diving ship, then working in the Submarine Escape Tank at HMS Dolphin, I was sent to the Royal Naval Physiological Laboratory (RNPL). There I was engaged in a series of experiments in rapid compression, to test the effects on mental performance at depths of 300 feet. We used small chambers, designed to take goats, to achieve rapid compression; and used tables designed,

earlier by Rashbass, which involved rapid ascent to 20 or to 10feet and remarkable short decompression times.

Other duties involved lecturing to Medical Officers, running Practical classes for Physiotherapists, attending Post Mortems of diving deaths all over the country and various diving-trials in HMS Reclaim.

In 1962 I went on the last 'CD star' course and went, soon after completing it, to Malta for the first of several submarine escape trials. At the time, we had the objective of being able to dive to the depths at which people could escape. I also attended, as Medical Officer, a later trial in 1965 and the last of the series in 1971?, when we achieved 600 feet.

One of the first things I did in my early time at RNPL was in response to a request from Stanley Miles to write a paper on underwater vision. I said, "But I don't know anything about underwater vision." He said, "Well, that doesn't matter." He didn't think that any research was necessary; "just look up the textbooks". I built an underwater perimeter and tried it out, in the old Davis Submarine Escape Apparatus (DSEA) training tank at HMS Dolphin, with various sorts of mask, to find out what one could see underwater. That was one of the first things I did and, perhaps, the only thing that was directly useful.

Who most influenced my diving career? I suppose those influences were the writings of Paul Bert and, J.S.Haldane. Later, more directly, Al Behnke, who said, "Why don't you chaps repeat what I did, with your more modern and better equipment".

When R.N.P.L moved from the hutted-site next to the Naval Cemetery I began a long association with the Deep Trials Unit. Here the two strands of Diving and Submarine Escape were linked for we wanted, if possible, to dive and to escape from 600 feet. The early sea-trials

were carried out in Tenerife for which the Medical Officer was Eric Mackay; while I helped Val Hempleman with the long calculations on a hand-held 'Curta' Machine.

In 1966 I went up to Oxford to do a D.Phil. Degree (Ph.D.) One has to live in Oxford for two years, so I was absent from 1966 to 1968 and returned to R.N.P.L. and finished the Thesis in 1969. The Thesis, while it carried the title "The Biological effects of Gases at Pressure" was really a study of oxygen toxicity in mice and the way in which it was altered by the presence of other gases.

Persons who I would classify as extraordinary: I can't think of any. I don't know if I took enough notice of what others had to say. Half of the individuals who influenced my career did so and I didn't even know they were influencing my career until later.

My first experience underwater was, I suppose, as a New Entry Surgeon Lieutenant in 1956. When they said, "Who would like to have a dip?" I said that I would and I was dressed in a dry suit and lowered into the tank in HMS Vernon and wallowed about a bit. I quite liked it. I didn't have any previous diving experience although when I was about 10 years old I was stopped from sport, due to a heart-murmur. I responded by taking up diving for coins in a swimming pool.

The most dangerous or life threatening experiences I had were diving with other people. I found that I was used to diving to 300 feet in a pressure chamber and the effects that it had. When I went down to 180 feet in the sea, with another diver, I found that he wanted to go off and chase fish, so I really wasn't happy with that.

I suppose that the career was really not chosen by anybody. It just happened. What I found intellectually stimulating was the difficulty of the task of understanding what takes place during decompression. One of the things that Professor Paton, my supervisor at Oxford, said

about diving was that the reason it hadn't been solved was because some problems were intractable. I agree.

SeaLab really passed me by. I knew that things were going on, like the Deep Submergence Rescue Vehicle but I knew nothing much more. My opinion of the British Submarine personal escape system was that it worked down to 600 feet, but we didn't know the limiting depth.

The thing that brought me most satisfaction, I suppose, was being able to see the results of what you did, which was a series of things starting from 1961 and culminating about 10 years later in the simulated escapes from 600 foot in the Mediterranean. I don't know what the most important contribution was, perhaps it was the engineering skill needed to produce the air-supply valve.

When you helped to create something or establish or initiate development for change, it is very much a cooperative effort. The saturation-diving program that I started was carried on by Jim Vorosmarti and Bob Hanson. When you talk about these things, you talk about things that last quite a long time and involve a number of people, all of whom make a contribution.

As far as disappointments I have had: there are always bound to be some in every career. I don't know that I remember them now. At the time, they may have been quite acute, but time washes things away.

What personal decisions would I change and why? I remember having an argument with John Rawlings about something I said that I wasn't going to do and he got angry with me and said I *would* do it. I had a similar situation with Captain James Watt (later Surgeon Vice Admiral). It was over providing cover for the saturation dive, the very deep dive, which Peter Bennett had decided he was in charge of, and I said that I didn't want to cover it as Medical Officer. James Watt called me in. He had a certain way of saying things. He said, "Peter, you should have come

to me earlier. I have a lot of experience with this sort of thing,” and he told me I had to go back and cover the dive. So the answer is none. It did result in a similarly deep treatment.

I left RNPL in 1972 and began a second career in administration, only to be recalled to my first by being appointed to NMRI under the exchange program in 1976. This I found interesting because of the completely different atmosphere and it was a new experience for me to be in an organization that was transparent from above. I ordered a particular type of mass spectrometer that eventually had wide repercussions and could have involved me in a senatorial inquiry.

Somebody wanted to know who ordered it and why it had not been put out to competitive tender (it was the only one of its type). Eventually, after I left NMRI, it was returned to the manufacturer because it didn't do what they said it would do.

This was a novel experience because in the RNSS (Royal Naval Scientific Service), you didn't have that situation. You ordered something and it just came through. The most you usually got was an inquiry from a civil servant, as happened when I ordered some long graph paper, one roll of it. I was asked why I wanted long graph paper. I said, "Well, I want to draw long graphs." seemed a satisfactory answer but he was only a junior civil servant, and that was usually the highest that these things went. What came out of this was that the realization that I was an amateur. When I compared NMRI with RNPL the research planning at NMRI was to me a new discipline, common in the rest of science, but not one I was used to in diving research.

Before I went to NMRI I did some studies on the wash-out of inert gas which I later realized was complete rubbish. The idea of integrating the area under a curve just didn't work. It may have meant that you could measure what was in the whole body, but that still didn't tell you

where it was. I worked with Paul Weathersby, in NMRI, on an interesting project. We used a dog and recorded the rate at which the radioactivity increased, using a whole-body counter, when it breathed a small proportion of radioactive argon gas and then decreased, on returning to normal air breathing. Analysis, we hoped, would substitute measurement for assumption in gas exchange. I couldn't interest anybody else in the next stage; that was repeating the experiment but at raised pressures. Still papers were appearing which assumed that you could calculate decompression 'correctly' if one selected the right half-times for your theoretical tissues. All too soon I had to return to the desk job and after two short but happy years I went to the Ministry of Defense in London.

Significant events in diving history: When I was first at RNPL in the early 1960's, I acted as an unofficial diving pathologist because I used to go to all the post-mortems on the diving accidents that occurred in caves and quarries. I also carried out treatment where pressure facilities existed. I went out to the first oil platform in the North Sea, the one that later sank, to treat a diver for decompression sickness. Because of such incidents, the diving community gradually realized that it needed its own doctors. They couldn't rely on the Navy to carry out treatment. The subsequent increase in numbers of civilian divers with their own doctors meant that calls on the Navy became less frequent, except, of course, to train doctors in Underwater Medicine.

At this point the tape was stopped...no more interview.

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UNDERSEA & HYPERBARIC MEDICAL SOCIETY

PETER MAAS

Speech At Symposium Banquet

Kensington, Maryland

April 2003

PROCEEDINGS

The Russian navy's sad loss of the submarine *Kursk* in August 2000 touched submariners, divers, and salvage experts everywhere. It reminded us of the dangers of undersea work and of the importance of understanding the history of undersea rescue. For the United States, that history began on May 23, 1939, when the engine compartment of the USS *Squalus* flooded through the main ballast, or main air induction valve during one of its pre-commissioning test dives. It plunged the submarine and its crew to the sea floor, 243 feet beneath the surface.

The event initiated a rescue and salvage operation by the United States Navy Diving fleet that captured the hearts and souls of the country. Only through the courageous efforts of a team of well-trained divers and the foresight of a few individuals, including then-Lieutenant Commander Swede Momsen, was the surviving crew and the boat brought back from the depths to serve again. Peter Maas' recent best seller, *The Terrible Hours*, published by Harper Collins, has documented this heroic and successful U.S. Navy rescue of the 33 surviving crew members on the *Squalus*. His book has not only sparked the interest of those involved with submarine rescue but of the interest of the public in general.

Some of Peter Maas' other non-fiction works include the number-one best seller, *Under Boss*, *The Valachi Papers*, *Serpico*, *Man Hunt*, *King of the Gypsies* and *In a Child's Name: The Legacy of a Mother's Murder*. Let's welcome Peter Maas.

MR. MASS: Good evening to all. I'm delighted to be here with such a distinguished group at a wonderful symposium. I was thinking, on the way down here, how I would start out, and I remembered something. Last October was the one hundredth anniversary of the commissioning of the USS *Holland*, the Navy's first submarine. I like to think that I'm as patriotic as the next guy and thought to myself, "What a breakthrough that must have been. What a breakthrough in

maritime history, to say nothing of naval warfare.” You can imagine my chagrin when I found out that the French navy already had two dozen submarines in operation when the *Holland* was commissioned. Mr. Chandler has been talking about diesel-powered electric boats. I found out that in 1910, all the major navies in the world, including Russia’s, had diesel-powered submarines. We were the only ones who didn’t have one. In 1920, the Chief of Naval Operations, Admiral William Benson, predicted a future for submarines that he equated with the dodo bird. There was some protest in the Navy about that. They charged back that Admiral Benson was just representing a group that was reluctant to deal with anything that might upset the established order. John Holland, who developed our first submarine, had a more pithy remark. He said that the Navy brass didn’t like submarines because they didn’t have big enough decks on which they could strut. Now, I only mention all of this because it gave me, and I remind you of the atmosphere at the time, this marvelous man, Swede Momsen, who graduated from the Naval Academy at the end of World War I.

Swede Momsen was a marvelous man, and I honor him with you tonight. He was a man of enormous vision. He was a man of action. I think he was a man of science, too. It was a unique combination. Now, I have a personal feeling about *The Terrible Hours*. I’ve written a number of best sellers, some of which were mentioned earlier. But they always dealt with the dark side of America, whether it is police corruption, the mafia, government corruption or horrific domestic violence. It is not that such things aren’t true, and I made up nothing. But I always felt dissatisfied. I felt that I was missing something else, another part of America that was probably closer to the truth of what we are.

I’m here to tell you about writing *The Terrible Hours*, writing about a man who exemplified the very best that this country stands for, everything you would want from a naval

officer. I cannot tell you what a thrill it was for me to deal with this subject. What a joy it was to wake up every morning and go to work, to write something so positive and, I think, uniquely American. This man was a writer's dream. He grew up and spent his adolescence in Minnesota. He devoured books. His favorite book was *Twenty Thousand Leagues Under the Sea*. That was one of the reasons, if not the main reason, that he finally gained entrance to the Naval Academy. That was a way for him to serve on submarines. He graduated and ended up on the Battleship USS *Maryland*. He suffered there for about eighteen months until there was an opening in the submarine school. He applied for it immediately. Now, Swede Momsen had shown, as they say in racing circles, a lot of early foot, even in Annapolis. The skipper of the *Maryland*, after finding out that Momsen had applied for a transfer, called him up. He said, "My God, what are you doing? You have this great career ahead of you in the Navy. Why are you going to submarine school? Only the scum of the Navy go into submarine school." Well, Swede Momsen couldn't wait to get in a submarine. You heard Mr. Chandler describe life on the early submarines and they echoed a lot of what Swede Momsen told me. His first boat was an old boat. He lived out of a suitcase. There was no refrigeration. He threw over out the meat. I don't know what he did about the bread and toast, but it got rancid. Butter sloshed around. There were no toilets.. He loved every minute of it. He got his first command, an old boat, and in a dive, he plunged into the bottom off of Panama and was stuck there. He figured a way out. He blew the torpedo tubes with air and managed to extradite himself. The point of all that was that he couldn't wait to be at sea. It was inherent in everything you can think of.

You know, at that time, if a submarine went down, there was no deliverance. It was an accepted fact. Swede Momsen accepted it. That was the way it was. There were only a couple of inches of steel between you and tons of ocean pressure. You just didn't think about it. He

changed his mind suddenly one day. He had an epiphany. It was one that well explains what a marvelous man he was. Everything he did from then on related to submarine rescue, submarine pioneering and underwater pioneering. Incidentally, he never used the terms, even back when I was first talking to him, 'beneath the surface' or 'underwater.' He always said, 'inner space.' It demonstrates that marvelous vision he had. Well, he accepted the fact there was no deliverance, and it shows how motivated he was. He was not just a man of action but a visionary, a scientist, a man of enormous compassion. What changed his life was that he was in command of a submarine, the S-1, and in his squadron one night, the S-51 was missing. He was awakened in the middle of the night. He rounded up as much of the crew as he could and was sent out to search for the missing submarine. He found it near Block Island. He found a big oil slick and some wreckage. He knew what it was. Now, that boat was not down very far, according to today's statistics. It was about 140 to 150 feet below the surface. I remember him telling me that as they circled around, he kept thinking to himself about how helpless he was. They couldn't do anything. He couldn't do anything. There was nothing that could be done. At that time, anything 18 feet below the surface was a total mystery as to what it did to a man physically or psychologically. He circled around with this horrible, helpless feeling and consoled himself with the thought that those men had probably all drowned. They died instantly in some great rush of water, and it was quick. He was there, months later, when they finally salvaged that submarine and the bodies were being taken off. One of the bodies was that of one of his closest friends when he had been in Annapolis. He looked at his friend's hands and saw all the fingers on both hands broken. That man tried to claw his way out of the submarine in the last moments of his life. At that moment, for Swede Momsen, the idea that there was no deliverance became unacceptable. He sat and he thought about it a lot. He was stationed in Newport. He finally came

up with his idea of a rescue chamber or diving bell and made sketches. This was a man who didn't have a master's degree in science. He just worked the whole thing out and sent it off to the Bureau of Construction and Repair. A year passed and he didn't hear anything. He figured that he had made some mistake. There must have been some major flaw in what he was conceptualizing, he thought. That was it.

Then, as fate would have it, he was transferred to the Bureau of Construction and Repair to the submarine desk. He was going through the in and out baskets of his predecessor. I get really worked up when I think about this. He found all of his plans in the bottom of a basket. They had sat there for a year. Nobody had even looked at them. He went and tried to get somebody interested and they said, "Who does this lieutenant think he is?" I mean, we had been thinking about this problem for years. Well, if they'd been thinking about the problem, that was all they did. They hadn't done anything about it. While that happened, another submarine, the S-4, went down off of Cape Cod. That submarine was down only 104 feet, I believe. For three days, the world and the ships on the surface heard the tapping that crew made. The last message was "Please hurry." They couldn't do a thing. You know who was assigned to answer all the mail the outraged public sent, they who wanted to get rid of submarines, these coffins? Swede Momsen had to answer them. But he would not give up. He began to think of another idea: an escape lung. He began to think, "Well, this is something you could do. We wouldn't have to go to the Bureau of Construction and Repair. We didn't have to go through all of the bureaucracy. Maybe we can work something out here." He had a couple of dedicated people working with him in the Washington Navy Yard. He had this idea of an artificial lung that would be placed on a man's chest, where lungs would be, and he would breathe through that, in and out. It was just a simple idea, though nobody had ever thought of it. I'll give you an idea of the resources

available. We're talking about inner space, and we think of what we've done with outer space. His resources were such that his first lung, which he tried out himself, featured a red patch on it because it was made from the inner tube of a tire that had blown out. But he didn't care. He did the whole thing. He put it together and then, he and two enlisted men, one a gunner's mate named Tibbles, went down to the lower part of the Potomac River. There, the water was about 200 feet deep. He had built a bow with the cross so that he could stand up underneath the bow. There was an extension on which he could stand. He went down to the bottom of the Potomac to try out this lung. He was the one who was doing it. He didn't ask somebody else to do it. It was black down there. He came up breathing with this thing he had invented. To prove this to the crew, he said that he remembered when he was in swimming pools and ponds out in Minnesota, if you dove deep enough, you had to prove it by bringing up a couple of stones or something, which he did. This time, instead of stones, he showed the two guys on the boat mud from the bottom. At that moment, a young reporter from the *Washington Star* was on his way to work and saw people out there in the middle of the Potomac and waved them in. They finally came and got him. They explained to him what they were doing. The young reporter ran back to Washington, D.C. with the scoop of his life. Because they didn't tell him what the contraption was, he named it the 'Momsen Lung.' It was in the papers. Swede Momsen and his little boat, the *Creelly*, came back to the Washington Navy Yard, and whole Navy was there, including the Chief of Naval Operations ----. Everybody demanded, "What have you have you been doing?" They couldn't believe it. It was the first that they had heard about it. Eventually, they adopted the lung, as you know, but they were really mad. He had gone out of channel. He had done this on his own. He didn't tell anybody what he was doing and a lot of noses were out of joint. There were congressional investigations because of the S-4 and so on, and it was revealed that he had this

idea for a diving bell rescue chamber. He got the go ahead to begin and the brass could not stop him. But the resources weren't great. He used the same drawings that he had sent three years before. I mean, his dedication was just mind boggling. There had been an idea of a large tank that would contain a collapsible seaplane, which could be taken out. It had been placed on an S boat. I guess you could then unfold the wings or whatever and the plane would fly off and be kind of a scout for the submarine. Well, it didn't work. I don't know if they could get the plane in the tank or whatever. Anyway, they were going to just throw away the tank and he requisitioned it and cut it in half. One half looked like an inverted water glass. That was his first diving bell. He started working on it with dedicated assistants, but he was always the first one to try it out. It was developed and continually developed. One of the key things he realized, which the Russians found out the hard way with the *Kursk*. The original idea was to lower the diving bell down from the surface. Suppose it was stormy or rough. How could you do it? He realized that a diver had to be sent down first to connect the guide cable to the sunken submarine. Weather, therefore, became less of a factor on the surface. That was one of his key innovations. It led him to something else. Some of the submarines went down pretty deep. Everybody here knows about toxic oxygen and nitrogen narcosis. I'm talking to experts here, so I don't have to get into that. He worked out this idea of helium and oxygen as a gas mix and worked out the tables, as Mr. Chandler pointed out. We're talking about 1938. Those same tables are used today. He did it all by trial and error, risking his life every step of the way.

Anyway, the diving bell was almost finished. It had been refined and added to, all by trial and error. Remember that a lot of people were still pretty sore with him because of that lung. They never have officially titled it the 'Momsen Lung', by the way. It's called the 'submarine escape appliance,' with no name attached. But everybody knows what it is because of that kid

reporter. A lot of admirals were unhappy about that. They transferred Swede Momsen before the completion of the diving bell and put in charge another officer who had been working with him. They named the diving bell after the other officer to teach Momsen a lesson. I mean, it's out there today. It's called the 'McCann Rescue Chamber.' It should be the 'Momsen Rescue Chamber.' I'll get to that in a minute. Nonetheless, it's there and it works. The tower is in New London, where the men are using the lungs. Again, this was done by the trial and error, and the mystery of the sea is something you can't underestimate. In using the lung, you had this hundred-foot tower with a lock at 18 feet, another at fifty feet, and one at a hundred feet. At 18 feet, two men died using the lung. Everybody went crazy. They asked, "My God, what have we missed here?" But again, with the mystery of the sea, the two men died because when starting out, they held their breath. At 18 feet, their lungs exploded. That was how little was known about beneath the surface. Anyway, we came there and then, suddenly, on May 23, 1939, what Momsen had dreaded, and what he had fought for, happened. The *Squalus*, America's newest submarine, went down with 33 men still alive, though he didn't know how many at first. They had to call on him. For most of us, our lives are going to be measured in grays, some good and some bad. For Swede Momsen, the judgment of everything he worked for was going to be instant and in black and white. He was either going to save these men or he wasn't. Well, he arrived, and we know the story, but there are little insights that I discovered. He arrived on a stormy night. The plane barely landed. He went out at sea and boarded the submarine that found the *Squalus*, the USS *Scalpin*, the sister sub, and the rescue chamber was coming from New London aboard the USS *Falcon*. The fog was delaying it. He arrived in the middle of the night and the *Falcon* was not going to arrive for another six or seven hours. Do you know what he did? He told the Portsmouth Commander, Admiral Cole, that Cole had better get some shut-eye because the admiral was

going to be up for a long time. The man was able to sleep for three hours, waiting for the *Falcon* to come. Everybody was amazed and stunned by this.

Anyway, the great rescue took place. For those of you who haven't read the book, everything was going perfectly. Suddenly, the whole world was listening to it on the radio and reading it in the newspapers. The rescue chamber, the diving bell, was now being called the 'Life Bell' by the press. There were three trips and the men came out. Then, there was a fourth trip and by then, everybody was claiming that it was all over. It was just a piece of cake, now. On the fourth trip, for those of you who are unfamiliar with the details, the diving bell wound itself up and down on a cable that a diver, Momsen's diver, attached to the escape hatch of the submarine. Incidentally, everything, including the escape hatch and the Barker Buoys, was developed because there was finally a way to rescue a submarine. On the way up, it had a tether on the topside that went to the surface and the reel jammed. The cable jammed on the reel and the thing was stuck in the middle of the ocean. Those men, including Carl Bryson, who is here tonight, were on that fourth trip. They had just been rescued from that submarine and were stuck all over again. Momsen sent divers down to try to lower the bell back to the bottom. They were then back where they had started. Really, they were even lower because the bell was down there, practically on the floor. They finally cut the cable. They tried to send divers down to reattach it, but they couldn't do anything. What were they going to do? Momsen figured out that they were going to have to use the tether and bring it up by hand because the sea was getting stormy and the cable, the tether cable, was hooked onto a wench. With a wave, it was "Goodbye Charlie," as they said. He figured that he was going to try to bring it up. They started bringing it up with the wench first, I forgot. I tell you, you get so involved with this story. I get so emotionally involved with it. They started bringing it up and to their horror, the tether cable, the only thing connecting

it to the bell, started to unravel. They lowered it back down again. They sent divers down to try to attach a new cable. Those divers were unbelievable. It was freezing cold. The water temperature was 32 degrees and it was black, pitch black. They were working in that environment. It was unbelievable. Everyone with whom I have ever talked worship Momsen because again, he never asked anyone to do anything that he didn't do first. They couldn't attach a new cable and one of the divers reported that one strand of wire from that cable was still hooked up. It was about the thickness of ordinary string. Momsen had to figure out a way to bring it up. Well, for those who haven't read the book, I won't tell you how he did it. Swede Momsen went on and salvaged the divers. His divers worked for the salvage and finally brought the *Squalus* back to shore. Now, I found out about this while I was in the Navy. I was working in the Pentagon during the last two or three months of my service. I was assigned to Public Affairs. My boss, who is here tonight, Captain Slade Cutter, is one of the great submariners in our Navy, a five-time Navy Cross winner during World War II. I think the reason he left the Navy was because he didn't want another guy like me under him. In any event, he was the one who told me about Swede Momsen and the *Squalus*.

He also told me about the USS *Albacore* and the new submarine design, to which he assigned me the write-ups. It was secret then but was going to become public, eventually. But Swede Momsen changed everything about submarine rescue. He did do many other things during the war. As was mentioned earlier, he conceived the wolfpack technique and took out the first American wolfpack team during World War II. During the first part of the war, the torpedoes wouldn't work. I think that they were Mark VIs. The first magnetic part of them didn't work. They were new, secret torpedoes. Even after the sub commanders came back with direct hits, ninety degrees, nothing happened. The Bureau of Ordnance said, "These guys don't know how

to shoot them.” Well, Momsen had the experience with the bureaucracy. Guess what he believed? He was a squadron commander. He believed in his skippers. What did he do? Again, it was so simple. The complicated problems that he faced were so simple. He took a torpedo that had been brought back and fired it off a cliff near Pearl Harbor. Guess what? It didn’t explode. He was a captain at that point. I’ve written about the Mafia. There are captains in the Mafia. They’re called ‘capos.’ When they want somebody shot, they tell one of the soldiers to do it. They don’t do it themselves. I believe, in the Navy, given a situation like that, the captain told somebody else to dive down to take a look at the torpedo, right? Momsen went down himself, with an enlisted man, and they brought it up. He took it apart on the ship, making the skipper of the USS *Pigeon*, I think, pretty unhappy. It was 685 pounds of TNT. He found out what was wrong and fixed it. The Bureau of Ordnance said, “Oh, well. We’ll fix it.” They knew it was going to take months. Admiral Lockwood, who was in charge of the submarines in the Pacific, gave the problem to Swede and said, “Well, I like your idea.” He fixed it. The firing pin was too heavy, so when it hit the cap, the counterforce in the direct hit kept it from exploding. Swede Momsen’s solution was simply to lighten the pin, which they did. Afterward, the torpedoes all worked. His lasting legacy, which was why I found out about him, was the *Albacore*. We had nuclear power and it was being tried out. The USS *Nautilus* was the first nuclear powered submarine but was essentially an old fashioned submarine in design, with twin screws and everything. He suddenly realized that we could have a submarine that was a true submersible and could spend 95 percent of its time under water instead of vice-versa. Why not design it like that? He was so wise at that point. He knew that he would now have to fight carrier admirals, as opposed to the battleship admirals that he had to fight with before. He was getting no money for submarine development. What he did was propose what became the *Albacore*, as a target for

hunter-killer groups to practice on because they were worried about submarines. He got \$30 million right off the bat. Out of it came the *Albacore*, the submarine that I was on. It was battery-powered and nothing could catch it. It turned on a dime. The crew had to hang on subway straps in the thing. Instead of a helm, it had a joystick, like a pursuit plane. I mean, it was unbelievable. It was the shape of all our modern submarines. That's his lasting legacy. Now, I was a little harsh in *The Terrible Hours* about how I thought he was thwarted and then ignored. The *Squalus* rescue was big news throughout the summer of 1939 but it disappeared. It vanished the minute World War II started. It was gone. It was lost. It was like it never happened. When Slade Cutter told me about it, I had never heard of it. I went to the New York Public Library and was stunned by the coverage. Suddenly, it disappeared like magic. I thought, "My God, this is a great unknown American hero." I first wrote about him in 1968. Nobody cared. It was in the middle of the Vietnam War. Everything was going crazy in the United States and the country was being torn apart by the war. Nobody wanted to read about a hero, much less a military hero. I hung onto all this stuff and all the interviews I had. Then, two or three years ago, I sensed a sea change in America about the materialism around us and so on and so forth. What were we really all about? I thought there was a hunger for heroes, for people who could tell us what we were all about. I had a great unsung hero, I thought. That was how the book was born. I was encouraged because I heard about Tom Brokaw writing *The Greatest Generation* and thought, "You know, people want to know. These are real people. America has real heroes." I had a great, unsung one. Now, I'll tell you a little bit about him. I'd like to read something to you. I asked him how he felt. He was hurt, constantly rebuffed, and the rescue chambers weren't even named after him. I asked him directly, "How did you put up with all this?" He said, "Well, I don't know. When the S-4 went down, it was a moment of truth for me. But I'll tell you, it was all worthwhile to see

that first man come out of the diving bell in the rescue chamber.” That told you everything about him. He never complained. After my book came out and became a best seller, I got from his granddaughter, who is here, a letter that Swede Momsen had written to his uncle, who had asked him, “How come the chamber wasn’t named after you?” Let me read a little bit. This is what Momsen wrote to his uncle, and this is private. This is nothing public. It reads, “the inside story of the naming of the rescue chamber after Lieutenant Commander Allan McCann, and giving him a Navy Cross, was some of the Navy construction’s stiletto stuff. It was my original idea and I ran all the early tests and I wrote up the specifications for the final chamber. Then, I took it and tested it and trained every operator that was trained, including McCann. I fought and bled for it until I had Navy construction, all of them, furious at me. And I had a devil of a time to retain what we had. When McCann was decorated upon recommendation of the Bureau of Construction and Repair, I was not even mentioned, nor have I had a single word of thanks, other than remarks in my fitness report.” That was what he wrote his uncle. Secretary Dansig said, “You know, I thought about it. Then, I remembered that Swede Momsen had commanded surface ships, too, including the mighty USS *South Dakota*. I thought it would be entirely appropriate to name a surface ship after Swede Momsen because it would serve to remind the Navy that we are one community, not a ‘surface Navy’ and an ‘undersea Navy.’” I couldn’t argue with that. I think naming that ship after him made up for a lot. Thank you very much. I’ll take a couple of questions, if anybody has anything.

THE SPEAKER: When are they going to make a movie?

MR. MAAS: It’s going to be on NBC on May 20th. I don’t know if it’s going to be as good as the book. Sam O’Neal plays Swede Momsen. You might remember him. He was the executive officer in *the Hunt for Red October* under Sean Connery.

THE SPEAKER: I just wanted to comment that I have never heard my husband refer to the bell as anything but the 'Momsen Bell.'

MR. MAAS: Well, I don't know. I guess I'm giving up that fight. I see he's out there, outside the alumni hall. They even say he designed it. Yes?

THE SPEAKER: How did you know of ---- Momsen?

MR. MAAS: Well, I working, as I said, in public affairs under Captain Slade Cutter, and he was the one who told me about Swede Momsen and the *Squalus*. After I got out of the Navy and started reading a little about the *Squalus*, I called Captain Cutter and asked him if he could arrange an interview. I asked, "Could I meet him?" I wanted to meet this man. I just sensed there was something special about him. I'm telling you, I fell in love with him. I've covered a lot of people in my lifetime, big people and celebrities, in every area that you can think of. Without question, he was the greatest man I ever met.

THE SPEAKER: Here's one submarine sailor that has Mr. Momsen in his spirits.

MR. MAAS: Well, thank you.

THE SPEAKER: ---- (unclear) ----?

MR. MAAS: Well, if it is the guided missile destroyer, it's okay. I don't know. That's pretty good. If Swede Momsen is up there, though I would prefer to have him down there, where he would be happier, I think he would be pretty pleased with that. I don't think you can do much more than they've done. It made up for a lot of other things and it took time. He was so wonderful. There are two things that I want to bring to your attention. First, when the *Albacore* was commissioned, he made the address, and the crew was being laughed at by a lot of people who said, "Oh, it's a test ship. You're a guinea pig," and so on. It had no torpedo tubes, for one thing. He told that crew that they were going to change Navy warfare. It was going to be the

biggest breakthrough of the twentieth century. He was right. He had an irony. He could be funny in a kind of a cool, detached way. His last talk was to the commanders of the Pacific. His last active role was commander of the Pacific submarine force. He addressed them and said, “You know, with the *Albacore* and everything happening, submarines are emerging from a fifty-year dive.”

THE SPEAKER: Did you ever meet Oliver Maithland?

MR. MAAS: Yes. I did. I spent time with him. I spent a lot of time with his wife, Frances. Yes?

THE SPEAKER: Mr. Maas, if it is not all water up there, something's gone wrong.

MR. MAAS: Well, you're right. I don't want to get into that. Well, I guess that's it. Well, thank you very much for coming.

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UNDERSEA & HYPERBARIC MEDICAL SOCIETY

THE RAISING OF THE SUBMARINE *SQUALUS*

(Narration from the movie by the same name)

Kensington, Maryland

April 2003

PROCEEDINGS

Even today, when veteran submariners and men of the salvage force begin swapping yarns about the old days, their talk invariably turns to the story of the submarine *Squalus*. It is the story of incredible heroism. It is a story that makes fiction pale in comparison. But it is also a story of undersea engineering. It is a story of men who, in their work-a-day world of mud and darkness, enlarged the Navy's knowledge of submarine salvage. This is the last official photograph to be taken of *Squalus* before the ocean claimed her. She still bears her original designator, S-11.

In a few days, it was repainted '192.' On the 23rd of May, 1939, *Squalus* nosed out to her designated operating area off Portsmouth, New Hampshire. Her sister ship, the USS *Sculpin*, can best show what happened to *Squalus*. She was the 191 and virtually identical in every detail. Rehearsing for her upcoming acceptance trials, she flooded her main ballast tanks while cruising at 16 knots. To submariners, this was called a 'quick dive,' designed to completely submerge the ship within sixty seconds. To any submariner, it was an evolution that became instinctual. There were main vents that had to be opened. There were hull openings that had to be closed. No verbal orders were given. Each man knew what was expected of him. For some unaccountable reason, one hull opening did not get closed. The main engine air induction valve remained open to the sea.

Thus, the largest piping system in the ship allowed water to enter in a tremendous volume, rapidly filling all spaces aft of the control room. A desperate attempt was made to blow all ballasts, but the point of no return had already been reached. The ship assumed an angle of forty degrees and quickly slipped backward into the darkness of the depths, coming gently to rest in the mud, 240 feet beneath the surface.

Twenty-six men, killed within seconds by the crushing onslaught of water at several atmospheres pressure, lay entombed in the spaces aft of the control room. A marker buoy, carrying a telephone, was released and rose upward, mute evidence that there was still life aboard. That watertight safety, however temporary, had been secured in the spaces forward. The *Sculpin* was dispatched to the scene to investigate.

Within an hour after she started to search, she saw a red flare released by the *Squalus* and then found the marker buoy. It was nearly twenty hours before the USS *Falcon*, the closest ship that specially fitted for submarine rescue and salvage, could close the distance and start doing the job for which she was designed. News of the disaster spread rapidly around the world. The plight of the *Squalus* crew instantly became one of the classic news stories of the century. The focal point of the operation was the McCann Rescue Chamber, an ingenious device never before used outside of training exercises. It would be its first employment in an actual emergency.

If the operation were successful, it would be the first time in history, in any navy, that trapped submariners were brought out from a submerged submarine alive. This phase of the story was told and retold until it became one of the great sagas of salvage and rescue. The gallantry displayed by the men waiting anxiously on the bottom and the raw courage of those who reached down to assist them is now legend. Four Congressional Medals of Honor were earned that day, but even more importantly, 33 men lived to tell the tale.

As soon as the last survivor stepped aboard the *Falcon*, a new chapter in the story of the *Squalus* began. It was the battle to recover the submarine itself. The first item of business was to come up with a salvage plan. Because of the pressure at 240 feet, a diver's time on bottom was not to exceed twenty minutes, and physical exertion was to be held to a minimum. That ruled out any plan that called for the closing of the air induction valve.

After considering various approaches, the salvors agreed upon an overall plan that would bring the *Squalus* up in a series of three lifts. On the initial lift, the stern was raised first, using pontoons in combination with blowing the ballasts and fuel tanks. When the bow came up, the submarine was towed to a more shallow grounding point. There, the pontoons were repositioned and the entire process repeated.

At the final grounding point, the water was shallow enough to permit the divers to work for longer periods of time and perform more difficult tasks. The main air induction was closed and the hull pumped dry. Fully surfaced, the *Squalus* was then brought into dry dock. It looked simple on paper, but the salvors were professionals. They knew that even the simplest task could prove almost insurmountable at 240 feet. One factor worked in their favor from the very start. During the initial dives, the newly developed oxy-helium system proved itself. The familiar air system was seldom used again until the salvage team reached more shallow water.

The first job was rigging lifting slings under the *Squalus*. The bow proved no problem, as it lay slightly above the bottom. But the stern, buried in mud, was a different story. It was too dangerous for a diver to wash out a trench twelve feet deep. Some salvage pioneering was needed. To make the job even more difficult, the lifting slings had to be passed between the hull and the propeller shafts. We'll examine a cross-section of the *Squalus* to see how the problem was solved.

The plan was to force a lance, made of curved pipe sections, around the hull. A small, flexible rod, similar to a plumber's snake, was slipped through. That, in turn, led progressively larger wires around the hull, until the lifting sling was in place. This is how the lance operation was carried out. The first section of the lance, with its special excavating nozzle, was prepared on the *Falcon*, lowered into place and attached to a standard two-and-a-half inch fire hose. A

diver stationed on the *Squalus* ensured the alignment of the lance by keeping it in contact with the edges of both edges and against the after, port and starboard stanchions.

As water pressure was applied, the nozzles scoured out a path for the lance. When the diver had advanced the assembly as far as was possible, he disconnected the hose and sent it topside. A new pipe section was connected and lowered to the diver. He joined it to the lance and continued the work. To help pull the lance around, a line was secured to the last pipe section. It led through a block and tackle and up to the *Falcon*. With the *Falcon*'s crew heaving in, hand-over-hand, the lance section advanced more easily. After days of effort, the salvors found themselves at an impasse. No amount of air or water pressure, or heaving in, could force the lance further.

Threaded pipe unions caused the difficulty. The sections were inclined to twist. The lance had to be pulled out and the process started again. A new lance was designed, one with a special toggle joint designed to prevent misalignment. Even with the new lance, work did not proceed rapidly. They needed a full week to advance the pipe around the hull. One diver, however, pushed through the flexible rod on his first attempt, in a matter of minutes. To get ready for the next step, the excavating nozzle was removed. A line was secured to the rod and the men on the *Falcon* hauled it in. This line, in turn, hauled progressively larger wires through the lance until a wire too large to pass through forced the lance around the hull and brought it to the surface. Two reaving wires were shackled to the last wire and drawn underneath the hull.

Nearly a month had passed since the operation began and the salvors had finally reached their first main objective: getting the two wires under the stern. It was an important achievement, for salvage with pontoons was then possible. They used a barge to lay out the pontoon slings. Each sling consisted of two lengths of two-and-a-half inch wire rope, shackled into one ninety

foot shot of battleship anchor chain. The first sling was bent onto a reaving wire and drawn under the *Squalus*. The first sling drawn under the hull led around an extra reaving wire, as well, which they used to draw the next sling into place. With the first sling ready for pontooning, the first of these ungainly crafts was brought alongside the *Falcon* for rigging. The pontoon was a steel cylinder, 32 feet long, and sheathed in wood to protect it from rough handling. One end was painted red, the other, white. It made it easier to identify valves and rigging underwater.

Inside, the pontoon was divided into three chambers, each served by its own air supply. This compartmentalization served to control the buoyancy, distribute the water ballast, and reduce the free surface effect. The center compartment was not flooded. It had been built to withstand pressures from either side, up to 75 pounds per square inch. For the first lift, by placing it under 15 pounds per square inch air pressure above the atmospheric pressure, the center compartment was reinforced. That permitted the pontoon to be lowered to 200 feet without further pressurization. They put in place two steel hawse pipes, symmetrically, one through each end compartment. Then, they passed lifting slings through the pipes while the pontoon was still on the surface. The slings were then reaved through the cable clamps. These giant castings, called 'flowerpots' for obvious reasons, weighed 800 pounds. To station a pontoon at its designated depth, the crew opened the flood and vent valves. As water flooded the end chambers, the air was forced out of the vent valves on either end. To speed up the sinking, they also vented air back through the blow hoses and manifold on the salvage ship.

Once the end chambers were flooded, the pontoon crews closed the vent valves. As a result, the pontoon had a negative buoyancy of about four tons. Its rate of descent, as well as the depth to which it descended, was controlled by two accurately marked lowering lines tended from the surface. When the pontoon reached the desired depth, the flowerpots, or cable clamps,

were set. The clamping part consisted of three steel wedges. They held the wedges off on slings until clamping was desired. That permitted them to adjust the pontoon depth as needed, without setting the flowerpot prematurely. In setting the clamps, the crew slacked off and removed the wedge slings and hammered the wedges down evenly. When the pontoon became buoyant, its lifting force was transferred to the sling through the vice-like grip.

After the pontoon was positioned at the desired depth and the clamps set, it was placed on a positive buoyancy. It was not the final lifting buoyancy. It was just enough buoyancy to keep the pontoon from pushing up against the flowerpot. The amount of that buoyancy was controlled by means of an adjustable drop pipe, pre-set on the surface. Assume the drop pipe was pre-set at that position. The chamber was ultimately blown and vented back. When the water level was lower than the pipe, air was vented back. Venting continued until the water level rose to the end of the drop pipe and cut off the escaping air. The flooding stopped. The pontoon was then on the positive buoyancy determined by the salvors. When all water was blown from a pontoon, it exerted its maximum lifting force. On the *Squalus*, some pontoons exerted an eighty-ton lift. Pontooning had begun on July 4th. By the following day, they had positioned two pontoons on the first sling. One was set at 200 feet and the other just 20 feet above it. They set the second sling and rigged it to one of the reaving wires. However, in hauling it under the *Squalus*, it became fouled. After several attempts, it became obvious that the strain of pontoon buoyancy on the first sling had somehow caused the second sling to jam, preventing it from being hauled into place. There was no alternative. The pontoons would have to be surfaced. Two heartbreaking days were spent in unrigging and hauling the gear back up.

When it was all over, the *Falcon* crew still had the first sling under the *Squalus*, plus the two reaving wires. With the screens of the pontoon released from sling number one, sling

number two went into place without a hitch. The third sling also presented no problems. By July 8th, the first two pontoons were again positioned at their original stations. But in so doing, the pontoons kept fouling on the other slings that had been buoyed off only a few yards away.

To avoid this problem, the remaining cables were stopped off and held in a cluster until needed. The crew brought the middle sling into play. A pontoon was spotted at the 180-foot depth, directly opposite its mate. Another was set at eighty feet. Again, problems beset the crew. Before the last pontoon could be placed on positive buoyancy, a lowering line gave way. The four-ton dead weight slipped down the sling and came to rest on a neighbor below. Fortunately, there was no damage except to the timetable. When the pontoon was hauled up to its assigned station at eighty feet, the two-and-a-half inch wire was below the hawse pipe on one end.

At that stage, since it was nearly impossible to readjust the entire sling, the pontoon was lowered until the two-and-a-half inch wire extended through the flowerpot. The last pontoon on the stern was rigged parallel with its mate at what was then the ninety foot depth. The salvors found that they had to deal with yet another pontoon problem. The weight of the sling often caused the chain to settle in the mud underneath the hull. When they placed the first pontoon on a sling on a positive buoyancy, the first end to become buoyant pulled out the slack. That caused the pontoon to become tilted. The crew had to vent back the chamber on the high end until it lost its positive buoyancy, permitting it to be lowered to the horizontal. After the flowerpot wedges were reset, the pontoon was placed again on positive buoyancy.

By July 10th, all pontoon work was completed on the stern. The *Falcon* shifted in her moorings and started to rig the bowel pontoons. That was considerably easier. A reaving wire was swept under the bow. The chain sling was hauled around with no difficulty. One pontoon was set at 140 feet, the second at 90 feet. Let's remove the pontoons and examine some other

preparations for the first lift. All main ballast tanks and all fuel tanks had to be blown to lighten the *Squalus* to the point at which the pontoons could lift her. Each tank was rigged with its own salvage air hose so that it could be blown dry. For simplicity, we show only a few of these hoses. Two tanks that were nearly full of diesel oil complicated the problem. If those tanks were blown, over 24,000 gallons of oil would hit the New Hampshire beaches only six miles away, not to mention the diving and fire hazards that would be created.

Disposing proved the easiest task of the entire operation. This simplified cross-section of the *Falcon* and the *Squalus* shows how one salvage air hose was connected to the fuel tank to remove the oil. This hose was disconnected from the air manifold and passed into one of the *Falcon*'s empty fuel tanks.

The *Squalus*' fuel oil compensating system, open to the sea, admitted salt water at the pressure of 240 feet, easily displacing the fuel oil and forcing it up the air hose and into the *Falcon*. The flow rate varied between 700 and 1000 gallons per hour. Later, the same air hose would be rigged once again to the air manifold. At the scheduled time, it blew the salt water out of the *Squalus* fuel tanks to help lighten the ship. Since the beginning of the operation, an air pressure of almost a hundred pounds had been maintained inside the compartments that had not been flooded. That prevented slow flooding through small leaks.

However, the pressure, if maintained at shallower than the first grounding, would blow closure fittings. Consequently, it was vented back to 48 pounds. Outside the pressure hull, the seawater and the various ballasts and fuel tanks were blown as needed during the lift. Before showing the results of the first lift, let's use this simplified pontoon arrangement to examine the control problems the salvors faced. In raising any vessel in stages, the critical job was to bring

her up to the depth desired and no farther. The key to it was in the use of the upper, or control, pontoons.

This is how it was done. The weight moments were determined for the end of the submarine to be lifted first. It included bottom suction moments, as well. The lifting moments, needed to overcome the weight moments, were then carefully determined. The control pontoon was always blown first. Thus, the first lifting moments were applied against the weight moments. Lower pontoons in submarine tanks were then blown on a careful schedule, until the totals of all lifting moments exceeded the total of all weight moments. The stern moved upward until the control pontoon reached the surface. Because the control pontoon can lift no further, the total lifting moment was reduced by the amount contributed by the control pontoon. The stern remained suspended at the depth determined by the planners.

However, when the control pontoon reached the surface, if total lifting moments still exceeded total weight moments, the stern would continue to rise out of control. On July 13th, everything was in readiness for the first lift. Only 68 diver man-hours on the bottom had been expended since the salvage work started. Nearly fourteen thousand feet of air hose linked the *Falcon* with specific pontoon chambers, ballast tanks, fuel tanks, and compartments of the submarine, forty fathoms beneath the surface. The *Sculpin*, retained at the scene for the rehearsal of divers, supplemented the air supply. Air under pressure was furnished to *Falcon*'s salvage air manifold through an ordinary two-and-a-half inch fire hose. Through on-the-scene representatives of the major news media, the whole world watched as air was cut in. It was the beginning of the first lift and the initial bit of the *Squalus* sought sunlight after 49 days on the bottom. For the entire morning and part of the afternoon, air was pumped down to the steering tanks in pontoons.

Finally, at 1415, the two upper pontoons surfaced. The stern of the *Squalus* was now ninety feet off the bottom, and holding. The crew secured the steering pontoons while the *Falcon* stood by to blow the bow. Spirits were running high. The hardest part of the lift was over. The stern, long buried in the mud, had behaved exactly as the salvors had planned. The bow, which had never presented a problem, was to lift easily. The control pontoon had already been blown. It was a question of increasing the lifting moments in the forward sections just enough to permit the control pontoon to surface. Main ballast tank number one was blown. The *Squalus* did not move. The strength of the forward sling, the only one available at the time, was marginal if loaded with the lift of two pontoons. Therefore, they made the decision to not blow the lower pontoon. Instead, main ballast tank number two was blown. Within 24 minutes, the blow took effect. The bow was moving. The surfacing of the control pontoon signaled victory. The bow should have been holding at ninety feet off the bottom. But the heavy commotion in the water continued. It was clear something was wrong.

Suddenly, the second pontoon surfaced. It could mean only one thing: control had been lost. Here is one of the major contributing factors to the failure of July 13th. With the *Squalus* resting on her bow prior to the lift, considerable water still remained in the forward ballast tanks. When the tanks were blown, water was forced through the flooding ports, located in the bottom of the tanks. When the ballast water level reached the ports, the air escaped into the sea. No more ballast water could be expelled. As the submarine lifted, the water ran aft and covered the flooding ports. Again, the expanding air forced the water out.

As the submarine passed horizontal, all water was forced out of the tanks. That sharply increased the lifting moments more than was desired. At some point, the terrific strain exerted on the steering slings parted one of them. Without all the steering pontoons to hold her up, the

Squalus sank backward once again into the depths. In spite of this initial failure, the events of July 13th proved that the salvage plan was at least feasible. Before operations could start again, however, the wreckage had to be cleared. Some pontoons had flooded and were enmeshed in cable on the ocean floor. Bringing them to the surface was a major engineering task in itself. Three full weeks was spent on the cleanup effort. A new inventory of hose, chain, and cable was brought to the salvage scene. By August 6th, everything was ready to prepare for another attempt. A newly designed plate led three slings at a time under the stern. Special precautions were taken to keep them well separated as they were payed out by the *Falcon*, thus making sure the slings did not twist or lay on top of each other. The reaving plate also passed under the bow because this time, three slings would be used for the bow as well as the stern. The crew achieved greater control by positioning more pontoons at the upper level at both the bow and stern.

The lifting plan called for the stern control pontoons to be blown first. Then, they implemented progressive blowing of lower pontoons and tanks until the lifting moments were increased to the point at which the control pontoons at the stern could surface. The same general plan was to be repeated for the bow. On August 12th, a full month since the last attempt, the *Falcon* again started her compressors. Blowing commenced at first light. By 9:45 AM, the stern lifted. The crew worked rapidly to secure the pontoons. Each man knew from bitter experience the importance of the next phase of the lift. Each crewmember did his best to preserve as many daylight hours as possible for the job ahead, the job of lifting the bow. The salvors were dealing with buoyancy forces measured in hundreds of tons. As they had already learned, those forces sometimes turned against those who used them. This time, however, control was maintained. The bow pontoons surfaced as planned. The *Squalus* was suspended eighty feet off the bottom and was ready for towing. They were over the hump and though much work remained, each man

knew for the first time that the *Squalus* was theirs. It was now only a matter of time. Towing hawses had already been rigged while the *Squalus* was still on the bottom. Thus, the tow could get underway immediately. The tug USS *Wandank* took the lead, with the *Falcon* bringing up the rear. It was the *Falcon*'s job to tend the maze of salvage hose and keep air supplied to the many pontoons and tanks. In one hour and thirteen minutes, the *Squalus* grounded, somewhat prematurely. She had completed the first leg of her journey back to dry dock. While it was a journey of only a few miles, success was measured in terms of water depth. Instead of 240 feet, the *Squalus* now rested at 172 feet. There, she waited patiently for another five days while the *Falcon* re-rigged for a second lift.

Compared to the hardships they had suffered during the first lift, the difficulties they experienced afterward were minor. Three pontoons were again used at the upper level at both bow and stern. On August 17th, the pontoons surfaced perfectly and the submarine was suspended ninety feet under the surface. The *Squalus* was ready to continue her undersea voyage to dry dock. Once again, the strange procession headed toward the Portsmouth Navy Yard. The only mishap was the parting of one towing hawse. Another line was quickly run from the tug to the nearest pontoon cluster, riding the surface, and the tow continued. It was late at night when the *Squalus* again came to rest. This time, she was in 92 feet of water, as planned.

That movement completed the second lift. A New England fog became the constant companion of the salvors during the days that followed. Before another lifting attempt, the *Squalus* was re-rigged so that she could be brought to the surface with only a forty-foot draft. That would permit her to be towed through the channel to the Navy Yard.

Until then, only the ballast and fuel tanks were blown during the various lifts. Because of the comparatively shallow depth, divers could perform more difficult tasks. The salvors

could make the after portion of the pressure hull airtight. The *Falcon*'s first job was to close the huge piping system that originally flooded the *Squalus* by closing the main engine air induction. The pressure hull could be pumped out to the level of the lower salvage airline fittings. With that much buoyancy, the salvors calculated that only two pontoons at the stern and none at the bow could lift the ship. Those pontoons were rigged in the conventional fore and aft positions, the only way possible if the *Squalus* was to be finally surfaced. In rigging a pontoon close to the hull, the chain cling passed through the hawse pipe as the pontoon was lowered to the desired depth. A toggle bar was then inserted through an open link. When the pontoon was set on positive buoyancy, it exerted its lifting force against the toggle bar.

On August 28th, the final lift was attempted. In a short time, the bow surfaced. But when the salvors saw the extreme list, they immediately realized that the ocean was again intent on thwarting their efforts. As the bow started to rise, the *Squalus* was balanced on the only part of her touching the ocean floor, the stern. That small pivot point afforded no stability and the *Squalus* rolled over. As she healed over, she spilled the air from her tanks, gradually became heavier, and retreated to the bottom.

The Falcon immediately blew the stern. It was bad luck again, for the free water in the after hull compartments ran forward, making the bow too heavy to lift without pontoons. The *Falcon*'s crew vented the stern air back, allowing the submarine to return again to the ocean floor. For the next two weeks, their efforts were hampered by the nor'easters roaring down from the Gulf of Maine. When the weather finally cleared, two additional pontoons were placed forward, to help lift the bow with greater stability. The stern pontoons from the last attempt were still in place.

On the September 13th attempt, the stern, as usual, behaved handsomely and surfaced without incident. But the bow, the consistent troublemaker of the entire operation, was again defiant. In spite of all attempts to control transverse stability, the submarine took a 45-degree list, again dumping air from a blown ballast tank until the stern sank. After the bow was lowered, an exasperated crew tried once again, de-watering all tanks and compartments from the stern forward. Shortly after 1500 on the 13th of September, the sea relinquished her hold. The ship came to the surface with a 15-degree list, but she was stable. To maintain stability during the tow, the submarine's ballast tanks were partially flooded to load the pontoons to about one-half their full lifting capacity.

By 1900, the *Squalus* was on her way home, with the tug *Wandank* leading the procession into the Portsmouth Navy Yard. One of the Navy's toughest salvage jobs of all time was over. But the last lift to the Portsmouth dry dock didn't end the story of the *Squalus*. Refitted, she was commissioned as the USS *Sailfish* and would again take to the sea. Throughout World War II, she fought valiantly in the battle of the Pacific, responsible for sinking many thousands of tons of enemy shipping, shaking off forever the notion that she was a bad luck ship.

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UNDERSEA & HYPERBARIC MEDICAL SOCIETY

INTERVIEW OF COMMANDER DEWITT "RED" MOODY

Kensington, Maryland
July 27, 2003

P R O C E E D I N G S

INTERVIEWER: Good morning, sir. Thanks for coming in.

COMMANDER MOODY: Thank you.

INTERVIEWER: Can you start off by giving me a brief overview of your career, when you came into the Navy and what the major events in your career were?

COMMANDER MOODY: I enlisted in the Navy when I was 17 years old, in March of 1944. I went to boot camp in San Diego, California, and from there, was assigned to the Fleet Sonar School for training. Upon graduation from Fleet Sonar School, I was assigned to a pre-commissioning detail of the USS *Strong* in San Francisco, California.

After the *Strong* was commissioned, we went through our normal training exercises and eventually deployed to the Pacific en route to Pearl Harbor. We came to Pearl Harbor to save a merchant ship that had suffered a collision that had caused a gash in the forward bow. We furnished assistance. Our damage control people got the ship stabilized so that she could go ahead and continue her voyage to San Francisco, and we continued our voyage to Pearl Harbor.

After leaving Pearl Harbor, we escorted several convoys between the islands as we worked our way out to the west, eventually arriving at Okinawa at the height of the suicide attacks. One ship that relieved us from plane guard duty was struck by five suicide planes about thirty minutes after we were relieved. At the war's end, we were off the island of Ie Shima, where Ernie Pyle was killed, and of course, when the Armistice was signed, the sky just erupted with anti-aircraft fire and the people were really celebrating.

INTERVIEWER: It was celebratory fire?

COMMANDER MOODY: Yes. As a matter of fact, there were a number who were killed by the projectiles as they descended back to earth. Just after that, we did utility work, patrols and so forth, and mail runs to and from the front. Eventually, we escorted the Army troops and the Marines into Japan. It was quite interesting going up the Inland Sea. We had all the guns looking for floating mines. As the sweepers went ahead of us, they cut some of the moors and we attacked anything from a five-inch .38 down to a .30 caliber. Most of them, rather than

exploding, sank. Their cases had to be penetrated. From that point, once again, we did a lot of auxiliary work and patrolling, and we also carried a lot of fails from point A to point B.

At some point during that time frame, we were caught in the typhoon that sank the three destroyers. We ended up being one of the first ships back to Okinawa, where I discovered that my brother had been there on a small landing craft. His landing craft went so far up the beach that you could walk around it at high tide without getting your feet wet. Shortly after that, I was detached from the ship.

INTERVIEWER: You brother set out to war, also?

COMMANDER MOODY: Yes, he did. Shortly after that, I was detached and returned to the States, took leave, and was then assigned to a draft going to the Aleutian Islands. Once in the Aleutian Islands, I was assigned to a small craft called the 'yard patrol craft,' which was a converted fishing boat that the Navy had taken over during the war for patrol services. We really didn't do much and, eventually, they sent us back to Seattle to be commissioned to ships.

On the tow back, we had a fire in the engine room. I was asked to put on an OBA and assist in the fire fighting. It was an electrical fire. There was not much flame. There was just a lot of charring and embers burning, and it was put out, and we continued our tow back to the States.

After decommissioning the ship, I was assigned with PT 880, which was a ship about 220 feet long that the Navy was using for weather patrols. We returned to the Aleutian Islands. From the Aleutian Islands, we went 800 miles directly east of Pimashiro, Japan. It seemed like all the weather systems in the northern Pacific passed through that area, so they thought it was an ideal place to station us. It was extremely rough weather. It was interesting, also, because we used to see a lot of whales. As a young man from Texas, that was quite an experience for me. We continued that routine for a while and eventually, they transferred the weather ships to Pearl Harbor from the Aleutian Islands in ADAK. They transferred us to Pearl Harbor, our home port. I did about two patrols out of Pearl Harbor before the ship was then ordered through the Panama Canal to the east coast and was decommissioned.

At that time, I finished, as we called it, my 'kiddie cruise,' and it was just before I

reached 21 years of age. I was discharged and shipped over for another two years. I married my wife Then too, Margaret Burns, to whom I'm still married.

After shipping over, I made my preference known that I wanted to go back to the Pacific, so they transferred me back to San Diego, California, where I was assigned to the USS *Higby*. The *Higby* was in the yard in San Francisco. After leaving the yard and undergoing some underway training and association with the fleet training group, we deployed to the western Pacific and were assigned to the ships working around China and Japan.

At about that time, I was offered an opportunity to return to the United States to play football for Destroyer Pacific (DESPAC) and I accepted. I returned and played two years with the Destroyer Pacific. We won fleet championships both years. We just couldn't win the west coast championship. It always put us against some Marine team that was well trained and usually whipped us.

INTERVIEWER: What position did you play?

COMMANDER MOODY: I played center and linebacker.

INTERVIEWER: You met Bob Sheets, right?

COMMANDER MOODY: Yes, I did. Bob was playing football for the Submarine Force Pacific, and Bob was a very, very interesting man. He was very trim, very lean, and pound for pound, I think he was probably the strongest man that I've ever seen in my life. He was just an all-around nice guy. As long as you did your job well, you were a friend of Bob Sheets. If you didn't do your job well, Bob Sheets would let you know about it.

INTERVIEWER: This was after World War II, after he'd spent a good part of the war in Japanese camps?

COMMANDER MOODY: Yes, it was.

INTERVIEWER: He vaulted back and played football again, huh?

COMMANDER MOODY: Yes. I would say he weighed about 195 pounds at the time, and it was all lean muscle. I think he probably put on a few more pounds a little bit later on.

INTERVIEWER: He just lost some steel at some point.

COMMANDER MOODY: Yes, but I followed Bob's career from a distance and greatly admired him. I also had some other friends in the diving community who were very close to Bob and used to keep me informed and tell me a few sea stories from time to time, and those were quite entertaining.

INTERVIEWER: You were in San Diego. You got into sport diving, right?

COMMANDER MOODY: Yes. At about that time, the aqualung, as it was called, came into vogue. A company, U.S. Divers, started marketing it in the United States. Of course, there had always been a lot of sport diving, or skin diving, as a lot of people refer to it, off California, and the sea life off California was just tremendous in those days. I got acquainted with groups of some young people called 'kelp teams,' and they were primarily young businessmen, anywhere from 19 to 30 years of age. They weren't rich, so they didn't have a diving boat of their own. They accepted me into the club, so I became a part of the kelp teams. I couldn't afford a good professional regulator, and there had been a lot of entrepreneurs in the United States that started selling regulators. The one I bought had been converted from an SCVA. Of course, I was hot to go with it. I found out later that it was a very dangerous regulator. I'm probably lucky that I didn't get hurt. Of course, some of the things that we did were as foolish as could be. On one dive to about 110 feet in the kelp, I ran out of air on the bottom. As untrained as I was, I didn't realize I was out of air until I started sucking and my faceplate started beating me on the nose. I had read enough about it to not panic and just try to get to the surface, but not on your bubbles. That was the criterion we used back in those days, lacking any other scientific information. I started up, and as I started up, I was very happy to realize that my lung capacity increased on rising. Then of course, I felt more comfortable. I didn't feel the need to suck in some air that I didn't have.

I also realized that in working your way up through the kelp, if you didn't panic, the kelp usually slipped off of you, and that was exactly what happened. I got to the surface, and after a few gulps of air, I was feeling much better. But I like to think that I was a little bit smarter, and of course, when I finally went through swim school, I realized how foolish I probably had been

as a younger person and appreciated the training that I got from the Navy

INTERVIEWER: You were a seaman while you were playing football for DESPAC, right?

COMMANDER MOODY: No. I was a first class sonarman at the time. After that, I was up for shore duty and was assigned as an instructor at the Fleet Sonar School of San Diego. At the Fleet Sonar School of San Diego, I had an opportunity to go through instructor training school, which I found to be an extremely good school. I learned a great deal by going to that particular school and by rubbing shoulders with some of the other skills in the United States Navy. I returned to the school and was the section leader for the conventional sonar. By 'conventional sonar,' I mean the search light sonar, because the scanning sonar was just coming into vogue in those days. They had one section for the search light sonar and another section for the new sonar that was coming online. I did two years there and had the opportunity to act as a football coach, but we weren't very good. We didn't have very good talent and thought we were mean, so we played a lot of junior college teams and bruised them up. They bruised us up, too, but our win-loss record wasn't exactly something I should brag about. I decided that I really should not look forward to being a professional coach at that time.

After finishing a tour at sonar school, just at the close of my career there, I made chief petty officer. From there, I was assigned to the USS *O'Bannon*, EDE 450. The *O'Bannon* had been converted to a destroyer escort. By that I mean that they had put on the very latest sonar equipment and the very latest underwater fire control system, and having just come from the school, I was in a good position to get up and running in that particular system.

At the time I reported to the board, we were in the yard in Pearl Harbor. I became very close to some of the civilian technicians who were installing the equipment, so they gave me a lot of good information and wiring diagrams and some schematics that you wouldn't normally get, so I was pretty well prepared to look after it once we left the yard.

On our first deployment to the western Pacific, we were on the first destroyer with the new system on board that completed an eight-month deployment with no major casualties. We did have, on a later cruise, some problems with our depth finding sonar, but it wasn't mechanical

or electronic. Evidently, it was from the fact that we had hit something in the water and it ruptured our transducer. We did something in the water that ruptured the main transducer on our main sonar system, and since the captain knew I had been doing some sport diving, he asked me if I would put on a shallow water rig and check it out, and I did. That was very interesting because I was really eager to get in the water and didn't wait until the ship had completely stopped, so when I jumped in the water I immediately started to troll through the China Sea.

INTERVIEWER: I take it you didn't want to tag out that day?

COMMANDER MOODY: Once again, you know, we were pretty amateurish. None of us were trained divers and, of course, the boatswain mates all got a big kick out of that. They had never towed a chief sonarman at sea before. After the captain gave me a good dressing down while I was still in the water, he finally got the ship stopped and I was able to get down. Sure enough, the transducer furring was damaged and we did have to return to the shipyard, go into drydock and have it replaced. Once again, that was a very, very good learning experience for me and I was one tired puppy when I finally got back on the ship. After that, we eventually returned to Pearl Harbor.

At about that time, I was finishing up my cruise and an officer by the name of Jack Young had made lieutenant commander by then. He was with the Fleet Training Group in Pearl Harbor and asked me if I would come and work for him once again. He had been my officer in charge as an instructor in San Diego. Of course, I loved Pearl Harbor, as did my children and my wife. My wife, incidentally, was raised in Hawaii, the daughter of a sergeant in the Army. I certainly jumped at that opportunity to remain in Pearl Harbor for a tour of duty and was eventually assigned to the Fleet Training Group as the senior sonar instructor.

I did two years there and we trained every ship that came through Pearl Harbor in ASW, including some Canadian and Chinese ships. Once again, it really gave me a broad experience with different ships and the different mannerisms of leadership in the United States Navy. It was somewhat surprising to me the difference that I noted in the way that the crews went about their daily business, and it was my opinion that the happiness and professionalism of the crew

depended very, very strongly upon the officer.

On high-quality ships, the commanding officer (CO) and the executive officer (XO) were interested in the crew's welfare and well being. Ships with senior officers who tended to migrate to their cabin and didn't have anything to do with the rest of the crew showed poor performance in its crew. I tried to pattern my career in the future so that I didn't fall into that same loophole.

After two years at the Fleet Training Group, a very interesting thing happened to me. I had a first class petty officer working for me by the name of George Paul, and George volunteered for, or requested that he be accepted in, the Seaman Admiral Program. I believe they called it the 'Holloway Plan.' Admiral Holloway, the Chief of Naval Operations, had established this program because after the Korean War, the Navy was losing a lot of junior officers, so they established the program to try and solve that problem. George gave me a lot of heat about it. He'd come in the morning, slap me on the back and say, "Good morning, Chief," and give me a little sloop and say, "you're going to work for me someday." One day, he got me when I was out of sorts. He slapped me on the back and said, "Good morning, Chief. You're going to work for me someday." I got a little irate and said, "I'm going to take that test, too." I took the test and passed it, and I guess he took the test and didn't pass it. I never did work for George. But, really, I have to say that I owe George and Lieutenant Commander Young a great deal for whatever happened to me after that, because it was a major turning point. When I look back on it now, it was, I think, one of the best decisions I could have made.

INTERVIEWER: What year was it that you were commissioned?

COMMANDER MOODY: It was in 1955.

INTERVIEWER: You had been in the Navy 11 years?

COMMANDER MOODY: Yes.

INTERVIEWER: You had made chief in seven?

COMMANDER MOODY: It was about seven. I think it was about seven years and three months. At that time, the Navy would train electronics people and then the commercial companies would try to recruit them quite heavily because we were going through somewhat of

an electronics revolution in the United States, which has continued to this day. I assume that the Navy still has the same problem of retention of skilled electronics people.

INTERVIEWER: It still does. You were an ensign when you were commissioned?

COMMANDER MOODY: Yes. We went to Newport, Rhode Island. Of course, one doesn't go to Newport unless it's the wintertime, so one can enjoy the climate. During that particular year, there were a number of chief petty officers and a number of warrant officers who had applied for the program. I ended up in, of all things, Easy Company. The Commander of Easy Company was a warrant officer, as was his second in command. Then of course, some of the other positions trickled down to some of the chief petty officers.

It was interesting in that, since I was a sonarman, I had a modicum of experience in operational tactics, from the standpoint of standing watches in CIC and things like that, whereas other people had skills in gunnery and engineering and so forth. It was a pretty tough school for most of us, so what we would do in the evenings was gang up people from different little groups. I might teach operational aspects. Somebody else would teach me engineering or gunnery. There were a lot of support groups that we developed right within our own organization. They worked quite well. I had to kind of chuckle. We had five enlisted aviation pilots with us.

Back in those days, enlisted people could fly aircraft. They used them for test pilots mostly in the auxiliary aircraft, not the combat aircraft, and the Navy had numerous numbers of those. Those aviation pilots were extremely good pilots, but they really knew nothing about the surface Navy. We had to pamper them a little bit, or maybe I should say that we had to pick on them a little bit to bring them up to speed.

INTERVIEWER: You have to pamper aviators to this day.

COMMANDER MOODY: But they were good people. Even today, I know of one of them who is still living, and we've remained friends over the years. As a matter of fact, when I left officer candidate school, I was assigned to the USS *Hornet*, CVA 12. Jack Taylor was one of the enlisted aviation pilots who made ensign and was assigned to the ship, as well. That worked out well because I had a good friend on board. We could do things together.

Of course, the XO of the ship treated us somewhat differently. Then the run of the bear Marine ensign comes aboard, and he looked at Jack and said, "Well, we're going to give you the Aviation Division Number Three," and that was the plane pushers and things like that. Those were the bad apples in the air group who they wanted to use for good manual labor. It was a tough lot. Jack did a tremendous job. He got guys who he really had to work on. He said, "We're going to give you the First Division of Deck Force." I ended up with the tough guys from the Deck Force and they turned out to be just a tremendous crew.

Initially, I did not have a chief petty officer. I had a first class boatswain's mate by the name of Houston, who was just a big, rough, tough, boatswain's mate. You might say he was the epitome of what you expected a boatswain's mate to look like in those days. I sat down with him and had a long chat about the how I saw our role together. I did have a reputation as a disciplinarian. He used to look at me and say, "Sir, I'm going to enjoy working with you." We really did work well together. We had a tremendous relationship. We kept in touch with each other for a while after that but eventually, we lost contact.

While I was aboard the *Hornet*, I had two occasions on which I got the chance to again strap on some battle gear and do some useful work for the Navy before I had ever been trained by the Navy. We were off of San Diego, conducting flight ops. We were due to be out for two weeks. On about the third day out, some of the auxiliary gang was supposed to be cleaning sea strainers. Well, one of the crews, I guess, got in a hurry, so instead of closing a gate valve before opening up the strainer so that they that could clean it, they started loosening the bolts on the inspection plate. Eventually, the ship surged and the water pressure in there popped it off and of course, the compartment started flooding. They eventually did report it. Of course, by that time, it was coming in pretty good. Then we went to general quarters, and I guess some people probably didn't realize that they hadn't closed some of the things that they needed to close, so we started getting some counter flooding through the ventilation system. We went down about two or three feet by the bow. By the time we got everything under control, I assume what everybody thought was a very simple thing suddenly turned into not so simple a thing. After the damage

control people got everything under control, there was a quick conference on what to do.

We did have one second class gunner's mate EOD-qualified. We had a young ensign who was EOD qualified, but of all things, he confessed to me that he didn't even like to swim. How he worked his way through the system was a mystery to me. But I was still gung ho at the time, so I said, "Well, if you don't want to dive, I'll dive." The gunner's mate and I strapped on our gear and went down and did an inspection dive. Sure enough, we found the exterior grading, where the flooding was taking place. At that point, we came back and somebody suggested taking a four by four piece of plywood, putting a mattress on it, taking it down and plugging it up. I had never heard of a J-bolt before, but I said, "You know, why don't you take a piece of metal and hook it so that we can put it through there, rotate it and bring it up." Some guy said, "Well, that's a J-bolt." I said, "Oh, it is? It sounds like a good plan to me." They made it, and I'll tell you, that was when our nightmare started. We put it over the side and it floated. We couldn't get that thing down, no matter how hard we worked. We said, "Well, maybe we ought to put a little weight on it." We put a little weight on it. Once we got it down, the mattress lost all its buoyancy and the thing wanted to go to the bottom. You might say it was a three-ring circus there.

In the meantime, we were in the water and the gunner's mate developed a serious ear problem. He couldn't dive anymore, so the young ensign who didn't like the water had to dive or go home, and he didn't want to go home because he couldn't, at the time. We got him suited up and in the water. He wasn't very big and didn't have much upper body strength, so most of the heavy lifting fell to me. We decided that our first plan wasn't very good, so we went back down with the tape measure and got some more exact dimensions. He asked, "Why don't you cut the plywood to about this size put something on there that's not quite so buoyant?" We went ahead and got that squared away, and they fixed this slightly better J-bolt on the nut portion of it and welded some handles that we could turn. We were going through a very traumatic period and quite a learning phase at the same time. To make a long story short, I worked underwater, on and off, for probably two or two and a half-hours in about an eight-hour period. I was so tired that I

couldn't see straight. I've never been so exhausted in my life.

Incidentally, after I had been aboard about six months and had seen what the EOD people were doing, I volunteered for EOD. Since I was a regulator Navy officer, though, they said, "You need to do your regulator tour," so I had to do a two-year tour on the ship. There were two other reserve ensigns who had volunteered at the same time. They got their orders. I was a little bit upset about that. Looking back on it though, it was probably better for me because once again, I went through quite a learning phase on the ship. It was also very rewarding because I got quite a bit of ship handling experience as an enlisted sonarman, and I had stood Officer of the Deck (OOD) watches under way while I was aboard the weather ship. It ended up that the captain evidently liked me because he assigned me as the Special Detail OOD and the General Quarters OOD and the Replenishment OOD. You might say that when just about any special event came along, he wanted me on the bridge and just gave me the highest possible fitness report he could for my ship handling, which, you know, if anybody isn't proud of it, I'd be surprised. It was a very rewarding time for me.

Anyway, back to the diving. After we acted like a bunch of stumbling bums for about eight and one half-hours, we finally got the patch on. They were able to dewater it and we were able to maintain our flight schedule for the following week. On another occasion, probably six or seven months later, we had deployed the western Pacific and were conducting flight operations off the Sea of Japan, and just kind of tooling around in general. I had an opportunity to go through a couple of typhoons while we were out there. That's an experience that every young man should go through at least once in his life. We had a runaway shaft and the engineers thought they had lost a screw. Once again, I got to suited up and do my thing. That time, once again, the gunners mate and I made a dive, and sure enough, we had a lot of information to report, such as, "the screw is missing." They said, "Really?" We said yes. It had snapped just forward of the after bearing strut on the ship. Part of the shaft and the screw were gone. Of course, the engineering crew caught it immediately when they started over-revving. They managed to shut it down before there was any serious damage. Once again, we had to return to Japan and go to our

favorite drydock to get a screw replacement.

INTERVIEWER: Where in Japan was that?

COMMANDER MOODY: It was in Yokosuka. Everybody has got to go to Yokosuka once in his life.

INTERVIEWER: I was stationed in Sasebo. They had a big drydock there.

COMMANDER MOODY: Yes, they did. As a matter of fact, while I was on destroyers, we spent quite a bit of time, off and on, down in Sasebo because that was where most of the destroyers were operating out of during the Korean War. Early on, after the war was over, we operated up around Yokosuka, and also in northern China. I can't think of the name of the port right now. It wasn't Sasebo. I'll think of it later on.

Anyway, after we lost our screw, we went ahead and did the replacement job. When we returned to San Diego, I had my tour completed, so I received a set of orders to go to the underwater swim school. Once again, I seem to go to these lovely places in the winter. It was in December of 1957. I reported to the underwater swim school.

INTERVIEWER: Where was that?

COMMANDER MOODY: That was in Key West, Florida. It had the coldest winter in 17 years that year. The class ahead of us was composed of 19 people who finally finished the training. Of those 19, 17 of ended up with serious complications of colds and pneumonia and what have you. It wasn't a fun time and, of course, the underwater swim school didn't have wet suits. They did have some old tattered and torn dry suits in which you would stay dry, at least until you got in the water.

I'm sorry. I'm going to jump back to the *Hornet*. That was when I got involved with the kelp teams. To this day, I think one of the reasons that they accepted me so graciously was because as a deck officer on the *Hornet*, I was able to get a 45-foot utility boat that we could use for diving. We didn't have any trouble getting a volunteer crew. That was kind of a day out on the beach almost for my young boatswain's mates and seamen. They would come aboard and we'd go over to one of the commercial docks and pick up all the civilians and bring them aboard.

Of course, we had a Navy officer who was in charge of safety, who was I, so everything was great. We'd go out and do our thing, and these kids would make contact with some of the civilians and get a chance to go over and maybe have a good home cooked meal or something. Usually, the civilians were used to tipping people when they did certain things and they'd tip the crew. The crew came to me and asked, "Are we going to get in trouble if we accept that money?" I said, "Heck, no. They're not bribing you or anything. They're giving you money for services rendered. After all, you guys are going to be the ones who clean up the boat." They said, "Oh, yeah. We deserve that, don't we?" Of course, we managed to get quite a lot of Lingusta.

INTERVIEWER: I bet there were a lot more back then?

COMMANDER MOODY: Oh, absolutely.

INTERVIEWER: They used to pull out some monsters, huh?

COMMANDER MOODY: You know, that was one of the things that was really tragic to see over my diving career. When I first got into sport diving, there was just a tremendous amount of Abalone. It was nothing at all to get about a seven or eight inch Abalone. The largest Lingusta I ever got was nine pounds and seven ounces.

INTERVIEWER: Oh, my Lord.

COMMANDER MOODY: For a while, there was a question of whether I had gotten him or he had gotten me.

INTERVIEWER: That's right. They've got pretty powerful tails.

COMMANDER MOODY: They do.

INTERVIEWER: They might drag you right off.

COMMANDER MOODY: What happened was that I reached in and managed to grab him and get him out of the hole, and as we were going up, he kicked. Well, as he kicked, I thought I was going to lose my grip on him, so naturally, I went into the fetal position to try and catch him with my leg. Well, I caught him with my leg, but he then caught me by the leg and put those arms of his around and started digging in. It was a very painful experience. I was still screaming by the time that I got to the surface, because I couldn't put him into the bag. He was just too big for me

to put into a gunnysack, so I had to bring him to the surface. Once I got him to the surface and got him under control, somebody helped me put him in the gunnysack. He made a very good salad.

Later in my career, I went back out to those same diving areas and told my crew to come with me. I said, "Come on. Let me show you what this wonderful diving is like off of California." It was so disappointing to see how the entire bottom environment was changed. Where you used to see lush underwater growth, you'd see somewhat of a dead area. You see indications of oil pollution and you see that the marine life that can survive in that environment is entirely different from the life that used to exist there, when it was nice and lush and relatively unpolluted. That has been a disappointment. I've observed the same thing on the east coast. Both coasts are so much sicker now than they were back in the 1940s and the 1950s. It's tragic that this legacy goes to our young people. But that was my experience on the *Hornet*.

Then of course, I went to the underwater swim school. I was the oldest man in the class. I was also the senior man, so I became the class daddy of our class. We had 11 young ensigns, and some of them were a little bit irritating in that they did a lot of bragging about what great swimmers they were. I gritted my teeth and said, "I'm going to have a better time than you." Of course, I was in pretty good shape. I had gotten there about four or five days earlier and continued a running program and calisthenics and everything. I felt like I could give them a go. In our pool trials, I ended up either number three or number two, as far as time was concerned. I was teamed with a first class gunner's mate who had some good time, as well. As a team, we felt that we were going to do well.

On our first open ocean swim, the CO of the school and the staff took a rubber raft out about 500 yards and dropped a small anchor. We were instructed to hit the water, swim around the raft, or inflatable rubber boat, and bring it on back to the beach. We took off kicking and stroking. I was trying to set a pretty good pace because I didn't want to get behind the power cord with these young ensigns who were irritating me. We were doing quite well. All of a sudden, I noticed that he was starting to puff a little bit. Well, when we got back to the raft, he

grabbed the raft and hung onto it and spit his mouthpiece out and said, basically, "I've had it. I quit." I didn't know really what to do. The school CO looked at me and said, "How about you? Are you going to quit, too?" I said, "Heck, no. I'm not going to quit." He said, "Well, you better drag him ashore. You're going to have to do the swim over." With that, I grabbed him by the nap of his lifejacket and I towed him back to shore. Finally, he said, "Well, heck, if I'm going to have to go anyway, I might as well swim." We made it back to shore, but my time wasn't all that exciting. He was dropped from the school. One of the other teams also had an individual who was dropped from the school, so I was assigned a new swim partner. My new swim partner was a first class mineman. His name escapes me just now. He was a very, very likeable guy and just a lot of fun to be around. But he was out of shape and had poor swimming time. I felt that I had a serious crutch to bear, and I looked him right in the eye said, "I'm going to tell you something. You're going to be a heck of a lot better of a swimmer by the time we finish this course."

When we'd get into swimming condition, a tether line usually tied us to each other. About half the time, I'd be towing him as I was kicking, swimming, scratching and gouging, trying to make good time. Later on, at our parties as we both finished EOD school, he would announce to one and all that he towed me all the way through swim school. It was something that you could look back on. There were some trying times, primarily because it was so cold.

INTERVIEWER: Was that at Indian Head in Maryland?

COMMANDER MOODY: No.

INTERVIEWER: Oh, it was underwater swim school?

COMMANDER MOODY: It was underwater swim school. It was still in Key West. That was one experience I really don't care to go through again, or to swim in anybody's swimming pool in cold water. I was very fortunate in that I did have an old wetsuit given to me by a civilian banker. He felt sorry for me when he saw me shivering so badly, trying to wear wool underwear and so forth when we were diving. He donated me his old wetsuit once bought a new one. We were about the same size, so it fit pretty well, but I had to keep putting all kinds of patches on it that would hold it together. It looked like it had been through World War II by the time that I

was done with underwater swim school. But it was a Godsend, really. I felt so sorry for the other people who didn't have anything at all to use. Since I did have some previous diving experience, when the school staff would go out to do a little fishing on the weekends, they would bring some of the students along with them. I got to go out with them quite a bit.

After completing the swim school, I went ahead and reported to Indian Head, Maryland, and learned what EOD was all about. I graduated from EOD school in September of 1958. The first thing that we did when we reported there was to put us through second class divers school. It was in the Potomac River and of course, the visibility was anywhere from three inches to zero at the very best.

INTERVIEWER: Yes.

COMMANDER MOODY: But, really, it's probably a good training venue for EOD divers because you do have to become aware of some of your other sensory capabilities, instead of just relying on your eyes. As a matter of fact, I felt pretty comfortable in the river when we did our first dive with the deep-sea rig. There was a master diver by the name of Chief Sopchek who was a chief boatswain's mate. He was a really tough, hard-charging individual and an excellent dive supervisor. He later went through a good career as a civilian technician at the U&B facility at Indian Head. Sopchek gave me instructions as to what he expected of me. He wanted me to get on the bottom, throw the air hose and lifeline over my shoulder, and dig out toward the center of the Potomac River. Since I was pretty used to taking orders and carrying out what I was told, as soon as I hit the bottom, I got to about a 45-degree angle with that hose and started digging out. I was thinking to myself, "This is somewhat like playing football." Later on, some of my classmates told me that Sopchek was jumping up and down and saying, "See that? See that? There's a guy. That's what you want to do when I tell you to go down." I think Sopchek got a lot more excited about it than I did.

I always did feel comfortable in the water. I felt that if you had good equipment, took your time and didn't panic, somehow you were going to work your way through it. That always worked out pretty well for me during my diving career. Incidentally, and I'm once again jumping

back to underwater swim school, but I did end up number two in the class.

INTERVIEWER: That's great.

COMMANDER MOODY: I felt very proud. I still kind of wish I had been number one because the guy who was number one was one of the guys bragging so much about his capability. But I was able to best him when we got into deep sea diving.

INTERVIEWER: How old were you when you went to swim school?

COMMANDER MOODY: I was 31, and I think the cutoff point in those days was 32, but when I finished up at Indian Head, I was number one in the class. Then we went on to the EOD portion of it, which I found extremely interesting. Even today, I pursue and interest in EOD matters.

After completing the school, I was assigned to the EOD facility at which I met Ike Ingle, who, in my opinion, probably accomplished more within the EOD community during World War II than any other officer. When he first entered EOD, he was a first class gunner's mate, and he went to the advanced mine school, which later became the mine disposal school. Then he went immediately to Pearl Harbor and was one of the first people to start any meaningful diving in EOD there. I do strongly recommend that you read his book, and if you can't find a copy of it, I'll certainly let you use my copy. It's good reading. He was the CO there and gave me a lot of good advice over the years. Since I had already been a division officer several times over, I was assigned as the assistant department head for test and evaluation.

I was also assigned as the assistant safety officer, since the XO was a safety officer and needed a junior officer to go out and actually do the field work where safety was concerned. I was also trained in the sign as one of the three team leaders, or officers in charge, of the Pluton teams. 'Pluton' was military speech for plutonium containment agent. The military was realizing that in the event of any type of a nuclear accident, or some other unforeseen accident, there would be a need for cleaning up radiological sites. Outside of the tsunami units that had training in that particular skill, there didn't seem to be anything in the Navy equivalent to that. We were the first of what later became some of the radcon teams that received a great deal of training.

I believe we were called a 'plutonium control team,' not a contamination team. Even

though that was our title, we were also trained in how to at least protect ourselves from beta and gamma radiation. Twice, we had the opportunity to go out to the Nevada test site for some period of time to actually do field training in beta, gamma and plutonium contamination.

The first time I went out, I was just part of a team. Later on, the CO decided to send another crew of people out to receive some training. I went to him and suggested that it might be good if an individual who had gone through the training before went with them to see that there was a continuity of training and that we were all receiving the same information. He thought that was a good idea and asked me if I had anybody in mind, and I said, "Of course, I do." He sent me out and I did manage to go through training twice. On the second trip, there were also some civilians from within the Navy Department who would have probably been involved in any operation of that nature. When it came to the actual fieldwork, they didn't want to do it, but they wanted to be game players as far as decisions were concerned, like the irate farmer who did not fill in his land, or the obnoxious television reporter. Of course, they played games with us, and as I've seen that happen in a lot of other venues when there has been an incident or accident, they think that people like local sheriffs, local authorities and news people were going to give you a hard time.

After several incidents that I had been on, I found that that does not happen. Usually, if you have an obnoxious news person who comes and gets in your face, there's an old country deputy sheriff there someplace who injects himself into the scene and takes the obnoxious individual by the arm and escorts him away and allows you to get on with your job. I think that from that standpoint, some of our training may have be a little bit misleading, but I'm not going to set policy on how to do the training.

I have not been on nuclear incidents, but I've been on other incidents that had a great impact on the community and did not find the harassment we thought we would find. As I mentioned, the pluton teams later became known as the radiation control teams, and I'm not really sure what the organizational setup is at this time. I stayed at the EOD facility until 1962. In early 1962, I was then assigned to the USS *Proteus*.

The *Proteus*, of course, was a submarine tender equipped to handle the Polaris missile. One of the reasons I was assigned to it was because of my background in plutonium control. They needed someone like that, since they were going to Scotland. We set up the anchorage in Holylock, Scotland. I was the First Lieutenant. I was the Diving Officer. I was the EOD Officer. I also ended up being the assistant shore patrol officer at my request, because I felt that some of the things I saw happening onshore were not in keeping with the best interests of the United States Navy, but I won't get into that.

INTERVIEWER: You said you were the first lieutenant. You were ship's company, as well as the NOIC?

COMMANDER MOODY: Yes, I was. In those days, they did not have depth, as such. Although your primary qualification was EOD, you were still assigned a ship's company. From what I have heard from other officers and learned from my own experience, that was exactly what you were. You were a ship's officer, and they treated you accordingly. That caused me to get into some very serious discussions with people who were senior to me and, as a matter of fact, getting kicked out of their offices with Navy regulations in hand.

In any case, it was, once again, a tremendous learning experience for me because we were operating ships, or boats, in very inclement weather. We had a lot of problems while we were going through the learning curve. The requirements that were levied upon my division were quite exorbitant. I couldn't restrict my people to the ship, but I would assign them to duties that they couldn't carry out. They didn't get to go ashore. The sailors really had a bad situation because they were basically working constantly and did not have any opportunities for a little rest and relaxation.

After we had been there for about three or four months, a Navy captain from the submarine force came out specifically to do an inspection of my division. After two days on the ship, he closed the door to my office and I asked the yeoman to leave. Ed Whitaker was there, though, and he was someone most people in the diving Navy knew quite well. He ended up as XO of the EDU back in the late sixties or early seventies. Ed was my assistant and a very, very

capable former boatswain's mate LDO at this time, and Ed and I were there in the room. The captain didn't mince any words. He said, "If I were a seaman working for you, I'd think you were f---ing me." I was somewhat aghast about this. Ed Whitaker spoke up and said, "Captain, if I were a seaman working for me, I'd know I was f---ing me." The captain broke into a big grin and said, "Okay. Tell me what the problem is." We relayed what the situation was, and we ended up getting a draft of 32 additional people when he got back to SubLant.

As those people started coming aboard, the XO started assigning them to where he wanted. I walked into the executive officer's office with my Navy message in hand and said, "Commander, those seamen have just reported aboard and are reporting to the deck force." I got a lecture on how it was the executive officer's responsibility to assign people to the shift. I told him that I felt it was my responsibility to report this to the future commanding officer of the ship, who happened to be the captain who had made the previous administrative inspection. I got my men and life became much more bearable at that time.

We did have quite a workload, as far as diving was concerned, because we did conduct ship's husbandry-type dives on the submarines. We did a lot of search dives, as a matter of fact, because there was a great deal of concern about somebody coming and making a clandestine attack upon the nuclear submarines. All of the nuclear submarines did have divers to do their searches. They just did not have the will or the wherewithal to conduct the searches, and we had a large number of divers aboard ship, so we did most of that.

It was at the same time that the Navy was undergoing a transition. All hardhat divers also had to be SCUBA divers. I had a couple of veteran first class divers who tried to become SCUBA divers and for some reason or another, it did not happen. They just opted to go elsewhere in their careers. They just were not comfortable if they did not have an air hose and lifeline to the surface.

We also asked for and got permission to conduct our own diving classes, since we were located so far away from the States and it would have been very, very costly for us to take and send two or three people to the States to become diving-qualified. Understanding that there was

the chance that at least one of them might get washed out during the training process, we felt that we had the wherewithal to conduct our own training. Ken Wallace, who was my master diver at that point, got the training curriculum for a second class diver from the deep sea diving school, and that was what we used as our curriculum for diving. We took a number of people through the school, and some of them qualified and became excellent Navy divers. I saw them later on in life, after they became master divers, and I was very proud of that. I think I got a lot of accolades. I got a lot of letters and medals and those types of things. But I think the greatest compliment that I ever received in my career was to have a junior officer come up and compliment me for the way that I went about my professional business, and I was very serious about that.

Somehow, I seemed to get tangled up with the boatswain's mates all the time. Ken was a chief boatswain's mate. Later, we sent him to the deep-sea diving school to undergo master diver training. He completed the training and eventually became qualified as a master diver. After a normal tour on the USS *Proteus*, Ken was given the opportunity to be assigned to EOD Unit 2. Ken came to the experimental diving unit (EDU) and was the master diver at the time that EDU was gearing up and starting to do a lot of research in saturation diving. He did become a preeminent expert and one of the first master divers involved with saturation diving. He made E8 and later, I believe he was selected for E9. But at the time, Taylor Diving, which was a subsidiary of Brown and Root, I believe, was trying to gear up to do saturation diving in the oil fields. Ken was basically offered an opportunity that he couldn't turn down, so he did further selection to E9 and retired from the Navy. I believe he had about 24 or 25 years worth of service, and he went to work for Taylor Diving. Eventually, he became the Chief Executive Officer and had a very successful career. Of course, Taylor Diving did quite a bit of contract work with the officer of OO Charlie.

INTERVIEWER: Taylor Diving did some of the early history of the experimental diving. They collaborated on a record-setting 1600-foot dive, done at Taylor Diving's facility.

COMMANDER MOODY: That's right. I had an opportunity later in my career, and I believe I

was skipper of the EOD School at the time, to go and visit Taylor Diving. Ken took me through their facilities, which were very, very impressive. They had another rig with which they could put a framework down over a pipeline, and it had arms that surrounded the pipe so that they could align it. They had a habitat that came down in the very middle of this rig. They had de-watered the habitat because the bottom was open. They just pressurized it and forced the water out. The divers could get inside and get fixed up so that they could weld in the dry. That was a very, very impressive operation, as well. Some of the fellows were instrumental in designing and supervising the construction and were also DOD qualified.

Let's see. We were on the *Proteus*. We did receive several letters of support that we gave some of the local people for diving. We had two shipyards there in Holylock itself, and we cleared one of the rail systems that they had for hauling boats in and out of the water. On another occasion, we had a luxury sailing vessel, about 98 feet long, and it was just beautiful. It had various woods. The decks were teakwood and most of the trim was mahogany. After the shipyard worked on it so that we could put it back in the water, they discovered all the seams were not swollen, so the ship was taking on water before the wood swelled up enough to seal everything. Their suction pump died on them and we got an SOS. My diving crew and damage control went over there and broke a beautiful skylight to drop a big adduction pump down. But the owner of the shipyard didn't complain a bit because they saved the ship from sinking, and they were very happy about that.

We also got involved in the recovery of the barge and crane that sank in some rough weather. The Scottish government asked us for assistance. We went over with shape charges and cut the bolts away from the support unit to the barge, and Then they were able to lift the two out of the water individually.

We also refurbished the diving boat. We had what used to be called a 'UBMH.' I don't know if you're familiar with that or not. It was a 55-foot utility boat in which the Navy had put high-pressure air tanks, heavy duty air compressors. It also had a bowel-mounted unit for towing what used to be the queen gear, which was the detection gear for metal that they used to use in

World War II. It also had a double A-frame on the back for recovering anything from the ocean, and a quite substantial auxiliary power unit on the back for running that lifting unit. It had capstans on the side and was a very handy boat, but the problems were that it was an excellent diving tender craft and we were in at Holylock, Scotland, which doesn't have southern Florida days. The weather is bad.

I had a little background in boat building. I did build a boat out of wood that was probably about three times as heavy as it should have been. I felt that if a half-inch of wood were good, three-quarters of an inch would make it stronger. Well, it did, but it also made it a whole lot heavier. Anyway, I designed a cabin. We had a trunk cabin, and that was where the divers got dressed and did a lot of their work. That was also where one of the air compressors and the tanks were. Of course, the engine room was back. They happened to have little other auxiliary stuff back in there. There was really no place topside that people could get under cover and protect it from the weather, so I designed a pretty hefty cabin with sliding doors on both sides so that a tender could stand inside and tend through that sliding door. I had a couple of ship fitters. Of course, I also had good old Ken Wallace. We had to pull the boat one time because it was getting pretty shop worn. I looked up there and didn't see this cabin being built. But we had to order the wood and everything else. I was the command duty officer one day and said, "Well, heck, I did some woodwork in a past life." I got up there and started putting up some framing. Well, I had put up about two pieces of framing, and I had a couple of my sailors helping me. Ken Wallace walked by. He looked up there and asked, "Lieutenant, what are you doing?" I said, "Well, I'm going to build this cabin that you told me you were going to build about three months ago." He said, "Don't do that. That's embarrassing." I said, "Look. I'm not doing anything. I don't mind using my hands. Now, if you want to help me, get your butt up here and get with it." He just said, "Lieutenant, I'll get that cabin built for you." I said okay. I left. Well, he got his shipfitters. He must have raised hell because they were like a bunch of ants on that thing. Before the boat went back in the water, it was almost completed. About the only thing that was left to do was to put the windshield in and everything. The first bad weather system came through after that. I had

about three of the divers come up and say, "God, we're glad you got us a cabin built." It worked quite well and they really took pride in it. They started cleaning it up and painting it and everything. They used to use it as a showboat. When other diving ships would come around, we'd show it to them and say, "This is our diving boat." They got kind of cute. They even put a little cabin up in front. They said, "That's your cabin."

Anyway, I went from there to the skipper of the EOD Unit 2 in Charleston, South Carolina. Of course, in Charleston, I had a total crew of just fewer than fifty, as I recall. I was supposed to have 19 officers, but I only ended up with about 15 or 16. They deployed to the Mediterranean on MSOs and they also to the Caribbean on MSCs. In those days, it was a three-man team, usually composed of an officer and two enlisted. We were short of officers to our requirement, and I had four E9 chief petty officers. I sat them down and told them that I was considering giving them letters, designating them as team captains with the same responsibility as an officer in charge of the teams. They initially looked at it a little skeptically. I just said, "This is going to happen, guys, so you might just want to get with it." After we had implemented that, the guys loved it, and it gave everybody a kind of an equal rotation.

INTERVIEWER: What kind of operations were you involved in?

COMMANDER MOODY: Around Charleston, it was primarily in support of the mine warfare people. We did a lot of mine countermeasures and mine recoveries. We had one lieutenant, Jay Junior, who was quite a character. Another one came up to him and said, "If I'm going to be on the mine recovery, I want to be in on the mine plan." I said, "Okay. That's fine with me." They notified us when they put a plan through the practice lines, and he went out with them. When they came out for the recovery time, he not only recovered the twelve they had planted, but he recovered two more. I said, "Jesus Christ. You've set a new record here. What is going on?" He said, "Well, I'll tell you, skipper. When they planted them, I put some shot line and tied them all together. I just had to find one mine. Then I could find the rest of them. While we were looking for those twelve mines, I found two more that had been out there for about two years." That was the quality of the people with whom you were working.

INTERVIEWER: Do you mean the dispersal people?

COMMANDER MOODY: That's right. We also did a lot of diving jobs. In those days, the local people did not have the resources or diving capability to go out and look for drowning victims. Up and down the east coast, we used to get called upon quite often to go and search for people. It was not something that we volunteered for, but once the request was made and your superiors said, "Yeah. Let's support them," you went ahead and did it. Usually, we would report to the local sheriff of the area, and the sheriff would take really good care of the crew once they got there. We had one occasion on which it seemed like this young man was undergoing SCUBA training from the administrative assistant of one of the state senators in South Carolina. Well, he apparently drowned, so they called us to send some people. It was in a reservoir with a lot of underwater structures and a very dangerous place for SCUBA divers to be working. After thoroughly briefing a young officer, I told him to go report to the sheriff, and if he couldn't find the body, give the sheriff a briefing as to exactly why he could not. He was well prepared to do that, and he had to because they didn't find the guy.

In the meantime, I got a call from a fellow of interest of the administrative assistant and he told me to have my divers report to him. I said, "We don't work that way. We report to the county sheriff. He's the one who has jurisdiction." Well, the guy had an interest, since he was liable to be charged with negligence or something. I said, "If you want to go with them, they'll be roaring through your town in about three hours. You can follow them." Then I called the sheriff and told him what I had relayed. He said, "Good. That's exactly what I would have told him." We had very good rapport throughout the areas in which we worked with the local authorities.

The National Park Service thought we were a valuable resource. We got involved in very diverse operations, such as locating test carcasses from ordnance, from the Air Force and the Army. The Army had some water ranges, at which they would fire some of that heavy caliber artillery into the water and we would recover it. Sometimes, if the operational tempo got too much for the people in Dahlgren, we'd go and support them in some of their underwater recovery. At Eglin Air Force Base, we had a continual requirement to come in and do a lot of

recovery for them. As a matter of fact, when the Air Force called on the Navy to assist them in recovering the nuclear bomb in Palomares, Spain, I had an officer who was going to Eglin with a lot of search equipment to find something they had lost there. Because of priorities, all the equipment we had ordered into Eglin for the search got diverted and ended up in Spain to look for the nuclear bomb.

INTERVIEWER: You went out to that mission?

COMMANDER MOODY: Yes, I did. I got a call early in the morning, at about two, and I asked the duty captain, the CNO, if he thought that I should respond personally. He said, "Well, I'll leave that up to you, but this is about the biggest hot potato in the world right now." I felt that, in order to support my people, it would be best if I went with them because I could interface them with the staff and outsiders to allow them the freedom to be able to do their jobs. I found that was a good thing, too. When you went on an operation like that, you needed somebody who could talk the talk and communicate with the senior people who may not have any idea of what you were doing, either in the diving world or in the EOD world. I found that worked quite well.

In any case, we were asked and we responded. I believe I took about 18 or 19 people with me. They sent a dedicated AC135, which came from the same squadron as the refueling aircraft that had also gone down when the B-52 went down. They had found three bombs ashore and suspected that the fourth bomb had gone into the water. Later on, we drew a really tough operation. It was recovered. Our people primarily conducted inshore searches from the beach out to about eighty feet of water. We were using divers of all classes. We used UDG divers. We used, of course, EOD divers. We even had some of the divers from SeaLab come out because we were going to use them for extremely deep dives.

As it turned out, it was not too practical to try to use them because the old Mark VI diving unit leaked gas, was extremely fragile, and diving at those deep depths out of a Mark VIII boat was difficult and dangerous, to say the least. Also, the oxygen transfer units that were required were pretty tender to be used in a rough environment like the beach and on Mark VIII boats. They were not very effective as deep-sea divers. Some of them were UDT-qualified and

we did go ahead and deploy with our other UDT divers to conduct searches. They stayed on the scene for a while, but all the divers on that mission, regardless of whether they were UDT or whatever, were basically divers.

I got on the scene and briefed the admiral as to my position. It was our responsibility under Navy regulations. I told him that it was my problem, as the CO of the UDU2, because we did have, in writing, worldwide responsibility for ordnance or things of that nature. It wasn't quite worldwide, but in that part of the world, we were responsible. He accepted that and I referred to the particular Navy order that specified it. Once they got that in hand, I had wonderful relations with the entire staff.

INTERVIEWER: When the weapon was finally recovered, did EOD have anything to do with it?

COMMANDER MOODY: We did disarm it. There were a couple of ways in which we were involved. I did a great deal of the planning on the lift system we used and was the task unit commander for the recovery units. I was kind of the task unit commander without a staff because I was a one-man show. I did a lot of personal interfacing, and also wrote quite a few Navy messages.

I think it's important that we continue things like that and support each other because I found that Australia is really a strong ally, as is the United Kingdom. In most enterprises, particularly in the Pacific Ocean, Australia was a strong supporter, and it was good to see the technology that other countries had, as well. But I did enjoy that aspect of it. The running of the facility I found to be quite easy. Once again, I was the front man to go fight our financial wars in Washington, D.C. The Technical Director, who was a civilian, I had no problem with whatsoever. We worked well as a team and he carried on the scientific functions and administration as a technical director and allowed me to have a more free hand to interface with some of the forces that we had to contend with from the command. Probably a year after I had been at the facility, I received a call that they were going to send an initial team to Egypt to discuss the possible involvement of the United States in clearing the Suez Canal that had been blocked since the Yom Kippur War.

INTERVIEWER: That was Operation Minimus Moon, right?

COMMANDER MOODY: It was Operations Minimus Moon and Minimus Star. I believe it was Minimus Star.

INTERVIEWER: Yes, It was.

COMMANDER MOODY: One of them was for the mine countermeasures operation and the other was for the EOD and ship removal to clear the canal. The initial team to go to Egypt was to be composed of two mine countermeasures officers, two EOD officers, two Army officers, one EOD and one mine countermeasures specialist and a land mine countermeasures specialist. I requested the requirement be changed, once I had been designated, being part of the initial team. I had asked if instead of taking two officers, I could take an E9 chief petty officer with me. I would have opted for a warrant officer had we a warrant officer in EOD at the time. But we did not. Therefore, I requested that a senior E9 EOD technician accompany me to Egypt. I got involved when they started assigning personnel to go on an initial team and wanted a captain from the mine force to go along as the senior officer. The Commodore of the EOD group in Norfolk was senior to the Navy captain from the mine force. Therefore, they did not want him to go on the team. The chief of staff was then designated, but because of health problems and other reasons he could not go.

To flip-flop the buoys and do the search, we would lay down a second line of buoys and we then would search in that area before we removed the first line of buoys. We would then flip-flop again so that the buoys were never removed until they had been searched on both sides. That way, we felt like we were coming as close to a hundred percent of the search area as we could, as far as our buoy system was concerned. The underwater visibility was excellent, and on some days, you could see as much as forty or fifty feet.

INTERVIEWER: Oh, wow.

COMMANDER MOODY: On the worst days, the visibility, to the best of my knowledge, never got below about eight or ten feet, and most of the time, it was excellent. One of the operational problems that we had was the mistral that used to blow up off the North African coast. It could

be a balmy day in Spain. All of a sudden, the wind would shift about sixty degrees and jump up to about sixty knots. You had to be very alert to the weather systems. Fortunately, no one was ever hurt, although things got pretty dicey on a couple of occasions.

The rest of the force was reporting in at about that time. Of course, they brought some ASRs and some ATFs that had divers on them. We tried to deploy them to do contact identification on items that the mine sweeps and other sonar-equipped vessels had found in some of the deeper water. That didn't pan out too well because of the problems with getting into a good moor and the mobility of the divers and everything. They worked very hard, but the results were somewhat unsatisfactory. Carl Brashear was on one of the vessels and, in fact, did lose his leg, as is reported in the movie. He was a good senior diver on the ship. I'm not aware of any problems, such as those depicted in the movie.

INTERVIEWER: He was a strong guy, huh?

COMMANDER MOODY: He was. He was very, very much in shape and had very strong upper body strength. He used to punch a Steve bag and do calisthenics for about thirty minutes a day each. As far as I know, the chief boatswain's mate and the diving officer had excellent rapport and ran a good, taut ship. One problem they had was that a couple of divers were bent on their first few dives. I was asked to go over and see what was wrong. In fact, we asked them, "When was the last time the gauges were calibrated?" and they didn't seem to have a good handle on it. We had the gauges calibrated over on the tender that was part of the task force. They had no problems after that.

There were other ways that the ships were employed. They would send out the *Cubmarine*, which was a small research submarine, to do a visual search in some of the deeper areas. If they found a piece of aircraft wreckage, they'd sit on the bottom and we would have a diving vessel come over and send divers down with a recovery line. They would recover the aircraft wreckage. We did have an incident, in which there were some pretty heated messages exchanged between the MSOs and the ASRs, and that eventually trickled up to the commander of the task force. I was asked to find out what was going on. It was a matter of diving safety.

The MSOs really didn't understand the need for keeping that clear when the divers were down, and the COs and the ASRs were making exceptions to it. There was a change to the way the business was done and after that, it worked well. We assigned the senior officer on the scene as the ASR instead of the mine sweep, so it worked out a lot better.

The EOD people, while doing their dives, as they got into deeper water and had more limited bottom time, went to a tow-type search. A couple of our chief boatswain's mates took some of the old mine sweep gear with the otters and spreaders and rigged them in such a manner that they could then put divers on a sandbar between the two outer doors. We could then tow them at about a knot and a half to two knots.

The bit problem that we had with towing was the double hose regulator, so we got a lot of flooding in there. That seemed to be the limiting thing that affected how fast we could pull a swimmer. Later on, I went into a couple of operations and I made sure that we got the single hose regulators. We found that we could tow them much more quickly. We had one of the vessels lay some surface buoys in eighty feet of water and we conducted a search out to eighty feet. From there, the other vessels took over.

INTERVIEWER: When the weapon was actually recovered, what did you do?

COMMANDER MOODY: When it was recovered, one of the things I wanted to do was get the wire straps around it just as quickly as we could. Once we got it to about a hundred feet of water, we stopped the lift and had them take a 7/18 braided nylon line with two wire straps and strap it in front and in back of the suspension unit that was still on the bomb. That was the first time I really felt comfortable and thought that we had it in hand. The divers told me later that it was pretty exciting to go down there and put those straps underneath that big, billowing parachute.

INTERVIEWER: Was there a fear of being entangled?

COMMANDER MOODY: Well, entanglement was a concern and of course, if we lost the thing at that point, they were going down with that parachute. It was pretty dicey for them. They did a really good job and cut away some of the parachute so that it didn't encapsulate so much of the water. One of the problems we had as we were bringing the bomb clear of the water was that the

parachute was billowing, putting a heck of a force on the entire rig. That was why we went ahead and cut some of the risers, so we could spill the water. We got it aboard and the EOD people went to work and pulled the proper components out to save it. In pulling the components out, they had to use a little ingenuity because they found that one of the components had swollen from the seawater. In order to get it out, they put a little live volt in it on a safe position and then used the Spanish windlass to a pad eye on the ship and brought it out. The Air Force was watching this and they thought that was pretty neat.

INTERVIEWER: Do you remember whom it was who did the ISP?

COMMANDER MOODY: It was Walt Ponce, the lieutenant. Walt's dead, now, unfortunately. I forget the award that Walt got for that. I want to say it was a Navy Commendation Medal, but memory can be tricky.

INTERVIEWER: You were still the CO of the EOD unit at the time?

COMMANDER MOODY: I was still skipper of the unit at the time.

INTERVIEWER: How long were you out there in Spain?

COMMANDER MOODY: I was in Spain, I believe, just a little less than three months. I returned to Charleston and was extended an extra year on my duty there. About six weeks after I got back, I got a Navy message directing me to go to the Caribbean, down to San Juan to look for an OST weapon this lady had lost in the water.

INTERVIEWER: What is an OST weapon?

COMMANDER MOODY: It's an operational suitability test weapon. When the United States built a particular mark and mod of a nuclear weapon, they also made a series of OST weapons for quality control purposes. Those weapons were handled and stored in the same manner as the all round nuclear weapons.

Every so often, at a predetermined time, they pulled one of them out and delivered it in the manner that it was supposed to be delivered. If it functioned properly, everything was fine and we went on with life. If it did not function properly, all marks and mods of that particular weapon were pulled and retrofitted to correct the problem and to ensure that we had every

explosion at a hundred percent efficiency in our nuclear arms program. In any case, there was no nuclear material on this bomb, but the Navy's interest in getting it back was strictly for the classified equipment on it. It was off of Vieques, about 800 yards off of the mop airfield that we usually used for bombing practice there. The coral is pretty dense in that part of the world. A lot of it had been knocked down from previous explosions and underwater depth charges and things like that. But there was still a good growth of coral, so sonar was pretty ineffective in that area. We had to devise some type of diving search. Unfortunately, the weather did not cooperate that well and even a diver would almost have had to be on top of it to see it in all that coral clutter. The Navy sent down two research vessels to see if they could locate it. One was the *Cubmarine*, which had been used in Spain, and the other was the *Alvin*.

The *Alvin* eventually found it after a series of very strange happenings, I would say. Basically, the *Alvin* came back one time with its search plot and its crew was supposed to cross a practice weapon that we put in the water to check out trajectories and everything. We had some pilots fly two missions that were exactly the same as the pilot who had dropped the OST weapon, and they lofted some practice units out in the ocean. We immediately went down and buoyed them.

Well, our buoy carried away on one of them, but according to *Alvin's* track, she should have crossed exactly where it was in the water. We had it pretty well plotted from some of our electronics navigation. The on-scene commander yelled at the pilot of the *Alvin* and told him to get himself back down there and find that practice weapon. When he went back to find the practice weapon, he found the real thing.

INTERVIEWER: Oh, wow.

COMMANDER MOODY: The second unit that we had lost the buoy on was very close to where the actual weapon was found. Once we found it, recovery was pretty simple. As a matter of fact, and I don't know if this is classified or not, but the last time I saw that OST weapon, it was in the boatyard of EOD school.

INTERVIEWER: Oh, really? Was it the exact same one?

COMMANDER MOODY: Yes.

. INTERVIEWER: That's good training.

COMMANDER MOODY: Yes. There was another operation in which I got involved. I got a call one evening, after Hurricane Betsy went through Louisiana, and they said that they had lost a chlorine barge on the Mississippi River inside the city limits of Baton Rouge. Lyndon Johnson had flown down there and directed the Navy to locate the weapon, get it out of there, and locate the chlorine barge. They were really concerned that the chlorine tanks would rupture.

INTERVIEWER: The whole population there would be at risk, right?

COMMANDER MOODY: Yes, very much so. Once again, in view of the seriousness of the operation and knowing that there was going to be mass confusion there, I felt that I should go to once again be an interface and protect my people so that they could get on with the job. We flew down in a C-130 and all the motels were booked because people had come there from New Orleans. New Orleans had been pretty well devastated. I went to a meeting with the Coast Guard and all the local authorities, and they asked us where we were going to stay. I said, "Well, that's a problem. We need some search boats that we can use as diving platforms. We also need a place to live."

One of the managers from the company had the anchorage responsibility as to where the vessel was tied up, and it was tied up in a nest of barges, which they do quite often in the Mississippi River. It was the outboard barge of a nest that was five barges deep and several barges fore and aft. I forget the name of the company. I believe it's probably in the letter there. Anyway, they offered us berthing aboard one of their pusher boats, one of their tugs. It was a beautiful craft. It was about 98 feet long. It had beautiful accommodations for us, and they also said they would make available some boats for us. We went down and looked at their boats. Two of them were work barges. They were about, I would say, 24 feet long and about 9 feet wide. In fact, I think those dimensions are actually in there somewhere. They had what we called a 'harbormaster unit,' which you clamped onto a barge. It was kind of a self-contained power unit for the barge. It was like a diesel outboard power unit.

They furnished the crews. They had canopies over the ships and a nice workspace where we could put our air compressors and diving equipment. We did not have a recompression chamber but had an established liaison and knew where the nearest various decontamination and recompression chambers were. We felt that in view of the situation, we had to get on with the program. We went out and started doing our diving, and the only ship to help us, initially, was the USS *Hineman*, which was a World War II destroyer. It did have search-like sonar on it. It found all kinds of contacts, but most of them were mud banks. But it had to be done, so we were out diving. The diving conditions were pretty grim. Some of the reports said it was anywhere from three to nine knots. I would have estimated that it was between about two and a half to three knots, in general. It was a tough current and unfortunately, a lot of debris was coming down, so we had to be very, very sensitive and needed somebody watching the surface and reporting to us.

INTERVIEWER: You had zero visibility, as well, right?

COMMANDER MOODY: That's right. The other thing was that you needed a pretty hefty clump to get to the bottom, so we managed to get some old 180-pound clumps that the Army Corps of Engineers had. Of course, the EOD divers started vying to see who could pick up two at the same time. I had one or two guys who could, and some guys on the workboat could, too. They were really tough roughnecks. Once they saw the sailors get involved, they got involved, too, so they were very helpful.

We were asked quite often, "Why are you doing this hazardous work?" Our stock reply was "Well, we've been trained to respond to emergencies." We were asked, "What happens if this chlorine gas gets to you?" We responded "Well, we'll take care of it." We didn't have gas masks. We didn't have respirators. We didn't have anything, but we figured we'd put on our diving gear and at least use our air and that we could take care of it. But the guy who really gave me my crew the most confidence was the foreman of the handling box in St. Louis. He was the guy who had loaded this barge. He was, once again, one of those shy dock foremen I had never seen. But he was very confident in what he was doing and had some material that he could throw

on the water, and if he got a smoke reaction, he knew that he had a problem. Once, he showed the staff, and I just told him, I said, "You're assigned to my boat crew." He said, "Good. I wanted that. I've been down here for two days, waiting to go to work." He stayed with us all through the operation and also brought down some respirators so that we felt we were better protected. It was very frustrating, difficult and arduous work. We had to go in every night and report the fact that we weren't successful that day. There was a lot of pushing and shoving and calling going on at those meetings. It seemed like every politician who was there wanted to say something.

That was my first experience with what I called what is now the 'National Command Center' or 'Instrument Command System.' Fortunately, there was a captain in the Coast Guard who was in charge, and he kept things going in a very professional manner, and plus, he liked what we were doing. He really helped us with anything we wanted to do.

Eventually, the Army Corps of Engineers brought in some commercial divers from New Orleans. They also brought in an oil drill rig and anchored it. Then they put the drill stem down and tied a diver onto it. Well, they put a safety belt around the rig, and he was in deep-sea dress and he went down that way. His mobility was extremely limited.

INTERVIEWER: He was EOD?

COMMANDER MOODY: Oh, no. He was one of the commercial divers. Something happened and the belt slipped, and he ended up under the surface being towed. After two or three days of trying, they went back to New Orleans. They didn't want any part of it.

In the meantime, we knew that our SCUBA gear was very ineffective because of the big front it had presented to the water rushing down to the current, and we had all of our shallow water rigs lifted out to us. We started using the shallow water gear and did several little elevations that helped us in the operation. Of course, the biggest elevation was getting the biggest, strongest diver and putting a lot of weight on him and getting with it. Also, when we did our search with the 180-pound clumps, they would hold in the bottom pretty well. Then we'd get them taut with the descending line and take a shackle and the search line. When we went down, we did kind of a pivotal search at the end of where the current was working with us, rather than

against us. The only time we'd have to really work against the current was when we were coming back up. Sometimes, they'd just work against the current and come on back up. We quickly identified some of our more capable divers. They did the brunt of the work, trying to get it accomplished, and were happy to do it. They had the opinion that they would do the advance work and let the faint of hearted attend to them. A couple of them got very nice accommodations for it. Any operation like that is very discouraging, but we kept going. There is one thing I neglected to say. Based on other searches that we had done in the Charleston, South Carolina area, we knew that the local fishermen, the guys who knew the bottom could be very valuable. Well, they didn't really have a lot of fishermen in that part of the Mississippi, but they had a lot of guys who worked on the river. On the first night we were in Baton Rouge, I told my sailors, "You guys can go ashore. When you come back, have some information from the waterfront as to where that barge is." They went down to some of the local waterfront bars and made friends with some of these guys who worked on the dock. When they came back, they all said, "It's almost underneath where the moored barges are." We couldn't convince anybody that we should go in there and make a sweep underneath those moored barges, and we weren't too eager to do that anyway, with the existing current conditions.

Well, they brought in a piece of equipment and it was, to my knowledge, the first time it was ever used. It was what they called a 'bottom profiler.' The transducer looked like a little football, and the guy who was operating it was from Raytheon. You would have thought that he was with the Central Intelligence Agency because before he would unmask that thing and put it over the side, he looked around to see if anybody was taking pictures. They put it over the side and had a beautiful plotter, about 18-inches squared, with the bar arm plotting system. As that little starter thing started losing its signal across, they pulled up alongside, close to where the barge had been initially, and sure enough, it painted a picture of the barge underneath the other barges. They didn't want to announce that on an unsecured channel, so there was a lot of waiving of arms and attention-getting mannerisms and they managed to get us over there.

Lieutenant Festeg, from the diving school, was also down there with a crew of divers. I

believe it was about eight divers who he had with him. In any case, his boat and the boat that I was on showed up at just about the same time. We had shallow water diving gear aboard our craft that he did not have on his, but we decided to test high up and talk about how we were going to have our divers operate underneath these other barges.

I had one of my divers, Duffey, go in first, and he got in and reported, "Yes, there are some tanks in there and everything." I really think that he wasn't too comfortable with being underneath there. I'm not sure how effective his search was. The second diver we sent down was one of the salvage divers from the deep sea diving school. I believe his name is in one of the documents that I gave you. He went down and immediately went to the chlorine barge tanks and worked his way to the dome area, which was the loading area. They had a seal on it. We instructed him that if he could find that seal, we'd send him down with some snips and ask him to snip it and bring it on up so that we could possibly identify it, and that was what he did. We were then able to announce that the chlorine barge had been found.

INTERVIEWER: How many days of diving did you do?

COMMANDER MOODY: I don't remember the exact number, but I believe we found it in five or six days. It seemed like it was about ten months, but it was just a short time. Most of the crew went on back from Baton Rouge. Lieutenant Eastman and I went to Mississippi as guests of the owners of the pusher boat. We saw the devastation of Hurricane Betsy, and I tell you, it's hard to imagine in your own mind just what a hurricane can do until you see it firsthand like that. It was really devastating. Those were the three most important operations that occurred while I was in Charleston.

On a lighter note, Admiral Moorer came down and visited the mine force while we were in Charleston. The EOD guys were in their pressed marines and snappy military physiques and everything. Whenever a visiting dignitary came, Colonel Mangley always made sure he came over and spent some time in our unit. Of course, everybody was really getting spiffed up and looking sharp. Admiral Moorer came to visit and was very impressed. But before he came, they had many commanding officers from the mine force come over to meet the Admiral at

headquarters. My guys knew he was coming down, so they took two Civil War miniballs and mounted them as bookends. I was always been an admirer of him. I was standing there, holding these bookends, and when I was introduced, I looked him in the eye and said, "Admiral, it's been well publicized that you are the prospective Chief of Naval Operations. Sir, in order to handle an operation like that, you've got to have a big set of balls, so here are two more." Well, he looked at me with those cold, very blue eyes, and I thought to myself, "Red, you finally stepped over the line." Then he broke into a big grin. He looked at them and said, "And I know exactly how to handle them." He immediately gave them to his aide, and I got the nicest letter from him later on. At another function, I met his wife, who was there on her first visit. As I was talking to her, she said, "Oh, by the way, I wanted to tell you that he's so proud of those bookends that you and your EOD people gave him." That really made me feel good. Of course, I passed that on to the crew right away. It was great.

At that time, I had been there for a little over three years and it was time for me to move on. As a matter of fact, I almost retired from the Navy then because I had been offered a very good job in the Marine Mammal Program. As a matter of fact, if I may go back to Vieques, they actually deployed some marine mammals there. They brought in four dolphins, Atlantic bottle-nosed dolphins, I guess, and put a little tent up in a small cove there, right off of the fake airfield on the island, and allowed the mammals to get used to the water down there. They'd also take them out and exercise them a little bit each day. What we were going do, if our diving or our submersible searches didn't find the OST weapon, was deploy these mammals.

INTERVIEWER: They were Atlantic bottle-nosed dolphins?

COMMANDER MOODY: Yes. I was very impressed. In fact, I left the task force proper, moved ashore and set up a camp on Vieques because it was so hush-hush that when they moved the dolphins in at night. They put the aircraft out on a corner of the runway. They put the mammals in a helicopter right away and immediately flew them to where we were. Back in those days, it was really a super secret fact that we were trying to use mammals to find things like that in the ocean.

They brought a 19-foot boat with outboard motors on it and hung a transducer on the side. When they did the search, it would start heading down a particular course line, and the mammals were just like bird dogs. They would go back and forth, in and out, really searching the ocean. They said they could do a forward speed of about three knots on the reference boat and felt like the dolphins were getting as close to a hundred percent coverage as they could get. In my own mind, I would have been satisfied had we employed them out there. They would have probably found the weapon.

Another one of my jobs was to recover some ordnance that might have been similar to what they were looking for to help them in the training program. I did that. Unfortunately, while I was disarming one of them, I lost a finger. That kind of cut short my military career. At the time that happened, the *Alvin* stumbled on the weapon, so it was recovered anyway. For all purposes, the operation was over and I just ended up with a short finger. But it was time for me to leave EOD2, and from there, I went to be the commanding officer of the USS *Shelldrake*.

INTERVIEWER: Yes. I read some of the information you gave me on that that. You guys did some pretty impressive stuff while mapping off the coast of Vietnam.

COMMANDER MOODY: Yes. We set some records for survey miles that, to my knowledge, have never been equaled, even today. It was an interesting experience for me when you consider the crew. I had an extremely young crew. The average age was less than twenty, even if you included my age in the equation.

I did not have any chief petty officers and while I was working with a bunch of EOD people, you just threw an idea out and somebody took it and ran with it. One of the things that I used to appreciate in Charleston was that the CO sometimes knew that I'd sit in my office and think of things that we might do to improve the situation. I might ask some chief petty officer to come in and say, "Chief, do you think it might be a good idea if we did such and such?" I would say yes. The answer was usually, "Well, skipper, we thought you might like that, so we did it two weeks ago." You really had to be on your toes because everybody was self-starting. It was such a wonderful group of men with whom to work. Of course, they did not have women in EOD

during my tenure, so anything I speak of involves only men.

I had one chief whom, when he was in his dress uniform, was immaculate, and I was always somewhat informal with my people unless formality was required. Of course, I could be just as formal as desired. But the chief used to present himself in the door every morning. At that time, I was a coffee drinker. He'd say, "Skipper, the coffee is ready in the dining locker. Would you like a cup?" I would say, "No. I'll be right in." I'd go in and usually have a cup of coffee and exchange pleasantries for maybe 10 or 15 minutes and then we'd all go our separate ways and do our business. But if I made a decision that the crew thought was a little bit out of shape, he would present himself, very formally, in his best uniform, and say, "Would the Commanding Officer care for a cup of coffee?" It only took about two occasions of that happening until I would say, "Okay, Chief. Where did I screw up?" Once again, I don't care how long you've been in the Navy. You can always go through a learning process.

Anyway, it was time that I left and went to the service. The crew on the ship was very young and we had a couple of situations. We had a main engine that lacked a bearing. The chief engineer told me that we had a problem and needed to get to a shipyard to get it fixed. Of course, my question was "Well, why can't you fix it yourself?" He answered, "Because we've never done it before." I asked him to get his very best engineers and really brain stump the thing. I told him that they should think it over very carefully and come tell me in about an hour as to how they can fix it. Well, he came back about 15 minutes later and said, "We'd like to try to fix it." I said, "That isn't what I asked you. Tell me how you're going to fix it." He said, "Dang it, Captain, we can fix it." I said, "That's what I wanted to hear." He turned out to be an excellent officer. His name was Jim Blanton. Unfortunately, he died of cancer after he had been selected for captain, but he was a tremendous young officer.

We managed to prepare the engine. In fact, I rubbed a little salt in his wound. I said, "When you get to the point at which you're stumped, let me know. I'll show you the next step." Well, they couldn't pull the old bearings. I took the old dry ice alcohol trick and made some dry ice from it. I took the dry ice and alcohol and packed it in those bearings. As soon as I saw the

frosting starting to develop on the metal around there, she popped right out. The crew saw that and they said, "I've got inspiration." I learned how to freeze fuses from EOD. That turned out quite well. We got another good EOD officer out of it.

I kind of equated it this way. With the sailors I had working for me on the survey ship, if you gave them their instructions in good terms, maybe give them three steps and have them come back and get three more steps, they worked pretty well. They wanted to do a job well and they did. If you were in the EOD community and did the same thing, you'd say, "Let's go do this and don't worry about the three steps because somebody is going to know how to do it and get on with the program." It was that simple. It was a good experience. It seemed like all the ships I was getting on in those days were being put out of commission. When we got back to Pearl Harbor, they put us out of commission again. At the time, the OO Charlie (Code OOC) in Washington wanted me to become involved in research in the sea.

INTERVIEWER: Did they want you to net them a program called 'SeaLab?'

COMMANDER MOODY: Well, it wasn't SeaLab, *per se*. It was another program that they were supporting at the time. They had put a habitat down in the Caribbean. I forget where it was. I think they turned it into a commercial outfit. They take tourists aboard.

But a couple of the universities here in the United States were going to send their research people down to live in this habitat, just like they had done with SeaLab, but it was going to be done from the standpoint of developing deep diving. It was going to be from the standpoint of working and learning in the sea. The Navy was going to have a project officer assigned to run this thing because the Navy was funding it in a cooperative effort with the educational institutes to better our knowledge of the sea. OO Charlie wanted me to be the project officer on that. I was perfectly happy with it until I got what I considered a better offer, both career-wise and from the standpoint of my love of EOD. I was given the opportunity to oversee the EOD school, so I jumped at it.

INTERVIEWER: What year was that, sir?

COMMANDER MOODY: I believe it was about September, or thereabouts, of 1968. After I

relieved and had been there for a while, we instituted a couple of things that I'm very proud of. One of the first things that we did was to establish the VIP course.

INTERVIEWER: What was that?

COMMANDER MOODY: I used to get a lot of complaints from everybody about when they report to an area, nobody knew what they were supposed to do. "I'm a square peg in a round hole because nobody knows, and blah, blah, blah." they would say. We thought, "Well, how can we, as a training command, do something to facilitate this?" We decided to set up a VIP course of two or three days for senior officers and senior civilians within the military establishment, and show them what the EOD plan was. We decided that course would make life simpler for us and probably garnish more support for our programs. I talked it over with the four services and the three other service commanders who were there. They all thought it was a good idea because we were getting the same complaints from all the services. We went ahead and tasked the training officer to establish the three-day VIP course and to keep it as simple as possible for people of the senior level so that we didn't get them in there, bore them the first day and send them away as enemies. Naturally, as a part of that, we'd always have a welcome board reception. We entertained pretty lavishly at our homes sometimes. If I had a visiting admiral or captain who could have a very good impact on our organization, I always had them over for dinner. My wife was just tremendously supportive of that.

Anyway, they set it up. We said, "Okay. Now, what we're going to do is have our senior enlisted people from each service and our senior officers from each service. We're the trial run of students who will go through this." We went in and I was amazed. Some very experienced military people got tongue tied when we all appeared. We had to assure them, "Hey, look. We're not a 'burger board.' Your fitness report does not handle one course like this. Please just relax and treat us like you would any other student and get on with the program." They did and it really turned out well. From that, we saw a few small things that we felt we could improve upon. We made changes and offered it up.

While I was at the school, I got just tons and tons of letters from senior officers who

thanked us profusely for the program. It's still active, as far as I know. I felt that helped us a lot with our future in EOD. I've also run into a lot of people who have been through the course since Then gotten the little honorary disposal and everything. They're very proud of it. They're very proud of what EOD does.

There is another thing that I did of which I am extremely proud. A very good friend of mine and I were talking in the officer's club one night, and we had spoken about this topic before, as a matter of fact, when we were stationed together out at the UV facility. He was an Army officer. We both felt that there ought to be some kind of symbol that the students passed by during the day to let them know the seriousness of this profession they were choosing to get into. We also wanted to have some type of a memorial for some of those people who had caught on before. I said, "Well, let's get all of the liaison officers together tomorrow. Let's talk about it," and so we did. All of us thought that it was a tremendous idea. We said, "Look, before we just go and make decisions like this, let's all of us go back to our individual services and query and root the guys out who are doing the real work to see if they feel this way." Well, the response we got back was just so tremendous that there was no way that we could turn back, but we didn't want to, of course. We then went ahead, organized ourselves and got all of the people involved in it. Anybody who Moorer called in for probably the Charles Handy crowd. We had guys who couldn't afford it giving us hundred dollar checks. We had one ten-man team, an Army team from Vietnam, send us a check for \$1100.

INTERVIEWER: Wow.

COMMANDER MOODY: We were just overwhelmed. The next thing we did was to go out and get a contractor. Well, he wanted to charge us \$68,000. We thought that was exorbitant. At about that time, I had a chief builder from the Seabees walk into my office and ask, "What is the matter? Don't you trust us?" I said, "What are you talking about?" He said, "We can build your memorial for you," and he ended up building it. His name was Harry Fromfeld, and Harry took on the task and did a tremendous job.

There was another thing that we did in association with that effort in order to raise money

to build the memorial. We started having the 'Memorial Ball.' At the first ball, we had a Marine Corps brigadier general, a Medal of Honor winner, as our keynote speaker.

INTERVIEWER: In your tenure at the EOD school, he built the memorial and started the annual EOD Memorial Ball?

COMMANDER MOODY: Yes.

INTERVIEWER: That's great. They then moved back down to Eglin Air Force Base.

COMMANDER MOODY: Yes, absolutely. I usually go to the Memorial Ball, you know, if my schedule permits. Anyway, we went ahead and Then, of course, I got much involved with the North Atlantic Treaty Organization (NATO) functions and then a little bit with the United Nations (UN), but more with NATO than the UN. It was always a good experience to get together with them and compare notes on what each country was doing. We have remained good allies through most things.

There was some coordination between other facets of the government and EOD, but with the airline bombings and a lot of other stuff that was starting to come up, we established a lot more rapport with the FAA and the Federal Bureau of Investigation (FBI). As you saw in some of my records, I received a tremendous number of letters from the FBI because we helped them out. I was very impressed with the FBI. Fred Smith used to touch base with us regularly just to keep that channel of communication maintained. I was involved when Fred came in. We'd have a cup of coffee and I'd usually call down some Air Force sergeant and some Army specialists or some Navy guy. Fred would have a little item. He'd say, "We think this is a piece of military ordnance. Can you help me with it?" After our coffee, those two would go bopping off and about an hour later, Fred would come back and say, "Jesus, this guy is smart. He knows everything about this piece of ordnance." It was a good relationship. I think that was one of the real pleasures that I took at the school, to see the way that the other services handled the EOD aspects. I found that all our problems were kind of the same and you had to solve two things.

The first problem was money and the second was personality. If you could solve those two problems, training fell in line and so did operational capability. I requested and was told that

my follow up command would be as the Commodore of the Unit in Pearl Harbor. It had been designated as a Group. It was designated a Group in about 1972 or 1973. It was a Navy captain's billet. They believed that I was well on my way to becoming a Navy captain and the job was mine for the asking. I asked and was assured that it would be my next duty station when some administrative problems cropped up at the Navy EOD facility. I was asked to go out and be the commanding officer at that facility. In loyalty to the individual who asked, I accepted that and reported to the EOD center.

INTERVIEWER: The EOD facility you speak of is now the EOD Tech. Is that correct?

COMMANDER MOODY: Yes, it is. At that facility, I had, I believe, 11 Navy officers and other services there, as well. I believe we had about 43 enlisted men and 57 civilians. That was the working group there. We just continued along with the research, trying to support the fleet as much as we could. One of the disappointments that I had was the long lead-time, from the time that a concept was considered, tested and approved until the time you could finally get it out into the field. The lead-time was just atrocious.

Another very difficult thing on which we worked was getting all the EOD equipment man-rated. Now, if it was man-rated, that meant it went through special testing requirements that ensured absolutely safety, as far as the individual was concerned. After I settled into the EOD facility, it was a very, very rewarding job, in that I did get to interface with the international people from NATO, the United Nations and the ABCA-5, which was a organization that met regularly between America, Britain, Canada, and Australia.

INTERVIEWER: What about the Suez Canal operation?

COMMANDER MOODY: The reason I got involved with that was because Tom Gore of EOD Group Two fell out of the running, and they were going to send the chief of staff, but for health and other reasons, it was deemed that we should try to identify someone else. I made a telephone call to the action officer and the CNO and voiced my concern about it, and was basically asked if I would be free next week. Having opened up the subject, I had to make a decision. I said, "Before I make the decision, I'd like to talk to the commodore of EOD Group Two to ensure that

we're not at crossed purposes with this." I made a call to Captain Dave McNulty and he, in effect, said, "Red, if I can't go to Egypt, I can't think of anybody I'd rather have go in my stead than you." For that reason, I was assigned to be a part of the initial team. I took my E9 chief petty officer with me as my good right arm and technical assistant. While in Egypt, we met with the Egyptian naval authorities regularly and had some very, very meaningful discussions with them.

I was very impressed with the Egyptian officers who I met. They were bright, intelligent and held much of the same attributes and philosophies we had in the United States Navy, as far as getting on with the job was concerned. I was privileged to meet the senior commander of their combat swimmers, who was very secretive about his position other than to say he was a diver-qualified navy commander. After a series of discussions with him, I looked him right in the eye and said, "How long have you been with the combat swimmers?" His reaction approached surprise. He asked me, "How do you know I'm with the combat swimmers?" I said, "It's revealed by your general demeanor, the fact that you're in excellent physical shape and your knowledge of questions that have been asked at discussions about underwater work." In confidence, he told me that he was the commander of the underwater swimmers. We turned out to be very, very close friends for a period of time.

There was also a one-star admiral, a Commodore, at the meeting, and at that point, I also turned to him and I said, "Sir, I imagine that you're the commander of the salvage forces in the Egyptian Navy." He seemed to be quite surprised that I would make that assumption, as well, and I came to find out that he was the number two man in the salvage organization of the Egyptian Navy.

After a series of studies, we, in a very rough manner, tried to determine the length of the shoreline and the total area we expected to cover, as far as EOD operations were concerned. We did a series of calculations and I estimated that it could be accomplished in about six months if we had a hundred divers to employ on the search. The Egyptians indicated that was not going to be a problem. They could come up with a hundred divers. Washington largely directed the

concept. We had had some EOD people killed in South America, clearing a log jam with explosives shortly before that, and there was a big political outcry by politicians who didn't want any American forces killed overseas trying to help a foreign government. Therefore, we were told that our EOD people would not be doing the searches, but the Egyptians would, under our supervision. Knowing that, we established how many divers we thought might be needed to support the operation.

Upon my return to the States, I went ahead and wrote a trip report. Part of that report was a preliminary concept of operations that entailed doing part of the search with site scan sonar, which was just coming into use in the commercial fields, particularly in the offshore work in the oil fields, and I was familiar with it. We decided to search the deeper waters of the canal with the site scan sonar, so as to give us a faster search rate and enable us to search around all obstructions, pipelines, piers and facilities, such as that used by underwater swimmers. You did have surprisingly good visibility within the canal, and there was a slight flow to the north and the south. During part of the year, it flows north. During another part of the year, it flows south. There is quite a bit of sea life in the Suez Canal, which created a problem because unfortunately, some of the soldiers who were put out in the field used to use explosives for fishing. It was kind of discouraging when we had our divers in the water and fishermen were about.

INTERVIEWER: Oh, gee. Did you ever have any incidents?

COMMANDER MOODY: We did have an incident in which an Egyptian corporal had taken a mine about the size of our M-16 and strapped a hand grenade to it as a fusing device and threw it in the water about 400 feet ahead of our search line.

INTERVIEWER: Oh, wow.

COMMANDER MOODY: It just so happened that in order to get the Egyptians to be efficient divers, we had to put divers in the water. It was one American to every six Egyptians. I don't know if Congress found out about that, but our superiors found out that we were doing it and we were severely chastised and told to take our divers out of the water. We took our divers out of the water and for three days, we didn't find anything, so in order to get the job done, we had to

put the divers back in without the knowledge of our superiors.

I will go back to the fishermen. When the charge went off, there was a lot of topside concern that our people might have gotten hurt, so you saw a line of heads come to the surface immediately, looking around to see what happened. It just so happened that one of the divers was a large Egyptian, about six foot two, and looked like an Olympic athlete. As he reached the shoreline, he was shedding his diving gear, and began chasing the corporal over the sand dunes. Our officer, the one supervising the American forces, and the Egyptian commander who was with him, decided they had better go and see what was going on. The American officer on the scene related to me that when they got into the tent, the large Egyptian special forces diver had his knife out and was about to garrote this guy. After a lot of arm waving and shouting and everything, they got things under control, and the major and the corporal told the diver that they would take appropriate disciplinary action against the corporal, but asked that the diver please not kill him. That seemed to satisfy the special forces diver and our people got out of there quickly. We didn't want to get between them. But that was about the hairiest situation that occurred, as far as the fishermen were concerned, but I'm getting ahead of my story.

In any case, I came back and wrote up my concept operation, which Dave accepted readily and used for the official concept operation that he wrote, and they then went ahead and deployed over there. In the meantime, we were given \$4,000,000 to procure equipment to support them. We bought four sets of sonar, and that was the first time side-scan sonar was ever employed for the United States. They were employed with the United States Navy to detect ordnance.

The EOD facility also supported the operation by deploying a number of military people who were assigned to the facility, the senior one being Lieutenant Kelly, and the senior civilian being Dr. Claude Manly. Claude was the individual at the facility who was doing research on the use of precision navigation, sonar for ordnance protection, magnetometers and all electronic aides for the location of explosives and devices that heard early explosions underwater.

We were letting the Army take the lead on the protection of the shoreline, which we

closely monitored with them. Claude Manly volunteered to go to Egypt as part of the national crew, and it was nice that he did because there were a lot of mathematical calculations that had to go into the system that did the search, to ensure the accuracy of the search itself. We needed him to assist with the parabolic curvature of some of the precision navigation systems that we had. We also purchased some high-frequency precision navigation systems that had accuracy to about five to seven meters, which was state of the art in those days, and probably some of the finest before the global positioning satellite system came online.

Our people were employed in two different ways. One way was a crew that was with the Egyptian divers to ensure that they did their search in a particular area at a particular time, using a search line. As I mentioned before, in spite of orders, we did have to put U.S. Navy EOD people with them to ensure that they would, in fact, report a mine if they saw one. Initially, when they reported something, they jerked the spacing line. Everybody would stop and the U.S. guy would go over there and identify whether it was hazardous. If it was hazardous, they would probably go ahead with their search. Later on, we'd send somebody down to countercharge it. If we knew it was safe to move it, we would allow the Egyptians to pick it up and move it ashore. The Suez Canal authority furnished the search boats. The other group of U.S. divers that did the side scan sonar and identification dives used the search boats.

INTERVIEWER: What ordnance did you find?

COMMANDER MOODY: We found every imaginable type, for the simple reason that there was not only the air drop condition there, but because the Egyptian military jettisoned ordnance in the Canal. It was easier to throw it in the canal than take care of it ashore. They had the Bailey bridges crossing the canal during the Yom Kippur War. The Israelis took out the Bailey bridges, which had vehicles going across them that were loaded with explosives. Plus, we found several bodies. Some of them still had their rifles.

INTERVIEWER: The report you showed me read that there was 175 tons of unexploded ordnance pulled out, and over 8,500 individual contacts.

COMMANDER MOODY: That's right, yes. We had to have a special assessment team come.

That was when Dr. Tony Richardson came out with his analysis team and assisted us in sorting out and assigning values to these various contacts that we got from the source. Based on his analysis, we went back to do our dives. I can't begin to remember all the parameters that went into his analysis.

You would be on individual sweeps. Then as you came back, you would start getting multiple contacts. At least you had to get the contact more than once before you were satisfied that it was a viable contact and investigated it. Toward the close of the operation, but not before that, I made two liaison visits to Egypt to support them with the technical area of the operation. I was able to spend time with Dave McNulty and other divers and saw what was going on, how we could support them back in the United States and keep the operation going. That was a great learning experience with them. As Dave was getting close to being overseas for six months and was on TAB, he needed to get back to the States to break that up. I was then asked if I would relieve him as the on-scene commander of Navy EOD forces, so I went and spent three weeks as the test group commander for the EOD forces, doing the same things that I described before.

INTERVIEWER: You were in Task Group 65.5?

COMMANDER MOODY: Yes. Then Dave came back and I went home, and that wrapped it up. Not too long after that, I went ahead and decided that after thirty-one and a half years in the Navy, I was still under fifty years old. It was a good time to get out of the Navy and go fishing.

INTERVIEWER: That was when you retired?

COMMANDER MOODY: That was when I retired.

INTERVIEWER: You were commanding officer of the EOD facility?

COMMANDER MOODY: Yes. I retired in September of 1975 and Then as a civilian, I decided to continue working underwater and in the EOD as much as possible, in the civilian sector, so I became a consultant and I worked with the Seaward Corporation. We did searches in the sea and were involved in numerous underwater searches. Primarily, aircraft is what I got involved in searching for. Later on, I also got involved with the Space Shuttle *Columbia* disaster and was the search manager on it for a couple of months. After about six weeks of the initial operation, I told

them that I was tired and needed to go home. They asked me to come back after about two weeks to set up a diving operation because they had classified material of high interest, so I came back and set up a diving search pattern for them. I spent two weeks there and went back home, and about a month before they were going to close down, all of the managers of Seaward retired and never did start the operation. They asked me if I would come back and be the senior search manager and wrap the up job, so I did and closed it down after about two or three weeks.

Another enterprise in which I was involved was ship damage and responding to emergency calls for service in the Persian Gulf during the tanker war, and I did investigations on several ships that were damaged during the conflict. On two different occasions, we responded to tankers that had either been hit with missiles. We were responding to a call for assistance when the United States Navy decided to do the job and bid us out of our livelihoods. I also got involved in some land clearance work in Canada for an Indian tribe, for which another substantial lawsuit was settled out of court.

INTERVIEWER: We have just a few more minutes left. Looking back over your thirty-one and a half years in the Navy, is there some other memorable incident that we haven't yet discussed that you'd like to talk about, or something that we should have discussed in more detail that you would, thinking back, like to clarify?

COMMANDER MOODY: Right at this moment, I can't think of anything. This has been one of the most comprehensive reviews of my career ever, I think.

INTERVIEWER: Is there something particularly memorable that you'd like to discuss from your post-Navy diving exploits?

COMMANDER MOODY: No. Somewhere along the line during my aging process, I decided that diving was hard work, so I stopped.

INTERVIEWER: Oh, really?

COMMANDER MOODY: Yes. Well, it was my experience that for every hour of good quality diving you're able to do, you probably do about fifty hours of non-quality diving in water that's turbid or completely black. Also, for all of that fun that you have in one hour, you have to spend

about eight hours in the maintenance of equipment if you expect to remain on both feet. At a certain point in anybody's life, things are not as much fun as they used to be, even though I felt I was still healthy when I finally decided to stop. Running around and responding to emergency calls and so forth can be tiring. I got into Kuwait about 48 hours after the shooting was over in the first war with Iraq. Ostensibly, I went because we were going to do the clearance of the American sector, and the company that I had teamed with had basically been told that they had the contract. But when the officials from that company went to meet the Minister of Defense, he wouldn't even accept them, and one of the underlings came out and told us that the Emir had decided to open up the contract again. The contract was awarded to another company, and the company was well qualified to do it, but the royal family largely owned its parent company. I was familiar with the way they did business in the Middle East, I think, so after being out there and going through a couple of kind of traumatic days, I just decided that the Middle East was not as much fun as it used to be. When I came back from that trip, I was kind of run down and tired. I told my wife, "It's not fun. I think it's about time I retire." Well, the only thing that locked that in cement was the relief I saw in her eyes. I didn't realize how she would react.

INTERVIEWER: You've been married now for how many years?

COMMANDER MOODY: Fifty-six.

INTERVIEWER: Wow.

COMMANDER MOODY: That's probably a good place to stop, huh?

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UNDERSEA & HYPERBARIC MEDICAL SOCIETY

Interview of

REAR ADMIRAL RICHARD LYONS

Friday, November 5, 2004

PROCEEDINGS

INTERVIEWER: I'm interviewing Rear Admiral Richard Lyons. Admiral, please relate how you became a part of the Special Warfare group while you were on active duty.

RADM LYONS: Very briefly, I hope, a fast history of how I wound up in Navy special warfare: Right out of Columbia Midshipmen school in 1944, I saw an interesting notice on the bulletin board: "Wanted: Volunteers for extra-hazardous duty involving explosive disposal, and must be strong swimmer." That had my name on it. So I volunteered right into Navy Scouts & Raiders; went to Ft. Pierce, Florida for my training in 1944, and from there directly to the Commander, Amphibious Forces, Pacific (ComPhibPac) at Pearl Harbor, and then on out into the South Pacific. And wound up in the Philippines as a matter of fact, having just done a recon on the beach in Mindanao, where it was anticipated the next amphibious assault would take place. That never happened, because the bomb was dropped.

INTERVIEWER: Let me ask here: You started off in Scouts & Raiders, but then did you join up with one of the UDTs?

RADM LYONS: No, not during World War II.

INTERVIEWER: Okay. So Scouts & Raiders got involved in hydrographic reconnaissance at some point?

RADM LYONS: Yes, we did. We were doing recons and --

INTERVIEWER: With the Navy?

RADM LYONS: Oh, yes, this was all Navy. This is Navy Scouts & Raiders.

INTERVIEWER: Right, but not in association with UDT at the time, I assume.

RADM LYONS: No, not at that time, no. And that was different in the Pacific, as a matter of fact, than it was in the Atlantic theater, because, as you know, Phil Bucklew was one of the most well-

known after the fact, on doing recons, where he did recon on Omaha Beach. So that didn't happen for us in the South Pacific, as it turned out. And I then got out, when the war ended, and I had the opportunity for extended duty, and being a bachelor at the time, a young bachelor, I volunteered to go on to the staff of the Commander, Seventh Fleet, where I became what is known as a Scout Intelligence officer, and wound up in Northern China as a Scout Intelligence Officer for the better part of a year. And I subsequently got out.

INTERVIEWER: What year was that?

RADM LYONS: And that was in 1945.

INTERVIEWER: So did you meet Phil Bucklew?

RADM LYONS: Interestingly enough, I was going to mention. I did meet Phil Bucklew. He had been my instructor at Ft. Pierce, Florida. And one of the members of my class, which was class A, was his assistant, Ensign Vin Adams. And they were running the Shanghai Shore Patrol, which is kind of interesting. I subsequently got out in the summer of 1946, and then ultimately, I pursued my studies at Stanford. And the Korean War broke out. And so I went -- I was ordered back, again being an active Reservist, I was ordered back to the Naval Beach Jumpers in Coronado. And I found, when I reported in down here in June of 1951, some of my former associations of friends that I had made during World War II; here they were getting ready to establish a new Underwater Demolition Team. And so I volunteered out of the Beach Jumpers on the first day that I reported in. And we went on to commission UDT 5 and take them to Korea. And I subsequently got out again to finish my studies at Stanford in December of 1952.

INTERVIEWER: Let me ask, did you have to go back to training at that point?

RADM LYONS: Well, very interesting on that one. I did the training at Ft. Pierce, and when we all reported on board, LCDR Louis States, who was the commanding officer of UDT 5, just being

commissioned, and here he had all of us. And I went personally, because I was the only one who had been through Scouts & Raiders training, and I went into see Louis States, and I said, "Captain, I know that this training is somewhat rigorous; maybe I could be used in another way, because I've already done this down in Ft. Pierce." And he was a southerner. And he looks me right in the eye and he says, "Lt. Lyon, there is not going to be anybody on my Underwater Demolition Team who doesn't go through this training." He said, "with one exception, and that's me." So I've gone through the training twice. It was quite an experience.

I think the most related experience to diving was when Captain States detailed me because of my background in competitive swimming while I was an undergraduate at Yale. And he said, I need a strong swimmer to go on up to Wonsan harbor on independent duty, and you'll probably be up there maybe a couple of months. (It wound up as four months) and we have reports of a new anti-amphibious assault mine, which has been found inside Wonsan harbor, which is huge. The harbor itself is enormous. It's at least a good 10 miles across the harbor. And the entrance to the harbor is rather well-formed; it's somewhat like a reverse of San Francisco harbor. And so I went up, and that's where I became involved in mine recovery. And in the winter -- and this is something that I've been curious about because I knew what my physical capabilities were, but when I was in water which was 34 degrees in a dry suit, I found that I just couldn't physically function effectively and efficiently. And that was, for me, it was a big surprise. Because I could only stay in the water for 20 minutes and then had to be pulled out.

INTERVIEWER: And you were of course diving alone --

RADM LYONS: I was diving alone.

INTERVIEWER: Were you tethered?

RADM LYONS: No. I was diving. We had a two-man rubber boat. And as I said, these were anti-amphibious mines, so as we were being on occasion shot at from the shore. LT Dick Edwards would stay in the boat while I was in the water with a pair of 24-inch bolt cutters to dive. I would dive under the mines which we had previously spotted by helicopter. We were able to use the helicopter which was on board the LST 799 in Wonsan harbor, and that's where our base was.

INTERVIEWER: How long were you there?

RADM LYONS: I wound up being there for about four months.

INTERVIEWER: You would try to dive everyday?

RADM LYONS: Pretty much. Not every day, but we worked when we were able to find the mines. We had a lot of not so good weather, as we were there during the winter time and then into the spring, and it turned into not just the RMKYM, which was the Russian-made mine, the small one, but an impact mine and several other types that turned out to be all manufactured by the Russians.

INTERVIEWER: Let me ask you how many dives you made a day; how long you would wait between dives before you warmed up and down - just the process.

RADM LYONS: Well, as I have indicated, in the really cold water, which turned a little bit better as we got into spring time, but in the really cold water, I could only be in 20 minutes.

INTERVIEWER: What was the water depth?

RADM LYONS: I had no kind of gear on; no clothes or open circuit gear. I was just skinning it, as the saying goes. And I could dive down to about 10 feet, I would say, and that's no big deal. But as I said, you just don't work efficiently as you do in water which is warmer. That's a matter that, as I said, I've been really curious about.

INTERVIEWER: You went down deep enough to get underneath to the mine cable, and then --

RADM LYONS: And I had to put the bolt cutters -- I had 24-inch bolt cutters -- and I had to put them on the cable under the mine and then cut the mooring cable, and the mine would bob up to the surface. We did that sometimes in another fashion, where I would go down and tie a recovery line around the mine, and then we pulled up the mine anchor mechanism from the bottom, which turned out to be like a little cart on which the mine rested. And they would be taking those mines out on sampans and pushing them over the fantail and sinking the mines right in what we thought were cleared channels. And that incidentally is what happened to both the *Pirate* and the *Pledge*, where they were in what was thought to be clear channels, and turned out not to be.

INTERVIEWER: How many dives did you make a day? How long did you work?

RADM LYONS: I would make, I think, as many as four dives in one day. You just can't do a lot.

INTERVIEWER: And you get back on the ship to warm up?

RADM LYONS: And I'd get back into the little two-man rubber boat, and we would go out to the MSB, the mine sweeping boat, which were converted LCVPs, and then we would go to the next spot that we had previously located a mine and we would again launch us in the two-man boat, and over we would go on; I'd get on the water and do the same routine. So I think four was as many as I did in any one day. I had other wonderful experiences, but not which would relate to a diving, physical -- you know, the physical stress on me personally, like cutting a mine out of the sweep gear of the AMS-5, the *Condor*, which was interesting.

But we didn't use any either open or closed scuba gear at the time; it was just coming in. And when the team came back from Korea, we got issued the gear and we had it, UDT-5 had it in our dive locker, and we used it both in the bay and in the ocean.

INTERVIEWER: What year was that?

RADM LYONS: That would be 1952.

INTERVIEWER: '52, now that was before Doug Fane arrived in Coronado?

RADM LYONS: Doug was there, and we had the three teams -- teams 1, 3 and 5. All were skippers of course, and then they established the unit command, Underwater Demolition Unit. And Doug Fane had the unit command as a senior Lieutenant Commander. He stayed on over the next years and really kept Underwater Demolition on the front burners.

INTERVIEWER: Now did he form up a kind of a combined diving locker, drawing people from each of the teams, or did each team have it's own diving locker or did you --

RADM LYONS: I recall that we had our own. They were issued to us as a team. And that may have been the beginnings of how the teams ultimately wound up, each with their own diving lockers. They all tended their own gear.

INTERVIEWER: Who were your instructors at the time? How did the knowledge get into the system?

RADM LYONS: Enlisted guys who had gotten previous instruction from I don't know where, and the guys that were in the dive locker took care of the gear after the dives and made sure everything was working right, and they wound up as our instructors. And it was easy for me to tell that they didn't know a hell of a lot more than I did. So it was kind of a learn as you go evolution.

INTERVIEWER: Well, that must've been fun, and an interesting time, you know, right there at the kind of the historic and --

RADM LYONS: You know, it was --

INTERVIEWER: Didn't know where it as going to go and --

RADM LYONS: Well, for me, it was a great experience, because it was, you know, really new at that time. There was not a lot of this kind of equipment around, and just going along the bottom of

San Diego Bay with a dive partner, with one of your buddies, was, for me, very interesting. And the same thing, of course; right out off the strand, you know, into the ocean.

INTERVIEWER: How long was your period during the Korean War of active duty?

RADM LYONS: From June of '51 until the first of the year and, well, through 1952. And I got out; I was team executive officer in December of 1952. And I remember my last action was to assign a lot of brand new officers to the watch list before I came off active duty. And ultimately went right back up to Stanford and finished my MBA.

INTERVIEWER: Now you were deployed for what, four months of that time?

RADM LYONS: Well, we were deployed from shortly after the team was commissioned, which was in September of '51. We were deployed in late October, is my recall, of '51, and we went out and relieved Team 1 at that time. And then we came back after spring, and we came back in mid-summer of '52. And as it turned out, Team 5 did not, because of the way things went all the way up to 1953, almost '53 when I got out, and the team did not do a subsequent Korean deployment. And then ultimately, they changed the numbers and Teams 1, 3 and 5 became 11, 12, and 13.

INTERVIEWER: So that happened in '53-'54?

RADM LYONS: That happened about '54. And then Team 13 was decommissioned, and those members of 13 went into 11 and 12.

INTERVIEWER: So that's when that transition occurred.

RADM LYONS: Yeah.

INTERVIEWER: Did you have many folks who had been to Normandy, at the time, in your team?

RADM LYONS: No. As a matter of fact, I don't recall any that were involved in the action at either Omaha or Utah Beach. However, we certainly did have those when I was going through the

training with Phil Bucklew being down there, and Ensign J.J. Bell, and LT(jg). Bucklew, they were the ones that were running the Scouts & Raiders training at Ft. Pierce.

INTERVIEWER: So in which year did you go through Scouts & Raiders --

RADM LYONS: Started in '44 and got out of there in early '45.

INTERVIEWER: And why don't you say a little bit about your duties while you were in Scouts & Raiders, some of the operations in which you were involved.

RADM LYONS: Well, as I said, we went to Advanced Naval Intelligence School right from Ft. Pierce, Florida, which was held at the Henry Hudson Hotel in New York City, right on Columbus Circle. You know, from out of the jungle of the Indian River at Ft. Pierce to New York was quite a transition. And we were there at Advance Naval Intelligence School, where, very candidly, because I think it's totally been declassified at this point; our briefing, all of the classwork that we had there, was focused on Taiwan. Of course, and as it turned out, that didn't happen. But we then went out right from Henry Hudson Hotel, Advance Naval Intelligence School, to AdComPhibPac, with a brief stop here in Coronado.

And AdCom Administrative Command Amphibious Forces Pacific was headquartered at Pearl Harbor. And so we would be in Pearl Harbor and at the disposal of ComPhibPac for such work as needed to be done, primarily in beach reconnaissance, first in the South Pacific, in the Philippines. And I wound up, as I said, doing a recon on a beach in Mindanao, and that never happened happily.

INTERVIEWER: Did you use the same techniques that had been developed for UDT ?

RADM LYONS: Yeah, interestingly enough, nothing had changed.

INTERVIEWER: Not just skip right across.

RADM LYONS: Same lead lines and slates hanging around your neck.

INTERVIEWER: The drop and pick up too?

RADM LYONS: The drop and pick up was absolutely the same, you know.

INTERVIEWER: Explain if you could, what do you want to call it, the disjoint between training in Scouts & Raiders in Ft. Pierce and UDT training. Was there a difference?

RADM LYONS: Very little difference. And the bottom line is, as I think you know, is that the Scouts & Raiders were decommissioned immediately following cessation of hostilities in World War II, and anybody who wanted to stay in was phased into the UDTs.

INTERVIEWER: Okay.

RADM LYONS: In my case, somewhat different, because I had the opportunity of going from Scouts & Raiders to Commander, Seventh Fleet as a Scout intelligence officer, which was great.

INTERVIEWER: Yes.

RADM LYONS: I just figured, you know?

INTERVIEWER: And why were there these parallel organizations? What was the rationale for that and the structure and so on?

RADM LYONS: It's quite simple. Scouting and reconnaissance, doing recons on beaches for amphibious assault, which was the mission of the Underwater Demolition Teams, and we were doing the recons, as I indicated, in both beaches. And in Normandy, the reconnaissance work was done by the Scouts & Raiders and then passed on to the UDTs. Well, hey, fold that function into the UDT missions, which is scouting; do the scouting and reconnaissance of the beaches and make it part of the mission of the UDTs.

So Admiral Richmond J. Turner really was the one that saw that. He was the one that really was the strong advocate for both the UDTs and the Scouts & Raiders. And then he scratched his

head and said, "Oh, I don't think we need the Scouts & Raiders; we'll just have that function performed by the UDTs."

INTERVIEWER: Was Phil Bucklew in Scouts & Raiders when he did the reconnaissance in Normandy?

RADM LYONS: Oh, yeah. Sure.

INTERVIEWER: Okay.

RADM LYONS: And North Africa.

INTERVIEWER: And North Africa.

RADM LYONS: Right. And I believe the beaches in Sicily, which were also done by the Scouts & Raiders.

INTERVIEWER: And that was before your team really --

RADM LYONS: Exactly. The UDTs really did their thing, so to speak, in the campaigns in the Pacific. And the Scouts & Raiders were, interestingly enough, less involved there in doing that, with some notable exceptions. As I said, you know, I wound up in the Philippines doing it.

INTERVIEWER: Were the Scouts & Raiders folded into the Combat Demolition units for Normandy?

RADM LYONS: Actually, they did not do the demolition work there, and as it turns out, the NCDUs, Naval Combat Demolition Units, which were all Seabees right out of Camp Perry.

INTERVIEWER: Which went down at --

RADM LYONS: They started in Camp Perry in 1942; transitioned down to Ft. Pierce, Florida in 1943, and then were folded into Naval Combat Demolition Units, Underwater Demolition. They were folded right into the UDTs down in Ft. Pierce, Florida. Now, it was a kind of feeling your way what is going to work best and how can we do this most effectively? And of course, Draper

Kauffman was right at the forefront. He is the patriarch of Navy Special Warfare as it ultimately evolved right from NCDUs, Scouts & Raiders, Underwater Demolition and Navy Seals, and I'm sure Draper is looking down at what's being done now and then saying, "Oh my gosh!"

INTERVIEWER: Well, that's neat. Is there anything else to offer us as you went on in your career that would be relevant?

RADM LYONS: Not really as far as a diving issue is concerned, because that was, you know, just a part of what we did -- kind of before all that wonderful equipment came to the teams. But it's kind of fun to see where it's gone. And as I said, having mentioned Draper Kauffman, a wonderful man. I had the pleasure of meeting him one time when he was on his last tour of active duty as Commandant of the 9th Naval District, in Great Lakes. And we had a wonderful talk. We just had a really wonderful talk. He was a Rear Admiral, and I was a fresh-caught Rear Admiral. And we had a great single meeting. Only time that I ever met him.

INTERVIEWER: Well, that's an interesting history. We are privileged to get this interview from one of the plank officers.

RADM LYONS: Oh yeah.

INTERVIEWER: I'm really glad we're able to capture it.

RADM LYONS: Well, I appreciate it very much you know, having these words with you, Dick.

INTERVIEWER: This is great. Enjoyed the lunch and enjoyed this talk, and maybe we can hopefully talk to John Lindbergh eventually.

INTERVIEWER: Okay, go for it.

RADM LYONS: Here comes a postscript.

INTERVIEWER: Yeah.

RADM LYONS: I guess one of the most exciting things that can happen to any naval officer is hearing about getting promoted. And as a captain and having spent all time that I did in Navy Special Warfare, I figured that was the end of the line for me until I got a phone call from the Pentagon in 1974. And it started out "Admiral Lyon?" I said, "No, this is Capt. Dick Lyon. And who have I the pleasure of speaking to?" "Well, this is Vice Admiral Pierre Charbonnet, and I just wanted to let you know that you can just forget that captain stuff. Congratulations." So as of 1 July 1974, having previously gone to Lakehurst, New Jersey in the dead of winter in 1969, I got my jump call and became fully qualified, and also got my designator as an 1135 officer. And so I became the first flag from the SEAL community on 1 July 1974.

INTERVIEWER: You weren't in a special warfare billet at the time. How did that happen?

RADM LYONS: There was none. At the time, I was just doing my Naval Reserve activity. For instance, what happened is when I got the call, my active duty reserve assignment was as commanding officer of a fleet management assistance unit. And our unit was tasked directly to Commander, Naval Air Forces Pacific Fleet, right here at North Island. And we were doing management studies to improve the efficiency of how COMNAVAIRPAC performed its function. And it was very satisfying. But I was wearing a Naval Special Warfare designator at the time as a captain. And as I said, I became the first designated flag officer.

INTERVIEWER: Fantastic.

RADM LYONS: That was fun. And of course now we have three on active duty right now.

INTERVIEWER: Yeah. Somebody was telling me that somebody at Pentagon wants to make a new flag officer every year, whether they need it or not.

RADM LYONS: That's possible. And of course the exciting thing for me as a flag officer is to see finally not one but two Vice Admirals. And Eric Olson is richly deserving of that. And of course,

Bert Callen served one day as a 2 star and went directly from a 1 star to 3 stars as the military director at CIA, which is a 3 star job. So we now have couple of vice admirals.

INTERVIEWER: We've got all in the system.

RADM LYONS: Both of them absolutely totally qualified guys. I mean, they are -- they are awesome, both of them.

INTERVIEWER: Well, that's neat. Good postscript.

RADM LYONS: Yeah.

(Whereupon, the PROCEEDINGS were adjourned.)

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UNDERSEA & HYPERBARIC MEDICAL SOCIETY

INTERVIEW OF
GUNNERY SERGEANT ROBERT DOSS

Kensington, Maryland
Thursday, September 4, 2003

PROCEEDINGS

INTERVIEWER: I'm with Gunnery Sergeant Doss at the Special Clearance Team 1 command. We will be talking about the team's deployment to Umm Qasr during Operation Iraqi Freedom.

INTERVIEWER: How long have you been with the Very Shallow Water Team?

GUNNERY SERGEANT DOSS: I have been in the shallow water team for two and a half years.

INTERVIEWER: Who got you interested in coming here?

GUNNERY SERGEANT DOSS: My background is from force reconnaissance. I was in force reconnaissance and I had taken out a platoon and got an e-mail from Master Gunny Gillespie out there, kind of tempting me to come. So, I came, checked it out down here and it seemed like a good command to come to. It's variety with the Navy and different communities in the Navy.

INTERVIEWER: What's your assignment here at the special clearance team?

GUNNERY SERGEANT DOSS: My assignment here is that I have been the training chief for two years and for about three months. I was platoon sergeant for the Single Dive Platoon.

INTERVIEWER: What was your assignment when you deployed for Operation Iraqi Freedom?

GUNNERY SERGEANT DOSS: I was the platoon sergeant for the Dive Platoon during that operation.

INTERVIEWER: Tell me about your deployment.

GUNNERY SERGEANT DOSS: The deployment, once it all kicked off over there, there were a lot of rumors about us going over there, or word of us going over there. We rapidly mounted out all our gear, loaded it up in quad coms and twenty-footers and took it down to the flight line and pretty much waited for an operations order. Once we received that, we got out of here, got to Bahrain, jumped right on the ship, the USS *Gunston Hall*, and then waited out there for a bit until we went in.

INTERVIEWER: How long did it take between the warning order and the deployment order for you to leave?

GUNNERY SERGEANT DOSS: It's kind of fuzzy. There was word that we actually got an order, but I don't think we actually did. I think it was a verbal and then when it actually came

down, it was probably a good three weeks and we were out of here shortly after that, after maybe two more weeks, we were out of here.

INTERVIEWER: You guys were berthed on the *Gunston Hall* and that was from where you worked?

GUNNERY SERGEANT DOSS: We did, yes.

INTERVIEWER: What did you do?

GUNNERY SERGEANT DOSS: On the *Gunston Hall*, we prepped all our stuff, broke out charts and worked out things. We kind of had a general scenario of what we were going to be looking at. We started providing course of action briefs and force protection and things that we might need to do, and getting all our gear ready and all that.

INTERVIEWER: Then what did you actually do for employment? When you went in there, for what type of stuff were you searching? What did you think you were going to be looking for and what did you actually find?

GUNNERY SERGEANT DOSS: Our first deployment option was a small group ten or twelve people. We flew in to link up with three or four Marine commandos and went on a little L-tack lights to clear lanes for them to get their heavy artillery through the Al Fal Peninsula. We were out there four or five days, maybe.

Once all that was done they did their options. We flew back to the ship and were on the ship for a day and then flew into Umm Qasr. I was on the first bird into Umm Qasr because my platoon provided force protection for the detachment.

INTERVIEWER: On that Al Fal Peninsula job, you guys actually found buried mines, right?

GUNNERY SERGEANT DOSS: Not surf zone mines. We found mines that were on stakes. We saw them and we cleared some obstacles out of the area they wanted to go through. But we didn't find any VSW mines in there.

INTERVIEWER: Those mines were on the beach that you found?

GUNNERY SERGEANT DOSS: When the tide went out it was just a mud flat. All the obstacles were just sitting in the mud. It was deep mud, so the LCAC moved in pretty closely and then we

kicked a couple of guys off the LCAC to pretty much tactile their way in and check it out. We broke down some obstacles and then got out of there.

INTERVIEWER: What types of obstacles were they?

GUNNERY SERGEANT DOSS: They were mostly, I think, rebar obstacles. They were similar stuff. It was just basic mechanical-type obstacles.

INTERVIEWER: You didn't have to break them down explosively. You just disassembled them?

GUNNERY SERGEANT DOSS: Yes. We disassembled them. They were really poorly put together and had probably been in there for a while, so, it was nothing too difficult.

INTERVIEWER: How long were you guys out there on that?

GUNNERY SERGEANT DOSS: We were there four or five days. There was a lot of waiting time. We were with the British. We were attached to that commando-engineer unit. We were kind of moving around a lot, and they were determining what they were going to do.

INTERVIEWER: You worked off the LCAC. That was where you started.

GUNNERY SERGEANT DOSS: Yes. It was the really small LCAC. They fit something like ten or twelve people in them. We had half on one and half on the other with all our charges and everything on there.

INTERVIEWER: You were providing security?

GUNNERY SERGEANT DOSS: We were.

INTERVIEWER: How did you do that?

GUNNERY SERGEANT DOSS: Well, we just had small arms.

INTERVIEWER: Did you have patrols out or sentries out? Those guys carried their own weapons?

GUNNERY SERGEANT DOSS: Oh, no, no, no. We were with the commandos, so when we were on the land they had perimetered all around that. We just kind of harbored up around the LCAC.

INTERVIEWER: Oh, okay. After that, you went back to the *Gunston Hall* for subsequent deployment the next day in Umm Qasr?

GUNNERY SERGEANT DOSS: Yes.

INTERVIEWER: What happened then?

GUNNERY SERGEANT DOSS: It came down pretty fast. We weren't expected to go in. There were three big things that weren't going to happen. The commanding officer said that we wouldn't go in if there wasn't force protection for us. We wouldn't go in there if we were at Mach Level 3 and we wouldn't dive at night. All that pretty much went out the window when the timeline came down. They wanted something cleared. This is secret, right?

INTERVIEWER: No, no. This is going to be unclassified.

GUNNERY SERGEANT DOSS: Well, they gave us a timeline and with risk versus time, we had to do certain things. I'm a Marine, so I knew, and most of us knew that the 15th Marines weren't going to hang out. They were heading into the country quickly.

No sooner did our bird hit the ground than they were retrograding out of there to go forward. We quickly grabbed the guys in the platoon and rolled around. They had already rolled out of some positions and we just rolled right into them and quickly picked up fields of fire and coverage and secured the old port. It was relatively secure, but once they pulled out, we had to re-check all the buildings and stuff quickly.

INTERVIEWER: You also had to man sentry-type positions?

GUNNERY SERGEANT DOSS: Yes. We manned the main gate into the old port. We had five other checkpoints, some high points on some of the cranes. We had a couple of snipers up there and some other grain towers and stuff.

INTERVIEWER: How did you manage to provide your own security and do your diving duties at the same time?

GUNNERY SERGEANT DOSS: Well, we didn't start diving, initially. We had the British and the Australians there. Initially, they did the quay wall search while we were providing security. We stayed on security. Some of the guys stayed on 48 to 72 hours before they even came off the wall because I only had 15 guys. I had two here, two there, two there, three here or whatever. I had a small reaction force made up of some of the mammal guys who weren't employed at the

time. The British jumped in and did the quay wall search. Then the dolphins went in right after them and they were diving. The British were diving to the contacts the dolphins had found.

INTERVIEWER: Our dive platoons did more security than they did diving?

GUNNERY SERGEANT DOSS: That's a fact; it was more because we were there. We were already in place. We actually did pull back divers as the operation evolved. We pulled enough people to man a small diving detachment to go dive and then we'd replace them on the wall.

INTERVIEWER: Do you think that's probably one of the strengths of the hybrid unit with the Marines, the SEALs and EOD, that you can have a better foundation for doing security?

GUNNERY SERGEANT DOSS: Yes. There's no doubt about it. The dive platoon is made up of majority force reconnaissance SEALs and a few EOD technicians. They already had the fundamental skills for force protection. We were actually over-trained for force protection. But it was good that we were trained because we were able to move in there quickly and secure the area and provide force protection for the rest of the guys that were in there doing the business.

INTERVIEWER: Did you run into any opposition while you were security guys?

GUNNERY SERGEANT DOSS: We did. We ran into a suicide bombing truck that tried to come in. They caught him later, but we called it in. He tried to come through the gate. He didn't come through the gate, but we had a standoff. He saw that we had weapons there and turned away. We had a lot of people trying to sneak into the perimeter, and we did the five or six reacts during the first three days, guys who were sneaking in, probably trying to loot. We took a few APWs and transferred them out.

INTERVIEWER: What's an APW, an anti-prisoner of war?

GUNNERY SERGEANT DOSS: I don't know if that's the politically correct way of saying it. Yes, we detained them and took them. Then we had a lot of onesies and twosies trying to sneak in, probably trying to loot.

INTERVIEWER: Yes, they were more looters than combatants?.

GUNNERY SERGEANT DOSS: I would think, yes.

INTERVIEWER: Were they armed?

GUNNERY SERGEANT DOSS: They were mostly looters who came in there. They were all hostile to us at that point and there was a lot of business going on in the town. The commandos were constantly routing out people and there was small arms fire pretty regularly for the first couple of days, but not really anything directed at us.

I think because the Marines were in there prior to us and had a fairly large contingency, they kind of pulled out quickly and we moved in. It probably seemed to them that a lot of helo loads were coming in daily, like ten or twelve, which was a lot. They probably just assumed that it was a large contingent force.

INTERVIEWER: Yes, they thought it was a pretty heavy kind of thing?

GUNNERY SERGEANT DOSS: Yes.

INTERVIEWER: The reason you guys had to seize Umm Qasr was to bring in the humanitarian supplies?

GUNNERY SERGEANT DOSS: Yes. They wanted that port to bring humanitarian supplies in. I would say that after 72 hours, there was a humanitarian ship in there.

INTERVIEWER: It was pretty successful, then?

GUNNERY SERGEANT DOSS: It was very successful. That was not a typical mission. The harbor was not typical. We did a pretty good work-up when we heard that we might do that. We started diving in harbors out here and got ready for that scenario. But yes, it was very successful.

INTERVIEWER: How much work-up did you have time to do?

GUNNERY SERGEANT DOSS: Well, we had a couple of good months. We started a seven-week diving profile. We went for about seven weeks straight, getting ready for the possibility of that scenario. We were diving pretty regularly in the harbor. There were a lot of technical difficulties with diving in a harbor with the equipment we had. We are used to doing a VSW zone, which is pretty much open water, ten to forty feet deep, and setting up our lines and transponders. When you are in close, you run into geometry issues with the transponders talking to the boards and the pingers and all that. We ran into some problems and worked out a lot of them. We had no low magnetic find device. So, we had to use a standoff with that core, and we

had to develop that. I mean the EOD guys over in my platoon did it all. They came up with ways of countering the lack of equipment and they did an outstanding job with that.

INTERVIEWER: In your dive platoon, how many guys were there?

GUNNERY SERGEANT DOSS: I had 19 guys, but I had to leave two behind. One was doing a screening for something and the other one had a medical problem. Then I was able to augment it with the guys who weren't diving or running the mammals.

INTERVIEWER: How many Marines did you have, how many EODs and SEALs? Did you mix them up?

GUNNERY SERGEANT DOSS: No. The make-up of my platoon was mostly Marines. I want to say I had eight Marines, three SEALs and three EOD guys. That is about right, or right around that ballpark. The EOD guys were my technical experts for all the mine stuff and charges. They just did an outstanding job with that.

INTERVIEWER: After Umm Qasr, what did you do?

GUNNERY SERGEANT DOSS: After Umm Qasr, we pulled back onto the ship. We stayed. We were the last ones out of Umm Qasr. Then a small group went forward to do Az Zubayr. We had sent, about a week earlier, a group way up north to find something in a lake, a downed pilot or something like that. When we pulled out, we jumped on an LCU and went out after the last bird pulled chocks. We back-loaded all our gear and got on an LCU and were escorted out. We went back to the boat and pretty much just manned out. There was a lot of talk about us clearing MDA-6 Bravo.

INTERVIEWER: What was that?

GUNNERY SERGEANT DOSS: It was an old mine range area from the first Gulf War.

INTERVIEWER: Was that in the North Arabian Gulf?

GUNNERY SERGEANT DOSS: Yes. It was a huge area. It would have taken us a long time. We were focusing all our effort on that, on how we were going to do that. It never panned out. I think the time it would have taken us to do it or even do a section of it would have just been tremendous. I mean we could have been over there for months.

INTERVIEWER: How long were you over there, in total?

GUNNERY SERGEANT DOSS: We were there for 75 days, roughly, or right around there. It wasn't long.

INTERVIEWER: Was it long enough?

GUNNERY SERGEANT DOSS: Yes. It was long enough, but not too long at all. We were out late, behind all the Marines that I know who went and we got back before all of them. It was not that bad.

INTERVIEWER: Do you have anything else I didn't ask about that we should talk about?

GUNNERY SERGEANT DOSS: No. There is nothing that I can think of.

INTERVIEWER: Thanks. Thanks a lot.

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UNDERSEA & HYPERBARIC MEDICAL SOCIETY

ORAL HISTORY OF THE MAJOR PARTICIPANTS
IN U.S. NAVY UNDERSEA TECHNICAL DEVELOPMENTS

INTERVIEW OF ROSS SAXON

PROCEEDINGS

INTERVIEWER: Dr. Saxon is the Executive Director of the Association of Diving Contractors International. He had a wonderful Navy career. I'm going to get to that, but let's start at the beginning. Where were you born, how did you grow up and why did you join the Navy?

DR. SAXON: I was born in Toronto, Canada and lived in Toronto until seven years of age. My father had left Canada to come to the United States and join the American Army. In 1943, he was discharged from the American Army because of medical problems and my sister and I went or came to the United States at that point in time. I initially grew up in Great Neck, New York and left Great Neck when I was approximately ten years of age moved with my family to California. I made a trip back to Canada when I was about 14 and spent a year there, returned to California and joined the Navy when I was 17.

INTERVIEWER: I am sure that at some time after that, or maybe soon after that, you decided to become a diver. How did that come about?

DR. SAXON: It was sort of a gradual progression stemming from having done some diving with my father prior to joining the Navy. The rigs we used were very rudimentary but created in my a love of the water. When I first went into the Navy, I went through boot camp in San Diego and was then assigned to radioman class A school and then to USS *Rochester* (CA-124), a heavy cruiser. While I was on the *Rochester*, I decided I really didn't like floating around on that great, big ship and volunteered for submarine duty which incidentally paid better..

I was selected to go to submarine school in Groton, Connecticut, and from there went to the USS *Carp* (SS-338) in Pearl Harbor. In 1955, I believe, the Navy conducted a SCUBA course at the Destroyer base. I believe that was the first SCUBA training course that was formally conducted in the Navy but am not entirely sure. It was something that I had the

opportunity and the interest to accomplish. Being on the submarine, obviously, I was interested in what was under the ocean's surface. Unfortunately, while riding submarines, we never saw what was underneath the surface, but I did get a chance to see some of it with the SCUBA activity.

INTERVIEWER: I remember that when I was in submarines, there was a requirement to have SCUBA divers in the crew. Is this what you did then? You were a radioman, of course, but was that how you were utilized?

DR. SAXON: To some degree, yes, but I don't think that requirement had come about at that point in time. Although I was a radioman, when I first reported to the submarine, I wound up in the deck force, as did most people in those days, so I was performing bosun's mate types of duties, which kept me outdoors.

INTERVIEWER: From there, your interest in diving continued to grow? What did you get into next?

DR. SAXON: Well, I went from *Carp*, which was the first submarine I was on, to the USS *Bugara* (SS-331) in San Diego. I really didn't participate in much diving activity related to Naval tasks but rather, when having the chance, dove in the San Diego areas. The diving that did take place was done by the folks on board the submarine tenders. While I was on the *Bugara* I sat the integration program test; a program that selected about 30 CPO or PO1's to attend OCS. I had, at that point in time advanced to first class petty officer. I advanced to Chief Petty Officer at some time after taking the integration examination.

When selected for the integration program. I left the *Bugara* and went to Officer's Candidate School in Newport, Rhode Island. Upon graduation I received orders to the Officers course at the Submarine School in Groton. After completion I received orders to USS *Menhaden*

(SS-377) in San Diego where I served as Supply, Weapons, and Communications Officer.

Although I had that SCUBA diving credentials, I really wasn't a Navy diver, per se. From the *Menhaden*, I went to the USS *Capitaine* (SS-336) and served on her as the engineering officer and for a shorter period, as Navigator. I qualified for commander of submarines on the *Capitaine*. When *Capitaine* was decommissioned and transferred to the Italian Navy I remained with the ship as Officer in Charge of a Mobile Transfer Team to the Italian government and additionally assumed responsibility for ex-USS *Besugo* that was also transferred to the Italian Navy.

From the OinC job I received order as Executive Officer of the USS *Mackerel* (SST-1) in Key West and did a lot of diving there, although again, it was mostly recreational diving. There was some diving associated with the operation of the boat because we were an experimental platform for the *NR-1*. with wheels on the bottom, thrusters with which we could “jump” over reefs, underwater anchors and various control devices for use and positioning of the ship while submerged. From *Mackerel*, because of the experimental nature of the boat, I volunteered to go to the USS *Trieste* and was selected for it.

INTERVIEWER: For the sake of the readers, explain the *Trieste*.

DR. SAXON: The *Trieste* was the Navy's deep diving bathyscape. The *Trieste* dove to 38,500 feet in the Marianas Trench in 1958. Don Walsh was the pilot of *Trieste* at the time. The *Trieste*, at the time I was with her, was limited to 20,000 feet because of the sphere configuration.

When I joined the *Trieste*, we deployed from San Diego to the USS *Scorpion* wreckage. The *Scorpion* was lost while returning from Mediterranean deployment in May 1968. Our job was to go out, prosecute the wreckage and try to determine what had happened with the *Scorpion*. The crew of *Trieste* was technically seven officers with a support crew of another 15 or 16 persons. My responsibilities in addition to being a Deep Submergence Pilot were Diving

Officer and Electrical Officer. We transported *Trieste* on board the USS *White Sands* (BS-ARD-20); a converted floating dry dock, which was in turn towed by the USS *Apache*. We spent a lot of time in transit and tow before we got on station. Then, we made nine dives on the wreckage of the *Scorpion*.

INTERVIEWER: When you reached the wreckage of the *Scorpion*, what did you do? What kind of maneuvering or photography and so on happened?

DR. SAXON: Well, the first thing was the difficulty of just getting to the wreckage because underwater navigation was somewhat archaic in those days and some of the instruments we were using were pieced together from topside-type equipment. The first operation was to plant deep sea transponders in the wreckage pattern so that we could triangulate using an on board computer in the *Trieste* sphere to get to the wreckage. On *Trieste*, we had a wide variety of underwater lights, still cameras, television cameras, a manipulator, and other sensors. All of those devices could be dropped to give us positive buoyancy in case we got fouled on the wreckage. We also had shot tubs from which we could release steel pellets to provide positive buoyancy, and tanks from which we could release aviation octane gasoline to gain negative buoyancy.

The primary job, basically, was to generate photographic evidence of the segments of the wreckage and try to eliminate from a scenario of different possibilities as to why she, in fact, was lost. One of those things was the speculation that there was a circular torpedo run and it had come back and struck the submarine while she was in transit. To try and eliminate that scenario we inspected the shutter doors of the torpedo tubes, all of which were tightly shut. There did not appear to be that type of evidence that a torpedo had made a circular run as most of the deformation of the metal did not indicate that type of casualty. We looked at some other things. We looked at the possibility of a battery explosion. We didn't see any evidence that a one of the

submarine batteries had actually exploded. We looked at the possibility of a torpedo battery explosion in the forward torpedo room, but there was no evidence of that. By 'evidence,' what I mean is that there wasn't any outward deformation of the hull where it was evident that there was an explosion within the submarine. Everything was basically an implosion created by the increased pressure on the way down, thereby crushing the submarine. Our job was really to go out and take a good look at the wreckage of the submarine and try to determine from this list of possibilities what may have taken place. We pretty thoroughly exhausted the whole list and came away with no really concrete reason for the loss. We added a couple of possibilities to the list but today, we still don't know. We have no idea why she sank.

INTERVIEWER: Obviously, your career took some nice turns to that point in time, going from an enlisted man to officer and from there to the *Trieste*. Were there any people, or any person, who influenced you to make the decisions that brought you to where you were at that time?

DR. SAXON: Yes, there were. There was a lieutenant junior grade on board the *Carp*, I believe. His name was Pete Lonnegren, and obviously, he was called 'Studs.' Pete was a very, very good young officer, and one of those gentlemen who would really sit down and talk with those of us on board the boat. I was reasonably smart, I think and an extremely good radioman. I think that we both felt that it would be no problem for me to make Chief Petty Officer pretty rapidly. In fact, I think I was one of the youngest chief petty officers in the Navy when I made it. But his advice to me was basically, "Where are you going from there?" I really had not thought that through.

As a kid, I had gone to military schools. I enjoyed the military. I enjoyed that type of life and pretty much made the decision that I was going to stay in the Navy for a career. He was, I guess, the catalyst who got me thinking about the future and whether I wanted to be a Chief Petty

Officer for twelve years of my life. That was before the days when we had the E-8's and the E-9's. I think that as a result of that, if I'm not mistaken, he encouraged me to take an examination for Naval Academy Prep School, which I did, but I didn't pass the exam.

I had a previous opportunity to perhaps go to the Naval Academy Prep School. When I went through boot camp, I wrestled for the Navy. During one of the regional matches we had the wrestling coach from the Naval Academy was present seeking people to come to the Naval Academy and be on the wrestling team. You had to go to prep school first, though, which I didn't do. But Studs was, I think, the guy who really got me interested in perhaps try to become an officer and continuing my career in the Navy that way. The next individual I remember as much as anyone was Don Walsh. Don Walsh was my executive officer while I was on the *Bugara*. Don, likewise, was encouraging me to move forward and to do something else. There was another officer by the name of Joe Flynn. There was a whole series of gents in the submarine force who I think were really conscious of perhaps the capability of some of the people in the crew and tried to give us advice, help us out, and move us forward.

INTERVIEWER: From the search for the *Scorpion*, where, then, did your career take you?

DR. SAXON: After the *Scorpion*, I was talking to my detailer about what would be my next assignment, and it was a little bit up in the air. My detailer went ahead and programmed me into becoming the first executive officer of the new class of submarine rescue vessels, which were going to be ASR's-21 and 22; Pigeon and *Ortolan*. But because they were both being built at Alabama Ship Building, he detailed me to the Armed Forces Staff College. I went to Norfolk, Virginia and went through the Armed Forces Staff College.

I guess I have to back up a little bit. I neglected to state that prior to actually joining the *Trieste*, I went through the second class Navy diver school on 32nd Street in San Diego. By then,

I had picked up more diving knowledge and diving experience. The combination of that, the deep submergence activity, having been a lieutenant commander for about a year and a half at that point in time and having gone to Armed Forces Staff College had helped to get me into the *Ortolan* job. After the staff college, I went to the officers' course at Naval Diving Salvage School of Washington, D.C.

INTERVIEWER: What year was that? Do you remember?

DR. SAXON: That was in 1970. I graduated in the very early months of 1970. *Ortolan* was still in the building process and people were not yet being assigned to her, other than the commanding officer, who was Louis Tew. The commanding officer of the *Pigeon* was Jim McDermott. At any rate, there was still a holding period of time. Following the graduation from NSDS as a deep sea diving and salvage officer, I then went through the saturation training course in San Diego at the Submarine Development Group 1. I had been at Submarine Development Group 1 in somewhat of a TAD status for a period of time between *Trieste* and going back to the Armed Forces Staff College and worked with Cdr. Billy Delanoy and then Cdr. Don Disney. It was nice to go back there, see some friends and go through that particular kind of training. I then joined the *Ortolan* at the Philadelphia Naval Shipyard for outfitting in July of 1971. It was on July the 4th, as a matter of fact.

INTERVIEWER: Up to that point in time in your career, did you have any interaction with SeaLab?

DR. SAXON: I had interaction with SeaLab when I was at the Submarine Development Group One. The first time was prior to going back to the staff college. There were some lesser amounts of interaction when I went back there for the saturation course. There was some interaction after

we returned from the Azores deployment and brought *Trieste* back to San Diego for an overhaul. There was periodic interaction. I did not ever work directly with SeaLab.

INTERVIEWER: What are your thoughts about the SeaLab program? Was it good or bad?

DR. SAXON: My thoughts are all good about the SeaLab program. I think that Sealab proved not only the Navy, but to the world, a tool that we desperately needed in order to move forward and go into deeper waters, producing oil and gas in the offshore areas of the United States and other parts of the world. I think it proved the concept of saturation diving and that it could be done safely.

The problem with SeaLab was, I think, that it probably wasn't sufficiently funded. It may not have been sufficiently attractive to the general Naval population and I think that was borne out by the lack of use of the *Ortolan* and *Pigeon* as saturation diving-capable support vessels. I believe there was more emphasis being placed on submarine rescue than what diving deeply could do for the Navy. But that's in the past. SeaLab was good for us. It was good for the world.

I know there's been a lot of speculation as to why the program was discontinued and I really don't have a way to comment upon the discontinuation of the program. Maybe it had served its purpose. Maybe it was one of these situations in which people just didn't want to have it or the burden of the cost associated with it under the OPTAR budget.

INTERVIEWER: A lot of people offered the opinion that it was because we lost Berry Cannon, one of the aquanauts on SeaLab III, when the program shut down. Do you agree with that or do you think it was more than that?

DR. SAXON: I think it was more than that. I don't think the loss of a single individual, as tragic as it was, would have been justification to shut down the program. I think that perhaps that was an excuse as to why it was shut down.

I can give you a comparison based upon the experience I had with the *Ortolan*. With both *Ortolan* and *Pigeon* there was the reluctance of the task force commander to, if you will, include them into his fleet with some of the design inadequacies associated with those vessels and some of the difficulties we encountered in certifying them and the systems on board. They were just too much of a burden.

They weren't viewed as being useful working assets to the task commander, and I think that to a degree, perhaps SeaLab was viewed in that same way. People were wondering, "Well, what does this give us at the end of the day? How does this further the mission?" Perhaps it was just a little bit of short sightedness. I don't know. All those questions go through my mind. I don't think it was just strictly Berry Cannon, though.

INTERVIEWER: You will recall, I'm sure, that during that period of time, there was just a flurry of habitats being built around the world, from Europe to the Mediterranean to the U.S. to Japan. That seems to have gotten away. Is there a future for habitat type of operations now?

DR. SAXON: I think, yes. I think what we're starting to see, Don, at least in the commercial sector, is a resurgence of interest in things like habitats and small submersibles. Those were some of the tools that we had available, even though they might have been fledglings or maybe not properly designed or constructed back in the late '60s into the mid 70's. My view is that most of those tools, if you will, were designed and produced as only a single part of the whole equation that was necessary to support them in their operational environment.

Most of the small submersibles were built without any consideration to how you put them in or took them out of the water. How did you transport them when they were out of the water? The habitats, I think, were built sort of in a knee jerk reaction to the fact that people could go down and live in these things and do some reasonably meaningful work. I don't think that back in

those days the long-term usefulness or the plan to use that habitat was adequately thought through, and I think we're going to see more of them. But I would hope that the habitats are less permanent. If they're portable, they can be taken from one location to another. Perhaps they can be modular so that they can be utilized in a different variety of roles. That would be my answer to that. I think we're going to see more of them.

INTERVIEWER: You will recall that you and I were on a panel at the space center in Florida a couple of years ago. From that panel, the National Oceanic and Atmospheric Administration (NOAA) has gone on record as saying they see a need for habitats for ocean observation platforms. They want to have some ocean observatories in the form of ocean habitats situated around the country, maybe even around the world. Also, there was some talk of cross-fertilization, we might say, with NASA. NASA is looking at a similar habitat to put on Mars when they do the Mars missions. Can you comment on that?

DR. SAXON: I guess the comment on that, Don, is that basically, I'm not really sure they know what they want to do. It almost seems as if they're looking for an excuse to have these habitats, rather than having some form of a plan of how they're going to use them. The different factions in NOAA seem to have different aspirations as to what they would like to have and how they would like to use them and to a degree, that's normal. But I think that there are certain realities that need to be considered such as how deep can you put one, how large it has to be and what is going to be done with it. Obviously, the deeper it is, the more costly and difficult to support it logistically. Also, is it truly something that needs to fall within a NOAA purview, or is this perhaps something with which you might have some commercial association? The problem with NOAA, in my way of thinking, is that it is sort of seeking an identity that was assigned to it but never realized. NOAA is the National Oceanographic and Atmospheric Administration and

should be recognized as such. Its' value, much like NASA, is highly important if properly funded. Unfortunately there appears to be an absence of dedication to our oceans; the purview of what NOAA is all about. But it isn't recognized that way. I think NOAA has to fix its own shop before it starts embarking on programs for things like habitats and so on. Essentially, it's a good idea, but I don't think it's been thought through thoroughly enough. I think it's just the mentality of, "Well, if you give us the money, we can do this. We can justify more and more money by having larger or more habitats." What are you going to do with them?

INTERVIEWER: That's a good point. Now, let's go back to the Navy. The deep submergence rescue vessels (DSRV) are now being put out of service.

DR. SAXON: Yes.

INTERVIEWER: In their place will come a new system for submarine rescue called the 'Submarine Rescue and Diving Recompression System.' What is your opinion as to the utility of the DSRV during its service and the new system that's coming in its wake.

DR. SAXON: At the risk of having a lot of people throw a lot of things at me, I think it was a total waste of money. In the history of submarine rescue, we've had one, the USS *Squalus*, in 1939 in shallow water in the Long Island Sound. It was a magnificent accomplishment and proved that we could do something. Since then, we've had no submarine rescues, per se, but we've sure thrown an awful lot of money at it. My personal belief is that we're putting a lot of money and energy into it, more for political reasons than for practical reasons. We want to be able to tell Johnny's mother that we have a system that can rescue her son when in reality, we can't rescue her son. Our submarines go faster. They go deeper. They're in waters in which I don't think we can do much, in terms of submarine rescue.

I think that if we're going to have some form of a system associated with submarine rescue, it should probably be a McCann Bell much as was used with the *Squalus* and was the primary system in place for many, many years. I think they should be relatively simple devices that are perhaps pre-staged on government owned, but perhaps civilian operated vessels, with a given range of capability or distance that could be traveled within 24 hours to reach the scene of a relatively shallow submarine casualty, perhaps in the harbor or in depths of up to perhaps 600 feet and reasonably close to the shore. But I think we're throwing a lot of money at something that, to me, doesn't make sense. I say that as a diver, a submariner, and now, a person in the commercial industry. I never felt, when I was a submariner, that submarine rescue was something with which I should concern myself.

INTERVIEWER: How about what we might call the 'adjunct equipment' that has been developed over the years for submarine rescue or to assist in submarine rescues, like what happens to your diving suit. I mean the submarine escape emerging equipment and the British Submarine Personnel Escape System and those kinds of things. What's your opinion of those?

DR. SAXON: Well, let's talk about the emergence system developed by the British. Basically, it is a much more sophisticated Stenke Hood. I don't know that it had a great deal of value to anybody other than the application for which it was designed. The hard suit, the one atmosphere suit that can go down to 1000 or 2000 feet, depending upon its particular version, wasn't developed, at least to my knowledge, for submarine rescue. It has since been considered as one of those tools that might be used to connect a down line or other line devices to the submarine, but it was really developed for oil patch activity and is used in a variety of different ways. It can be either a suit for the operator (normally also a diver) or a suit that has propellers attached to it or thrusters attached to it so that it can be utilized in the mid-column or be relatively mobile. I

don't know that the submarine rescue activity in which any other nation or we have been engaged has really produced any useful or meaningful tools.

INTERVIEWER: In your career with the Navy, what one achievement brought you the most satisfaction?

DR. SAXON: Wow. That's a wonderful question. It's a tough question to answer because my whole career was a response to challenges and wanting to keep moving forward. It's really a toss up between making Chief Petty Officer at quite a young age and probably being one of the best radiomen in the Navy. It's a tough question.

INTERVIEWER: It's an interesting response, but a good one.

DR. SAXON: Thank you.

INTERVIEWER: Looking now at your total career with the Navy, what would you single out as having the most value to the Navy?

DR. SAXON: In terms of my contribution?

INTERVIEWER: In terms of your contribution, yes.

DR. SAXON: There, again, is a tough question. I think it was my dedication to the job, whatever the job was. I was just doing the best I could at whatever I was assigned to do.

INTERVIEWER: That held true throughout your career?

DR. SAXON: Yes.

INTERVIEWER: Was that something you feel you might have been born with? Did your dad teach it to you? How did you achieve the 'I'll do the best I can' kind of posture?

DR. SAXON: It's probably something I was born with. I think it reflects a personal confidence in or commitment to enjoying what I do, to work to improve something, to respond to a challenge. It's just a trait inherent in the way I'm made up.

INTERVIEWER: That's good. I'll accept that. With your career in undersea activity for the Navy, is there anything that you regret? Was there a disappointment that you would like to go back and change?

DR. SAXON: Do you mean something I did personally or something the Navy, the environment or the situation created?

INTERVIEWER: It can be either.

DR. SAXON: Okay. Yes. I think that the greatest disappointment that I experienced in the Navy was related to the building and commissioning of the ASR-2122 class submarine rescue ships. The waste of time and the lost opportunities to those who were involved in those programs was awful. That came about because nobody, at least in my estimation, had a clear-cut vision of how the ship should have been used as a diving platform or as a platform for additional ocean research. The programs associated with the building and certification of the ship delayed for years its entry into the fleet as a viable asset, during which period of time, a lot of people associated with those programs got tired of being there and said, "Let me off of here. I want to go somewhere else. I can't put up with this anymore." Many of those in the program lost their skills. It was the impact on people of those programs that were so poorly handled, in my estimation. It did a great injustice to people and to the United States Navy, in general. That was the thing I regret the most. It probably what caused me to retire.

INTERVIEWER: Where did the fault lie?

DR. SAXON: There were too many managers, too many people seeking stature. There was too much bureaucracy and no coordination. There was a lack of a clear-cut mission statement. There was a lack of foresight and certainly; an overly complicated and overly aggressive "certification": system that led to delays and inefficiencies..

INTERVIEWER: Thinking over your career in terms of the constraints under which you lived, and we all have those constraints, I'm sure, what personal decisions would you change if you could have?

DR. SAXON: Do you mean in terms of decisions related to my naval career?

INTERVIEWER: Yes.

DR. SAXON: I would not have turned down an early command in order to go through the new construction program with the submarine rescue ships.

INTERVIEWER: That command would have been?

DR. SAXON: It was a smaller submarine rescue ship.

INTERVIEWER: Why would you have changed that?

DR. SAXON: Well, it's all hindsight, but there was a promise made to me and my opposite number on the *Pigeon*, as the first two executive officers of those ships, that we were to change coasts at the point in time when the commander officer's tour was up, and we would each take command of the opposite ship. That didn't take place. Neither of us had that opportunity. People coming down from the staff took those commands.

I thought that was poorly handled and in retrospect, if there were something I could change, I would have opted to take an early command and not have been involved in that particular program. Perhaps I would have remained in the Navy for thirty years. I don't know.

INTERVIEWER: You would change that even though your naval career might have terminated earlier than it would have had you made that change? When you left the service, you were qualified to drive more vehicles than anybody else in the Navy.

DR. SAXON: That's right.

INTERVIEWER: Name those and what they did.

DR. SAXON: Well, I was qualified for the command of surface ships. I was qualified for command of submarines. I was a certified deep sea vehicle operator. I was a qualified saturation diving deep sea HEO₂ officer. I was, at that time, the only officer to ever have achieved those joint qualifications. It know it has also since been done by at least Rick Williams who retired as a Captain.

INTERVIEWER: That does give you some sense of satisfaction, I would think?

DR. SAXON: It gives me tremendous satisfaction. It also gives me a certain amount of regret that being specialized in those areas may have inhibited where I went in the Navy afterward. That was back in the days when the submarine force was going through a tremendous upheaval, with the demise of the diesel submarines and many of the diesel submarine officers not having opportunities for upward movement unless they went outside the force. There was a certain concern about specialization, as it were, as something that perhaps limited future opportunities as a naval officer, although I did or was informed. I don't know. I can't verify it because I had been deep selected for commander after I had made the decision to retire because the board met at some point in time after that.

INTERVIEWER: Don't you also think that those kinds of qualifications came into play and held a significant role in the decision to accept you in your current position as the head of the ADCI?

DR. SAXON: I think they had a bearing upon it. I think those qualifications made it much easier for me to make the transition into civilian life and hold the positions that I did between my retirement and when I actually took this position. They were all part of the learning process and very valuable.

INTERVIEWER: In your career with the Navy, what do you see as the most significant advancement in undersea technology during your career? You wouldn't necessarily have to have been a part of it.

DR. SAXON: That would be the SeaLab program and the development of Remotely Controlled Vehicles. Our ability to use saturation diving techniques and put people deep and bring them back safely was a very important advancement and although we had two very preliminary ROV's designed and built for the Trieste operation their promise was evident.

INTERVIEWER: Would you say those were the most significant advancement in undersea technology in the last century?

DR. SAXON: In my estimation, they were.

INTERVIEWER: If all barriers and layers of bureaucracy one must sometimes go through had been removed during your Navy career, what would you have been able to do that you never could?

DR. SAXON: Wow. Honestly, I can't think of anything, Don. I don't think that the barriers that were in place prevented me, as an individual, from continuing to move forward. I think that the system had difficulties. I think the system had built-in biases. I think that the system sometimes made it much more difficult to do one's job, but I think that there was always a way to progress through that system to achieve the desired goal. I don't think there were any barriers, or nothing that was insurmountable.

INTERVIEWER: Excellent. For the last half of the last century, most people would say that the U.S. Navy was the world leader in diving. It seems today that is no longer true. Why do you think that is not true?

DR. SAXON: Well, I think it's probably based largely on the fact that the necessities of civilian industry have caused a real growth in the ability to service requirements. They have been brought about by the oil and gas pursuits off of our coasts and our requirements to maintain bridges, dams and all these other various water-served, water-borne or water-surrounded structures. To do so, we've developed equipment. We've developed techniques. We've developed training patterns. We've developed a cadre of personnel able to do those jobs in very, very efficient ways. In the civilian world, to go out and do a deep saturation diving job, we can mobilize and be on station within 24 hours with our personnel already down under pressure. It's impossible to do in the Navy because of all of the various checks and balances and just the procedures that are in place. We have a necessity to move much more efficiently and rapidly and with fewer personnel and with equipment that has been proven in the field rather than equipment that just meets some mill spec requirement. If we weren't able to do that, our companies would no longer be in business. To me, that is the greatest reason for the failure of the Navy to be recognized as the supreme source of diving. They are not. They just don't have the jobs to do that we do. They don't have the equipment. They don't have the personnel. They are a mission oriented force rather than a commercially oriented force.

INTERVIEWER: Following on that thought that you just voiced, let's think about the future as we conclude this interview. What is your vision for the future of U.S. Navy diving? Does it have one? If it doesn't, where should it go? What direction should it take?

DR. SAXON: I think my vision for the U.S. Navy diving force would be to establish a much closer working relationship with the industry into which many of these young men and young women are going to move when they finish with their naval service. In order to do that, the Navy's divers have got to understand the difference between the military applications and the

commercial applications of diving. How can we achieve that? Perhaps we can achieve that by having some of the youngsters entering into Navy diving going through commercial diving training. Let them show that they understand what it takes to work in the water, rather than just dive in the water. We need to talk more. We need to communicate more. We need to interrelate more. We need to make sure that our mutual problems are being addressed in a mutual manner, rather than the Navy going off on one tangent and us going off on another. We have tried to do this and to a degree, we've been somewhat successful. We are now issuing the Association of Diving Contractor International Certification Cards to qualified Navy divers so that when they come out of the Navy, they have an entry mechanism into our commercial industry. We have asked them and invited the Navy to come to our Underwater Intervention shows for quite a few years now. We provide them a booth at no cost so that they can come to our show and interface in the industry.

The mechanism is there to start this communication and we've just got to keep continuing these efforts. To me, that's the direction of Navy diving. With Navy diving, when it's necessary to have an individual to fulfill a military mission, he or she needs the training to fulfill that mission. If the Navy just wants to have a large pool of divers to do the equivalent of commercial activity on vessels, piers and structures and things of that nature, ship's husbandry, I'd want to send them through commercial diving training or farm out the job to the commercial folks.

INTERVIEWER: Then you would view an important aspect of the future of Navy diving as having some sort of a partnership with the commercial industries?

DR. SAXON: Absolutely. I think without the partnership, the young folks involved in diving in the Navy don't have a place to go when they get out of the Navy. Now, the partnership has got to be strong. It's got to be recognized, and it has to, I think, take into consideration that many of the

Navy divers, especially as they become more senior, first class petty officers, chief petty Officers, officers, are being trained to be good managers, and they need to realize that. When they're getting ready to come out of the Navy, they need to realize that when they enter civilian life, they ought to be going in as managers, not as people who can merely get in the water to do a job. If they've got the diving background and know what the diving is about, with safety and management, they'll be able to move into management because the companies are looking for them. They want them. Too many of the people coming out of the Navy send me resumes that read, "I want to go diving." I will generally call them on the telephone or write back, "No. You don't want to go diving. You want to go into management and manage diving, because that's what you're trained to do."

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UNDERSEA HYPERBARIC MEDICAL SOCIETY

INTERVIEW OF
CAPTAIN RUSTY MIRICK

Kensington, Maryland

Monday, September 8, 2003

PROCEEDINGS

CAPT MIRICK: I'm Captain Rusty Mirick, United States Navy.

INTERVIEWER: Sir, could we start with a summary of your career?

CAPT MIRICK: Sure. I was appointed to the Naval Academy from my hometown, Lancaster, Pennsylvania, in 1975. I graduated in 1979 after doing initial diving training in Coronado, California, as a midshipman in 1977, which was an introduction to SCUBA, basically. Following my graduation from the Naval Academy, I pursued ship tours on a fast frigate, the USS *McCandless* (FF-1084), a submarine rescue ship, a salvage ship, and eventually commanded a salvage ship in 1990, the USS *Hoist* out of Little Creek, Virginia. I had a number of shore tours interspersed with sea tours and shore tours that comprised the latter half of my career. I've served in Washington, D.C., Guam, and Hawaii. I'm currently stationed in southern California at the Naval Weapons Station, Seal Beach, where I'm the commanding officer of the Seal Beach Naval Weapons Station and the Assistant Chief of Staff for Ordnance and Explosive Safety for the regional commander, based out of San Diego.

My career has been dedicated to diving and salvage. That's my expertise through my training and operational experience. It has been highlighted with numerous fleet-level, major salvage operations, successful salvage operations over the years. I'm married and have four daughters, my wife and I do. That's the outline of my career to date.

INTERVIEWER: Sir, when we were speaking before, you mentioned submarine rescue and certifying SAT system on the USS *Pigeon*, right? Would you tell me about that, sir?

CAPT MIRICK: Sure. I got to the *Pigeon* after graduating from the Navy Dive School in Panama City, Florida in 1983, having finished the basic diving officer course, the salvage officer course and the mixed-gas course. All that was left for training for me was to go to SAT school. When I reported to the *Pigeon* in 1983 as First Lieutenant, I relieved an officer who was

removed for cause months prior and took over a department that hadn't had a junior officer to lead them in a number of months. We were in the yards to boot. SAT school was local and about two months in duration. It didn't take me too far from my unit except that I was not undergoing the rigors of shipyard duty.

I graduated from SAT school at the end of the summer with my classmates and reassigned myself to the *Pigeon*. Soon, we were out of the yards and ready to finish what we had begun before the yards, which was what we called 'sliding 850.' It is basically a progression of deeper and deeper dives to demonstrate the full design capability of the ship. It had never been done before with the Pigeon class. The Pigeon class was comprised of two ships back then, the USS *Ortolan* and the *Pigeon*. The *Ortolan* was following our progress closely because they were next. We were going to break the ground and they were going to certify faster and in less time with less money, hopefully, than the lead class ship.

We were successful in conducting dives progressively deeper off of Point Loma, off of the southern California coast. Eventually, I was responsible, as First Lieutenant, to put us in a moor in a thousand feet of water for the final certification dives to 850 feet under the Naval Sea Systems Command certification authority. We were on board for the final demonstrations of the conventional diving suit with mixed-gas capability and the saturation system. Unfortunately, what turned out for the history of the class of ship, only a brief time...a matter of a year or so, and we had an ASR 21-class ship fully capable.

INTERVIEWER: Were you able to dive on any of those sliding 850s?

CAPT MIRICK: Yes. I supported, as a watch-stander, some of the certification dives and demonstrations, which included an SRC, rigging and deployment and recovery, both the port and starboard DDS, the chambers that were resident in each hull of this catamaran ship.

INTERVIEWER: You had two dry-deck shelters, deck decompression chambers?

CAPT MIRICK: We had them at both port and starboard.

INTERVIEWER: I didn't know that.

CAPT MIRICK: The one atmosphere, they called it the 'observation mode' for the PTC, which was a design thing that was rarely used. But it was an initial capability, so we had to demonstrate it. Of course, to do any real world water excursions, of course, one needed to use the PTC and its principle function to get divers in the water column, which demonstrated that, the 850 feet. We also had to demonstrate surface recovery of a Deep Submergence Rescue Vehicle (DSRV) and underwater mating and all of that procedure. It took a lot of time and a lot of effort. It began way before I got to the ship. The timing of my arrival was neat because I got to see it all come together.

As for diving, I don't recall any significant contributions as a diver. That was more the chiefs' and first-class petty officers' chances to shine, and they did great. The officers were few. The saturation-qualified officers were very few. It just the Commanding Officer (CO), the Executive Officer (XO), the deep submergence officer, the ops boss, the engineer and myself. That was it for the whole ship. We were dedicated to the topside watches.

INTERVIEWER: How long were you off at Point Loma, doing your thousand-foot moor and 850-foot dive?

CAPT MIRICK: That would have been a two-week evolution. We were in and out a lot, in and out of San Diego. Right here at EOD Mobile Unit 3, I'm looking at the Coronado Bay Bridge and we're directly across from what is still called the 'Mole Pier' at 32nd Street. That was the home of the *Pigeon* and the home of Operational Mark II, Mod I saturation system operations. We did everything right out of 32nd Street. We'd get liquid oxygen load top-offs from Ballast Point, the

submarine base. We might get some oxygen clean level work done by the tenders. We had both the *Dixon* and *McKee* in port at that time. But other than that, even though we were a SUBPAC asset, belonging to the Submarine Development Group One, our home is what I'm looking at right now during this interview, Mole Pier at 32nd Street.

INTERVIEWER: After your system was certified, what type of operations did you do in training?

CAPT MIRICK: We weren't too sure into what operations we would get. We were busy with the certification cards that were issued by NAVSEA, which were not showstoppers but discrepancies. That ship's force was responsible to correct them, some of which would take a lot of money and a lot of time at the Long Beach Naval Shipyard. Others were more administrative in nature.

That consumed a lot of the work. When we did get underway, it was to keep ship's force and the ship's divers trained up and to augment the *Elk River*. Within 12 months of certification, it just so happened that the *Elk River*'s main propulsion machinery went down which required a C-4 casualty report. The *Pigeon* was the only surface saturation platform to qualify the students. We took over that additional role.

By that time, I was deep submergence officer and attendant. I had been relieved by a fellow named Mike Donch, who's also a Navy Captain, 1140. As deep submergence officer, I suddenly became the schoolmaster, something I hadn't anticipated. The training requirement was significant, but the operations are also what made the job special. The operations that I recall sometimes involved the conventional diving mode, typical of salvage ships in the southern California area. It all came together for us when the Mark V system failed one day off of Point Mugu and a telemetry round of some significance, and certainly some serious monetary value,

was lost. There was a general location, but the Mark V recovery system failed because the seal had a cold. The Department of Defense (DoD) gave SUBPAC a call and the Navy had to go to its next best thing. "If the sea lions aren't working, maybe saturation divers could," they figured. With the Mark V systems, the sea lion Marine Mammal Systems were recovering deep objects.

We gathered our tools of the trade. The crew was excited to get underway on a real job, for which we had no canned scenario. It was a real thing and the ship performed superbly. That was an operation we conducted in December of 1984 and finished in January of 1985 off of what is now the naval base for Ventura County. We were in the sea range for the Point Mugu Naval Air Station. We were successful in finding the warhead. When I say 'warhead,' I mean the telemetry round, which was buried in the mud. It wasn't something a sea lion could have gotten anyhow, because of the position of the hardware in the mud. We were able to, with SAT divers, recover it, get it on deck, and pass it on to the folks that needed the data.

INTERVIEWER: What was the depth of the water?

CAPT MIRICK: The depth of the water was about 250 feet. It was written up in that faceplate article that we were talking about before this interview. Unfortunately, it was put in a safe place. It's still safe. It's still there and I can't find it.

INTERVIEWER: We've got a pretty good collection at the Navy Experimental Diving Unit (NEDU)..

CAPT MIRICK: The 1985 faceplate features a front elevation, if you will, or a forward-looking picture of a stylized, 21-class ship on the front cover. Somewhere inside, the pages depict the entire salvage job on that particular weapon.

INTERVIEWER: How did you locate the weapon?

CAPT MIRICK: There were a couple pingers set in the general location by the DOD. They were able to localize the ordnance. They were just not able to recover it. We picked up the frequencies, added our own pinger matrix, and went to work. The conditions were such that divers had to get to and from the search area with line. I remember the line getting entangled with the stage and how it hung below the PTC, which doubled as a weight to keep the PTC orientation correct. The PTC was a ball with an open bottom. You wanted the open bottom pointing down. That's what the stage's job was, and it was over a thousand pounds of lead, basically. It hung from the PTC with four wires, if you get the picture. Those wires became a source of entanglement for all the lines. That was stressful because divers only had so much time for excursion before the lack of heat became a major factor and they had to be recovered. You couldn't recover them if they were tangled and there was no one down there to untangle them but themselves at the saturation mode, at that depth. That was the major challenge to this operation, but it came off very well. It was one of those things the whole crew could rally around. It was real world salvage.

I have another example. It was earlier in the year, which was why the crew was so keyed up for the salvage operation that I'm retelling. If you back up in this conversation six to eight months, we had an unsuccessful salvage operation. It was unsuccessful on several levels. The Coast Guard kept losing a weather buoy off the entrance to the San Francisco harbor, maybe 15 miles out at sea. There was something unique to this buoy. We were told it was because fishermen kept purposefully sinking it because it was in the way of their dredging or long lining or whatever business the fishermen had.

Whatever the reason, the sailors down in mess decks made up their own reason for this buoy. They said it was part of our nuclear deterrence, that there was special equipment on the

buoy and that was something that only a cynical sailor could come up with, as to why they wanted it back. The Central Intelligence Agency needed it or whatever.

Well, I wasn't so cynical. I believed the cover story was that they just needed the buoy back for an admiralty claim against fishermen. Nonetheless, that was the salvage project. It was in about 200 or so feet of water. The USS *Florican* was assigned the job, and she was capable of doing it. Unfortunately, there were some equipment, depth, and weather problems, and the naturally occurring cold water and current all combined to be, unfortunately, a fatal dive for one diver. If you're thinking of the USS *Safeguard* accident in the early nineties, or mid nineties, it was the same kind of thing. This was in 1984. The surface supply diver got entangled and tried to ascend, either being pulled up, or it was on the stage. The harder you pulled up, the more force was pulling down because the diver was entangled on the bottom, if you get the picture, by the umbilical. The umbilical was no longer a route to safety and the surface world and the umbilical became the forces that kept the diver down on the bottom. That drowning scenario was what played out on that job for the *Florican*, and that was exactly what was replayed for two divers, I think, on the *Safeguard* almost a decade later.

The point is that when we went to this job, the saturation divers made a bronze plaque dedicated to the *Florican* crew and those lost in that operation, the one guy. My crew was very solemn. We were realistic about the chance of getting this weather buoy back. It was quite a large disk-shaped buoy with tons of gear on it. To re-float it would have required a classic salvage technique. It was not at all an elementary procedure of recovering a little buoy. It was pretty heavy duty. The Navy had already spent significant resources and the cost of divers.

Up we went and laid the four-point moor. We got ready. We loaded the divers in the DDC, and they were given a 12-hour order from me to get in the PTC to go in the water column. The commanding officer put a hold on loading the PTC, which would have immediately resulted in getting those divers in the water column to go to work. Instead, in the DDC, they were on board the ship. They were comfortable. They were getting their meals. They were safe. That was where the CO wanted them because he was watching the weather and sure enough, the surface weather hampered our operation and we never did get anybody wet for that one. We had to recover all of our preparatory salvage equipment and steps we had made as we briefed. We had to reverse everything and keep the divers on board. About ten hours later, we were in a full-fledged gale force storm that had suddenly erupted outside of San Francisco.

We tried to recover the moor to flee the storm, but the weather was too rough to even deal with the four-point moor. A four-point moor is basically a length of chain at four points, terminated by a buoy, to which the ship is tethered in by a ten-inch nylon line. Ten inches is a very significant diameter. Most ships don't work with that kind of large dimension. This ship was designed to handle that, but not in sea state six and winds gusting to sixty miles per hour, and that was what we had. All we could do was sit almost helplessly and watch those lines part, one at a time, and they did.

It was a good call by the captain to not deploy in a diving mode. We would have had to recover them in a hasty fashion. It would have added a complication to an already bad situation. For the weather buoy operation, again, divers didn't get to play, but we were being blown out of a four-point moor, watching those lines part with explosive force. I'll let somebody else's oral interview explain the latent power behind a nylon line stretched to its breaking strength and

suddenly released when it parts. I'll let somebody explain the physics and what the feel and smell of it are like, but it was very scary.

Finally, because of Mother Nature, when the last line parted, we were free of the moor whether we liked it or not. We were able to make way for safe haven and recover our four legs when the weather cleared without incident. That was our first foray into real salvage after we certified it.

While I'm talking, there was another chance to excel. But those were the two big operations, the weather buoy and that one to two-year time frame of it being certified, and the successful recovery of the telemetry round.

INTERVIEWER: You mentioned that throughout the course of your career, you've been involved in several successful and significant salvage operations. Could you tell us about the more memorable ones?

CAPT MIRICK: Okay, I will, but let me just go back to the *Pigeon*. Our only rescue in my one and a half years on the *Pigeon*, before I got moved early to go be Executive Officer on the USS *Bolster*, an old salvage ship out of Long Beach, was the rescue of one of our own assets. We were aware of mother sub and deep submergence rescue vehicle operations in the Southern California operations area. We were assigned to be topside support. There is a backup procedure that requires a ship with a recompression chamber to be on standby in case a real emergency occurs because of some emergency procedure that a submarine crew will have to employ if something goes wrong. It is not routine or planned for, but we were there if the plan went awry.

To our surprise, in the middle of the night, we got an SOS call from the DSRV, which was on the surface. The submarine directed us to a position where they last held the DSRV. They were starting sub-miss, sub-look procedures, which the USS *Thresher* accident made famous, at

least within our own Navy, if not internationally, because of the international protocols of sub-miss, sub-look. It was an agreed upon thing with our allies.

Suddenly, we found ourselves really missing a submarine. It was our own DSRV, either the *Mystic* or the *Avalon*. I think it was *Avalon*. Both had their home ports in North Island. The Officer-In-Charge was a Lieutenant Commander Bill Pigg, a well-qualified submarine officer, a nuclear power officer. The DSRV was in great shape and operated with the mother sub that day. It was routine training for them. They had built up for it and looked forward to it.

Anyway, the submarine communicated with us and we transited the five miles or so to get to the exact point, conducted some basic searches and made sure the mother submarine could hear us. We had the ability to make some noise, so we did. We tried the underwater telephone to hail the DSRV, but we didn't have any update on her.

We were two hours into sub-miss, so we knew the Chief of Naval Operations was being personally briefed, if not higher, and the 'pucker factor' was getting up. Suddenly, the aft lookout, and I'm not kidding, the good old Mark I Mod O eyeball spied this light that didn't fit in with the rest of the fishermen and the stars and whatever was out that night. It was a strobe from the DSRV's sail.

We closed the distance and tried to establish communications. We were in a sea-state 3 and a half. We realized that after we exchanged information, we had to do an emergency surface recovery of the DSRV. Emergency surface recovery had never been demonstrated before. It wasn't a part of the sliding 850 Mark II, Mod I saturation system certification by NAVSEA. It was simply an untested Emergency Procedure (EP) that was theoretically supposed to work.

To NAVSEA's credit, some of the design considerations for the *Pigeon* and the DSRVs took into account the emergency surface recovery, but it had never been tested. It wasn't even

practical. In fact, the plastic mock-up of the DSRV for rehearsing watch standing and handling training of sailors was only after this incident. It was pretty early on in the DSRV days of operation.

Anyway, to get back to that night, it is a story that ends well. The point is that we were outside of our parameters for conducting the emergency procedure. It required a NAVSEA waiver to conduct it. I made my recommendations as the deep submergence officer to the CO that we could recover the DSRV safely. I made them aware that we were outside the specifications and let him handle the communicating with the chain of command. I really can't speak to that. The CO, at the time, was Commander Bill Shotts. Commander Steve Cleal relieved him. Cleal was the CO for the salvage operation. I think Bill Shotts was the CO for the DSRV recovery. But it quickly became apparent that it was a specialized task and had never been done before. The people on deck who knew how to do it were me, my weight-handling officer, Chief Warrant Officer Steve Miller, and BM1 Dehart and the rest of the pirates. Steve Miller specially selected that group. They were their own division, called the 'weight handling division.'

The ship had a condition one recovery, which was their general quarters (GQ) for this contingency, much the same as a destroyer might go to condition one for ASW operations to defend itself from an attack submarine. We had a condition one for rescue of our own DSRV. We manned that and went to work.

Getting lines to the DSRV, getting her situated and using the ship's propulsion because she was dead in the water, were quite challenging in the middle of the night. We called the DSRV a 'pickle,' by the way, because Lockheed Martin's design was rather cigar shaped and the green color scheme that was adopted in the space age years of the seventies. Everything had a certain look to it back then and a certain design or flair because of the aeronautics industry, which was

just booming at that time, in the late sixties and early seventies. We inherited something that would do just as well in space as underwater, I think, and the sailors termed it the 'Pickle.'

The Pickle's skin was dinged in a couple places as we manhandled her with hausers and tended the line into a specially formed cradle dolly that deployed to forty feet underwater, which was the normal mating regimen for the DSRV. Once we secured the cradle dolly, it was recovered by four points, four wires, up into the center well area. That was why the catamaran design was suited for the DSRV. Only the emergency surface recovery, its cradle dolly, wasn't behaving correctly. In a sea-state three, it was rough. The ship handling was difficult. The Pickle itself was not particularly patient with us.

I skirted around the deck, yelling at Steve. Steve skirted around the deck yelling at his people. We were primarily concerned with the safety of the operation, and it was pretty unsafe. We had people in the way of lines because by the design of the ship, there was no way to get out of the way of tension lines. The lines had to be tensioned to keep the DSRV under control. Things worked well enough that we were able to get her into the cradle dolly, recover up to the deck level, which meant that she was high and dry and we could start dealing with her problem.

It turned out the emergency surface recovery decision was about the only option we had, other than letting her sink because her life support had failed, or failed enough that she had to surface. Once on the surface, the sea-state was so rough that the hatch was needed for the climate control and oxygen for the inhabitants. But the hatch also was an entrance for water. Since she didn't have propulsion, because that would have taken away from life support, she couldn't manage the sea-state. She was taking on water, the lesser of two evils, instead of having her crew expire from lack of oxygen.

We were working against the clock. We were out of our league, in terms of the sea-state, but for all that, the next morning, Commodore 'Bullet Head' Mauer, from Submarine Development Group One, came down to the ship. I think we were asked to return to Ballast Point so that the safety investigation could be done more efficiently. It was at Ballast Point when the Commodore came aboard ship the next morning and looked at my dragging, tired, unkempt-looking batch of sailors of the weight-handling division and wanted to hug them all, but ended up putting a Navy achievement medal on Steve Miller's shirt. The rest of it is probably unspoken and unwritten history, except for this reporting.

Although the DSRV was in trouble, like anything else, once she was recovered, things quickly went back to routine. I'm sure the CNO and others started worrying about more pressing issues. Frankly speaking, I think for the chain of command, it was something they preferred to just handle as an operation and as a win, and not self-flagellate over it. There was no self-flagellation and very little written about it. The story needed to come out. The heroes of it were the people in the weight-handling division of the *Pigeon* in 1984, Steve Miller and company. Hoo-ya! As for the other salvage operations, I'll just give you highlights. Maybe I'll provide some people resources to go to for more information.

The USS *Hoist* safely recovered the USS *Bone Fish*, which surfaced after a severe fire in her battery room. Sailors, tragically, were lost in that fire. The ship would have been lost were it not for the *Hoist*. It is an example of a salvage ship conducting what submarine rescue ships were designed to do. That was in early 1990, before I took command.

Another significant operation that happened while I was in command of the *Hoist* in 1991 and 1992 was the handling of the mass conflagration fire on the Tunisian flagship *Inkhad*. She was in her homeport at the time. A fire broke out in her deep fat fryer. The crew abandoned ship.

It's not clear that everybody was on board at the time anyway, but whatever crew was on board that weekday evening abandoned ship. The *Hoist* went to work when the quarterdeck watch spotted orange smoke and orange flames emitting from one of the mid-ship windows on the Tunisian flagship.

That flagship, by the way, was an old U.S. Navy Destroyer Escort (DE). We sold it to the Tunisians in the eighties and it was reconfigured to meet Tunisian Navy standards, which included tons of wood veneer and fabric, which would never be allowed on a U.S. Navy ship. But they were part of the culture and the tradition of the Tunisian navy, a very proud navy with exploits in World War II. I'll let somebody else tell that. But the point is that they were proud of their DE, the *Inkhad*.

The fire that ensued would be what our Navy calls a 'mass conflagration.' It took all the resources of my ship, my hundred man crew, in terms of fire parties, de-watering parties. All the workboats were in the water. I commandeered two harbor tugs to control the skin temperature of the ship, which was peeling paint. We had whatever Tunisian ship's force we could find and we communicated in our best French, English, and Arabic derivations. We explained to them that they had to offload small arms so that the ship's company deserved credit for putting themselves in harm's way by offloading ordnance that could have cooked off.

Meanwhile, the *Hoist's* crew was busy with the business of fighting a fire for six hours, a bravo fire that had turned into a huge alpha fire throughout the ship. The ship was saved. She took on a list because of the firefighting water we put in and on her. We de-watered that and helped solidify Mediterranean allies during the Cold War, when examples of the U.S. reaching out to northern Africa countries were slim and enemies far outnumbered allies in that part of the world. It was not looked upon as a great salvage feat, but at least it was a huge diplomatic coup

in a time that our government needed it. I was also the salvage officer for the terrestrial disaster of KAL Flight 801 that crashed on Guam on Nimitz Hill in 1998. Do you remember?

INTERVIEWER: Yes. It was right after I left Guam, so that's about right.

CAPT MIRICK: I'm respectful to those lives lost, but I want to add an editorial comment. The experience prepared me for being a salvage officer once again, for the crash of Alaskan Air Flight 261, which was a maritime crash in the Channel Islands preserve off of Port Hueneme, California in 2000. When I was chief staff officer for EODGRU in San Diego, I found myself TAD, as the Fleet Salvage Officer, and in charge of salvage assets once again.

When the Supervisor of Salvage, Captain Burt Marsh, came on the scene, we were already one or two days into the operation. He was delayed getting there because he was still dealing with three salvage operations: TWA 800 off of Long Island; Egypt Air; and Swiss Air. Of course, the operation was seven times deeper than TWA 800, which crashed in about 120 feet of water. There was over 700 feet of water where that Alaska Air flight crashed in 2000.

The heroes of that, again, were the members of Submarine Development Group One. It had been renamed 'Submarine Development Squadron Five' in the ten years I'm skipping in this oral interview. Submarine Development Squadron Five still had its unmanned vehicle detachment based out of San Diego and had, from what I remember working with when I was on the *Pigeon*, new and improved equipment. The sailors were up to the task of deploying. The ROV *Scorpio* and the remote vehicle *Deep Drone* eventually showed up. We had motor vessel *Independence* under contract with NAVFAC. We had the USS *Cleveland* as our command and control ship, and we had a Federal Aviation Administration-patrolled bubble by the Coast Guard. We had a great staging base at Port Hueneme. We contracted a crew boat to run back and forth at the site.

With M/V *Independence* and ROV *Scorpio*, we were able to recover the famous flight data and cockpit voice recorders in short order. The jack screw suspect flaw that caused the stabilizer to make the plane crash was all surmised in guesswork in the first 36 to 78 hours but was confirmed when the unmanned vehicle detachment picked up the smoking gun, if you will. The helical, shard piece of brass from its mating fitting on the stabilizer, was still intact. There was amazing piloting done by the young enlisted man at the helm of this ROV. He recovered the item back from 700 feet so that the materials scientist and the National Traffic Safety Board and other experts could really get a first good feel, within the first couple days, of what went wrong on that flight.

It took a year of investigations, as all such investigations do, but it bore out that the initial hunches were right. The whole fleet of MD-80s and military variance of the civilian aircraft, which were widely in use, were all grounded and restored to carrying passengers to the United States, commercially, within days. It came down to a compatibility of lubricant with the helical screw and how frequently one checked it or did the lubrication.

That is a highlight of some of the major salvage jobs in my career. Some were just pulling on lines, labor intensive, and needed brute force. They not very high tech. Others, at the other extreme, were all high tech. But for the grace of God, the weather cooperated and what have you and our resources got there in time, so we were able to meet the missions that we did meet.

INTERVIEWER: You mentioned that you were also one of the few 1140s who went through master diver evaluations.

CAPT MIRICK: Yes. The decision was made in the early 1990s that the master diver selection process had gone through so many iterations. The master diver selection process had been

scrutinized at so many different levels. Some who attained it and those who didn't attain it had criticized the master diver selection process. There was a really close look by the community itself, given that we had to do it, at how best to do the picking of the next crop of master divers. Everyone knew the process wasn't perfect, but we thought we had a good handle on what was working. One part of the refinements was to remove the diving officer evaluator from a group of four or five and replace him with someone of the same skill set as the other four or five. That's the current requirement today, by the way, and all qualified master diver candidates of esteemed reputation, recommended by their COs, and can get off and go to Panama City to do it for the two weeks should go. Master diver evaluations are conducted more like three times a year, not four.

I was privileged to serve as, if not the last officer, probably the second to last officer on a master diver evaluation. The decision was made. But the decision, when it was made, also grandfathered those officers, those master diver evaluators who had already been on the schedule. They grandfathered that schedule to honor those people who were already committed. I knew, going in, I had to do a good job, an incredible job as an evaluator. I knew that I was the next to the last officer to perform such a duty, if not the last. I took it very seriously. It's one of the high points of my diving career in salvage operations but an unrelated kind of contribution, a giving back to the community that I desperately feel I owe. After all, it's the master divers who brought me along as a junior officer. It was the first-class divers and master divers with whom I interfaced when I first learned diving in Panama City.

To add icing to the cake, one of the master diver candidates, who we all felt qualified and was made a master diver when I was an evaluator, came back to work for me when I commanded Mobile Diving Salvage Unit One in Pearl Harbor some six months later. There's an example of

being very proud to have a candidate work for me. I never second-guessed this gent's capabilities, and he certainly performed to everybody's expectations.

INTERVIEWER: Where do you see the future for Navy diving going?

CAPT MIRICK: I see the Navy diving being a unique and irreplaceable but perishable skill that needs continued attention and resources, but maybe a smaller, slimmed down version than the kind of operation and outfits we had in the Cold War. I think that those who do special warfare combat diving and EOD diving have always been doing most of the diving anyhow. That was true even during the Cold War and even given the saturation diving and all the dollars in that program and my loyalty to it, and all the other surface supplied work we did. Since the Vietnam War, the EOD and special warfare have done the lion's share of the diving anyhow, in terms of numbers of dives per day-kind of accounting. But I think it has taken us a while to come to the realization that it's time to outsource and give to the more efficient organizations, like contractors, some of that ship's husbandry work that historically, Navy divers have found themselves doing.

Ship's husbandry works out great to keep the skills sharp and honed for divers who are committed and with resources to salvage, but it is not the case the other way around. Too often in the last decade the perception has been that divers do salvage, or call themselves salvage divers, for the once in a while times when they leave their real jobs, which is underwater ship's husbandry, and go do salvage.

The point is that it's completely opposite the perception. The Navy requirement to conduct towing of disabled ships in war and conduct basic battle damage repair and emergency salvage is well-formed and written in blood, and Navy doctrine should be reviewed on a periodic basis. But that is the basic requirement. Ship's husbandry is that what the divers do to keep their skills up

because, thankfully, these emergencies and types of operations don't occur very often. It's like a firehouse. Right now, the U.S. Navy is trying to figure out how many firehouses they have and how many they need.

You just flipped the tape. Just to show my age, on the old DDCs, port and starboard and on *Pigeon*, it was a reel-to-reel tape. Nowadays, you say 'reel to reel' or '8-track,' and folks don't even know what you're talking about. But we had a petty officer who was the communications and logs guy for the saturation side. When the tape ran out, he was to stop the communications so that that the tape could be flipped and it could continue recording. Inevitably, the watchstander would be so busy with his comms and logs duties and what was going on in the chamber, and thinking of the diver safety first, of course, the tape would just fall off the reel and spin and not be flipped, and no one would catch it. That was a case of beer. So, I think you owe me a case of beer.

INTERVIEWER: Got it, sir.

CAPT MIRICK: Anyway, I was talking about fewer firehouses. I think that is probably a good answer. But we've got to make sure that as we trim down firehouses, the fire trucks are the best we can get. I really think the Submarine Rescue Program has latched onto a mostly commercial, off-the-shelf, mostly Norwegian-inspired submarine rescue system and it will work very well. I think the salvage piece needs to be exercised and looked after with vigilance, but I think it's doable. I think training can sustain the necessary level of salvage confidence we need with an ARS 50 class and shore-based salvage units. I'm a proponent, if you're going to label me, of a lesser but better quality kind of salvage team. We need to be less parochial. We have great salvage assets and capability with the Army, believe it or not. We have great salvage capability with our CB friends. We have to recognize that the divers who do most of the diving are special

warfare divers or EOD, not salvage types, and piggy back off lessons learned from spearheading state-of-the-art organizations like Navy Special Clearance Team One.

I think we ought to continue to invest money in national assets like the Navy Experimental Diving Unit. I think you've got the gist of what I'm after. My experience has made me a product of many, many organizations that call themselves 'salvage' that may or may not have been able to really do the job. I've grown up with that. I'm now advocating more specialized assets, fewer in number, better maintained, better equipped, better manned kind of equation.

INTERVIEWER: Have you ever had any close calls or hairy moments as a diver, in your own diving?

CAPT MIRICK: Sure. Let's see. I get to answer that question a lot because I give a lot of presentations. They're not as long as this one. I'm not a bag, full of wind, as I sound like today. But I often get that question. Part of my job as a professional naval officer and diver is to pop the balloon on the myth of how dangerous diving is. Of course, it's inherently hazardous, but it doesn't have to be dangerous when you execute it. I try to convey that mission to uninformed audiences. It's hard. I usually put up a pretty good front when we talk about biological interaction and shark threat or whatever.

I'm going to assume that this is an informed audience, so I'll skip to the chase. We were doing some training off of Bermuda. Salvage ships' home ports on the east coast did regular Mediterranean Sea deployments because of a Navy requirement to have a 1-0 presence in the Mediterranean for towing nuclear submarines that needed that kind of service. That was a Cold War scenario I won't get into. But the point is that we made routine Mediterranean deployments and crossed the pond, back and forth, alone. It was called 'independent steaming.' You're alone, and you had Mother Nature working against you and everything, but by and large, the salvage

ships made it quite fine. The plus side was that you got to kind of do what you wanted to, within a few days or degrees of freedom. One of those freedoms that we took was doing some diving training in Bermuda.

I, as the commanding officer, had just taken this young sailor to Captain's Mast (non-judicial punishment). He seemed to have a propensity for fighting and just didn't take well to authority figures. Wouldn't you know it, but this kid's first dive after mast, which was two or three weeks later, when this training opportunity developed, I was his buddy. I'm sure the master diver is still laughing about this, Master Diver Wyatt, Glen Wyatt, an Engineman and an outstanding individual.

Of course, I want it to go on record that you needed judgment that morning because we were training in about ninety feet of water with a stage and a rig that's now retired, the Mark 12. The young sailor and I rigged in the Mark 12. We had to do some basic search skill work to work the topside tenders and get the full length of our umbilical. The backside of the problem was how much umbilical had to come back up.

In hauling around all his umbilical and walking around the bottom, my young buddy got tired. When we were told to go to the stage, that was where he went, and he stood there. He totally ignored the spaghetti and pretzel knots of umbilicals over our heads around the stage. There was no way we'd be recovered safely with our umbilicals twisted and wrapped around the standing member of the stage, the wire rope to which the stage is connected. I thought, "Well, I'll go start the work, and maybe he'll help me." I started disentangling this knot and had to do a little self-emergency procedure for over breathing in my hat, a little bit of carbon dioxide buildup, but divers are trained to do that. It was no big deal. But I had to take a few vents so that I wouldn't black out and then explain to topside what I was doing. It was only after I was finally

okay that topside started getting worried and giving me a hard time, which was typically how things worked. There was a lag between reality and what the topside was dealing with.

While they were dealing with my almost lapsing into unconsciousness, I was trying to convince my buddy to help me with the rest of the knot, and he didn't. To make a long story short, I got the knots untied. I'm sure I pledged to pay better attention to PT in the future, as I was quite fatigued after all that exercise and happy to get topside. I never heard anything about it from the young man, nor did he ever get in any trouble that I had to deal with as Commanding Officer.

INTERVIEWER: What's your most memorable diving experience?

CAPT MIRICK: Let's see. You haven't asked me about the hobby-lobbying area yet. But Navy divers are also famous hobby-lobbers, as well. We probably don't have the most advanced color-coordinated gear, but the pride in the profession of diving and the thrill of being in the water doesn't leave when you shut your computer off at work and jump in your car and commute home. It's with you. It's why you're there. Let's face it. You can get paid a lot more money doing other things. You can even have an easier time and get paid the same money in the Navy. But for those of us whose cuts of cloth are diving, it's hard to get away totally on liberty.

I'm one who's not a regular hobby-lobber, but some of my most rewarding diving experiences took place while I was on duty in Guam. I went off and flew to the local islands in the Solomons and Marianas archipelago, and went to Truck Lagoon, which was a boyhood dream even before I was certified to dive. I was certified to dive in 1970, so we're probably talking about 1969 or 1968 when I was reading articles about Truck Lagoon. It was quite a moving experience for me to actually get on those wrecks. I did it from a live-aboard dive boat. Someone cooked my meals. Someone carried my bottles. They had pretty high standards,

compared to the Navy diving I did, but it was very rewarding, in terms of getting down and seeing what's now an international landmark.

INTERVIEWER: You were a civilian SCUBA diver before you came into the Navy.

CAPT MIRICK: That's right. I was qualified in a camp I attended as a young man, a summer camp in New Hampshire. I said 1970. Do not think that I'm that old. I'm not. But they had a program in which, as long as you were 13 or 14 years old, you were handed this junior certification. You could only dive with instructor-qualified people until you were 15. Then, as long as you were confident and didn't have any incidents or problems, you would be issued a full-fledged open-water certification, which I was.

INTERVIEWER: Were those boyhood experiences what inspired you to become a Navy diver?

CAPT MIRICK: That's right. It was my upbringing that inspired me to select the Naval Academy. Once I selected the Naval Academy, I realized that being a Navy diver was a lot closer in reach than I ever imagined. I'm just grateful and thankful I was able to fulfill what I had been thinking about as a youngster.

Now, one of the people you ought to think about is Mr. Jim Evans, who is a retired Navy Captain, 1140, and now working at Commander, Pacific Fleet in Pearl Harbor, Hawaii as an explosives safety expert on the staff, as a civilian. He was a qualified saturation diver as an enlisted man and dove the Mark I system flyaway system, Air SAT. He's reachable by phone, and I can give you his phone number. Basically, it's 808-474-6434. That's the Ordnance Plans and Policy shop. That's why I know the number by heart. That puts you one phone number away from Jim Evans, who's in that shop.

I think that Captain Mike Herb is on active duty, working for MSC at the Navy Yard in Washington, D.C. He can bring a lot of life to the stories on 50-class salvage ships and 38-class

salvage ship operations. He's an imminently qualified salvage master with lots of sea stories on stuff that doesn't belong on the bottom that got there by accident and he was on board to recover those things, either in charge or contributing. Bill Orr deserves a lot of credit, Commander Bill Orr, 1140, who is on active duty for husbanding the system the Navy just acquired for the next generation of submarine rescue. The supervisor of diving is Chris Murray, an active duty Captain, 1140. I know you know him. He's a great source. The chronology I can't exactly put my finger on because of my advanced age. He's older than I am. He can do a better job of putting in perspective the civilian disasters, the Swiss Air, Egypt Air, and TWA disasters, the JFK charter flight recovery, and some of the larger Navy salvage jobs. He could put them in chronological order and order of significance.

When I was picked up to be a 1140 special operations officer after taking the physical exam in Norfolk in January and running on snow, which was in 1981, I had no inkling that there was going to be anything to replace the 50-class salvage ship and the Mark V and Mark XII rigs. Every ship I've served on has been decommissioned. I've been qualified on every Navy rig at one time, but now even that record has lapsed a little bit because of the fleet issue. The diving systems that I did my work in are now retired. Now, I'm giving an oral history.

INTERVIEWER: You must have been down on the Mark V when you first came in, at the end of its service life?

CAPT MIRICK: That's right. I was in the second to last officer class of Panama City required to go through the full Mark V curriculum. The last class was right after us. It was an EOD class with second class divers, basically. Then, they retired the rigs that were in Panama City. When I got to my first diving ship, the USS *Pigeon*, we had a few operations in Mark V, Mod 1 mixed-

gas. But the air hats were already on their way to being boxed up and sent to DRMO or wherever.

INTERVIEWER: I think they were sent to master divers' living rooms

CAPT MIRICK: That's right. Mark XII was all the rage. But Mark I saw the most use on the *Pigeon*, both the conventional mode and the Mark I, Mod S, saturation mode of the Mark I for the hot water suit, organic to the system. Now, when I re-qualify, it's light weight AGA, Mark XXI, Mark XX or SCUBA.

INTERVIEWER: It's no more Jack Brown anymore, either. They got rid of that right after I went to school. Sir, is there any question that I failed to ask that I should have? Is there something that we should talk about?

CAPT MIRICK: No. I'll continue to ponder those insightful questions for better answers, but I appreciate this opportunity.

INTERVIEWER: Great. Thank you very much, sir.

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UNDERSEA HYPERBARIC MEDICAL SOCIETY

INTERVIEW OF
DR. SAM RIDGWAY

Kensington, Maryland

Monday, September 8, 2003

PROCEEDINGS

INTERVIEWER: I'm with Dr. Sam Ridgway, at SPAWAR, in Point Loma, San Diego.

DR. RIDGWAY: I started with the Navy Marine Mammal Program in 1961, when I was an Air Force Veterinary Officer at a place called Point Mugu, California. Some scientists from the Naval Ordnance Test Station, in China Lake, California, and the Naval Missile Center at Point Mugu, had designed a collaboration to work with dolphins. It was headed by Dr. William McLean, who was the technical director of the Naval Ordnance Test Station. He was notable for being, among other things, the inventor of the Sidewinder missile. Dr. McLean was a physicist who was very interested in science in general, and he got Commander Jim Berien from Point Mugu, who was a Navy physiologist and particularly interested in high altitude physiology. He also got Dr. Thomas Lang and some others at the Naval Ordnance Test Station. Dr. Lang is a hydrodynamics expert. The first goal of the project was to try to learn how dolphins could swim so quickly, and to see if they violated any of the principles of drag when they were swimming at full speed. That was the impetus for the project, the hydrodynamic design of dolphins. Dr. McLean was also interested in communications, and interested in the idea of communicating with another species. Some work was also started along those lines. The hydrodynamics work lasted for about three or four years, culminating in some speed trials in some test tanks, as well as in the open ocean. It was concluded that dolphins did not have any unique hydrodynamic secrets that could be easily translated to Navy equipment. The conclusion was that they were well designed, hydrodynamically speaking. At the same time, I was recruited as an Air Force veterinarian and started working with the Navy program, and when I got out of the Air Force in 1962, I came to work as the first fulltime civilian employee of the Marine Mammal Program at Point Mugu. I was charged with keeping the dolphins healthy, and I became interested in their

blood and their physiological capabilities. It immediately occurred to me that we ought to try to find out things, like how deep could they dive, in addition to how fast could they swim. We started training a dolphin that's discussed in my book, *Dolphin Doctor*, a dolphin we ended up calling 'Tuffy' or 'Tough Guy,' to dive voluntarily in the open ocean. As we were doing that, SeaLab II came along, and Captain George Bond, who was the medical officer of SeaLab II, invited us to participate in that project. He, along with Captain Walt Mazzone, was very interested in understanding how dolphins could dive, and employing dolphins to help man in undersea investigations. We very quickly trained Tuffy to swim back and forth between divers, carry rescue lines and mail and tools to divers on the bottom. Since it was a saturation dive, SeaLab II was at 205 feet off of Scripps Canyon and LaJolla. The aquanauts, who were joined by astronaut Scott Carpenter, were living on the bottom. We had the dolphin dive down and carry things to them. We spent a week just trying that out. After about the third day, the dolphin worked very well with the aquanauts and got accustomed to the cables and lights of the SeaLab habitat. It was apparent that the animal could work with people in the open ocean without a tether. We didn't have to have lines.

INTERVIEWER: You had experimented with a harness system with the animal.

DR. RIDGWAY: We had. In fact, he did wear a harness at SeaLab, but it wasn't connected to anything. Later, we dispensed with the harness, but at SeaLab, he had this harness on that we thought would help retrieve him if he ever did take off. But he never did. I think that Dr. Bond had just been to Vietnam, or had some interactions with Vietnam, and we knew at that time that the saboteur swimmers had blown up several Navy assets in different harbors and operational areas in Vietnam. Bond suggested to me that we should turn our friendly dolphins to defend Navy assets against the swimmers that were very hard to detect with sonar, especially the

loincloth swimmers, who didn't have much of an echo return on sonar. We then went back to Point Mugu and fairly soon started training other dolphins to detect swimmers, both SCUBA swimmers and swimmers carrying tanks, closed circuit and open circuit, and loincloth swimmers. That program then transitioned to Hawaii, where we had warm water, and where the swimmers could stay in the water longer than at Point Mugu. That program was successful, and we deployed five dolphins to Vietnam in 1970 to guard the ammunition depot at Cam Ranh Bay. It worked there for about a year, and during that time there were no attacks in that area.

INTERVIEWER: There were no successful attacks?

DR. RIDGWAY: There were no successful attacks in that area.

INTERVIEWER: The dolphins were able to interdict the swimmers?

DR. RIDGWAY: Well, we don't really know about actual successful interdictions. We just know that there were no more attacks. Either they were scared off or something. There had been attacks before the dolphins came, but there were no attacks after they arrived there. We started the system that we still have today, called the Mark 6. There were other important things to detect. They have other means of interdicting them all and taking care of them, but the swimmer detection was the main thing. That system is still in the EOD today and is still being deployed on a regular basis.

INTERVIEWER: Who deployed it to Cam Ranh Bay? Were they ex-SPAWAR civilians?

DR. RIDGWAY: No, they were SEAL team personnel deployed at Cam Ranh Bay. The system worked. The SEAL team was SpecWar. They were under the command of lieutenant, later Lieutenant Commander Usrey, and he had two Lieutenants (jg) with him, Les Bivens and Hal Goforth. They were the key guys with the system. Later, both of them worked with our program for quite a few years. That was our first operational dolphin system.

After SeaLab, there was a lot of interest, in addition to scientific research, in actually employing the animals to do things. One of the things that we developed was a sea lion system for retrieving the ASROC depth charge. The ASROC was a nuclear depth charge, and it had to be tested. Of course, when it was tested it was a dummy. There was no nuclear warhead on it. But it contained many highly classified components, and therefore, it was fired from a ship. It had to go down to about 180 feet for a good test, because it was supposed to blow up submarines. When those things were fired off of San Nicholas Island, California, they had a whole crew of divers there, a deck decompression chamber, diving medical officers, and they had to stay at the site until the simulated weapon was retrieved. The ASROC could be outfitted with a pinger that would make a beeping sound that would make it fairly easy to locate for a sea lion. We trained the sea lions to go down and attach what we called a 'grabber device' to the charge. That saved a lot of time and the recoveries had to be adept. As you know, deep diving is more risky, and the sea lion could dive down very quickly, attach to this thing and then retrieve it. Even though they always had the dive teams available, it would save a lot of their time and a lot of their risk, because sometimes, it would take them a long time to actually locate and retrieve the device. The sea lion could retrieve it fairly quickly and everybody could go home. They were the primary recovery for the ASROC for about eighteen to twenty years, until the ASROC program no longer existed. At some point in there they were transitioned to an operational system called 'Mark 5.' Today, it's used to retrieve grill mines and other such exercise targets. Along the way, of course, we did a lot of scientific study on both dolphins and sea lions. We discovered through work with Tuffy and some other dolphins that dolphins would always dive on a full breath of air. They would usually hyperventilate a little bit before diving, especially if they knew it would be a deep dive. We trained them to what we called a 'diving test switch.' We

would turn the sound on at the surface, and the animal would arrest at the surface and go down, and ping on the switch with its sonar. We knew how deep it was. The dolphin would take a few breaths, depending on the switch's depth and dive down. When the animal pressed a plunger on the switch, indicating that he had successfully been there, he would come back up, and trainer Bill Scronce would turn on a buzzer. That would signal the animal to come back and blow his air into an inverted funnel for us to analyze. We found that their lungs would collapse, as one would expect from Boyle's Law, and there was no exchange of gas between the lung and the circulation below about seventy and a hundred meters depth, even when the animal went to 300 meters depth.

INTERVIEWER: That's a ways.

DR. RIDGWAY: That, we thought, well explained why they don't get bent. They just take in one lung, full of air, down. They would absorb most of the oxygen from that air, but because they could come back and give us several liters of air in the inverted funnel told us they weren't absorbing all of it. They might have absorbed half of the lung air and half of the nitrogen in the lung full of air, but not all of it. That kind of explained why they didn't have any problems with bubble formation and decompression sickness. It did not explain anything about some other problems, like high-pressure nervous syndrome, although the dives were so short that one wouldn't expect for them to have that problem. We also took pictures of the dolphins at depth, and showed the physical nature of the lung collapsed. The whole thorax collapses. That's because they have cartilaginous extensions on their ribs, and thus the whole thorax easily collapses.

INTERVIEWER: You can see a retraction in the thoros?

DR. RIDGWAY: Yes.

INTERVIEWER: Is it a big one?

DR. RIDGWAY: Yes. We were able to do that by rigging up a camera. The underwater photography unit at Point Mugu rigged up a camera so that we could photograph the animals at depth. We had photographic evidence down at a thousand feet, so we knew that was what was going on.

INTERVIEWER: That doesn't do them any harm when they dive out there, in the wild?

DR. RIDGWAY: No. No, they dive like that many times every day. Well, they dive to where their food is, basically. If the fish are at fifty feet, they dive to fifty feet. If the food is deeper, they go deeper. We learned from some later studies done by a colleague, Bill Evans, in our program. He was one of the first people to put radio transmitters on dolphins at sea. He found out that common dolphins would feed on the deep scattering layer, which could be 200 to 300 meters at depth, in the early evening. He put a dive recorder on the transmitter and found that the animals were making a series of dives, not just one dive to depth, but several in a row. We thought, "Well, if they're doing that and they're doing it rapidly, what about the buildup of nitrogen in the system?" Between dives, they might not really have to blow it all off.

INTERVIEWER: That's like the way they say some deep pearl divers would get the bends after doing enough breath-hold dives.

DR. RIDGWAY: That's right. We devised another experiment in which we took a mass spectrograph with a Teflon catheter that could be inserted in the muscle. That way, we could track the nitrogen washout from the animal after a series of dives. We took two dolphins, Blue and Brown, that had been trained to dive. We had them dive rapidly to a hundred meters, because we knew by that time their thorax was collapsed, and there wasn't any exchange going on with the circulation. We had Blue dive 25 times to a hundred meters within about an hour.

INTERVIEWER: Wow.

DR. RIDGWAY: Then she slid out on a mat and we put the catheter in her muscle. We did the same thing with Brown. Brown made 23 dives. Anyway, we were able to measure the nitrogen washout from their muscle. We showed that at the end of the dive, they had a super-saturation of nitrogen in the tissues, probably sufficient to bend a person, at least according to Dr. Workman's formula, and it would have been sufficient to cause the bends. The dolphins didn't have any apparent ill effects. We theorized that if they did have bubbles of decompression sickness, maybe the bubbles were trapped within the reedy morobala, a vast network in the dorsal portion of the dolphin's thorax. All the circulation from the core, from the heart to the brain, comes through this reedy, and we thought that maybe it was a really good bubble catcher. That was one theory, and we published that in *Science*. Various other people had other theories, and so in 1982 we had a little debate in *Science* magazine about it. We debated with Stuart McKay, who thought that bubble nuclei were crushed by the repetitive diving and a group at MIT, who thought that maybe the dive dolphins' circulation was especially quiet because sound of heart valves and can even cause bubbles to form and grow. Then we measured the dolphins' heart sounds, and we really couldn't see that were any quieter than our heart sounds. There was another theory propounded by my friend Jim McCormick, at Bowling Green Medical School. McCormick thought it had something to do with heparin. He thought that the dolphin and whale heparin reduced the propensity of the blood to form bubbles. He did some experiments on guinea pigs, diving guinea pigs, and suggested that with the heparin they didn't form bubbles that would cause deafness. He was able to dive heparinized animals and they did not lose hearing. The non-heparinized animals did. It was always a goal of ours to come up with something that would help with human diving, like help divers to dive longer, help the treatment of diving diseases, and similar things. The

effect heparin was one thing that was theorized, at least. The acoustic issue has become important, and people are questioning whether it will trigger bubble formation if a dolphin has been diving rapidly, feeding on a deep food supply, and we hit him with sonar or with seismic sound. We don't know that yet, but that's one area of investigation.

INTERVIEWER: There's a great deal in the press right now about Navy's sonar causing harm to marine mammals.

DR. RIDGWAY: That's right.

INTERVIEWER: Could that be a possible mechanism of injury?

DR. RIDGWAY: Yes. That's a theoretical mechanism of injury, but it's not been proven. We would like to go back with our trained diving animals and find out if we think it could be safely tested with the. But we would use ultrasound to try to see if the formed bubbles in both dolphins and the sea lions. We've never been able to determine whether they actually bubble after a series of deep dives.

INTERVIEWER: Some people suspect it is caused by military sonar. They never did autopsies on those animals?

DR. RIDGWAY: Well, they've done autopsies, but first of all, the autopsies have usually been done after the carcass has been frozen or buried, or has usually been in an advanced stage of deterioration. Also, Captain Bond told me years ago, if you want to really detect if an animal was killed by decompression sickness, or had bubbles, you should do the autopsy, or necropsy, as we call it for the animal, underwater. But none of them have been done under such conditions. There are other things that can cause bubbles, such as gas gangrene organisms, different bacteria that build up on a carcass. You have to get a carcass that's very fresh, and you have to do the necropsy underwater, as I understand it, to really detect the bubbles. Nobody has ever been able

to do that, so it's kind of theoretical as to whether that could really happen. Later in the 1970s, and we started in the early 1970s, or even in the late 1960s, I guess, we started teaching the animals to find objects on the bottom. Among those, of course, were mines that the animals could detect with their sonar. We learned that it's fairly easy to teach the dolphin to find different mine-like objects. But we were concerned that if the animal dropped a mark right on the mine that it could explode the mine and kill the dolphin. We had to train the animals to mark it in a way by which they didn't touch it. That was difficult, but it was accomplished. Hop Porter was in charge of developing the system that was eventually called Mark 7. The lead trainer, Jim Cory, and I were able to get the animals trained. We first deployed at a Navy exercise in 1980 in Charleston. During this mine exercise, as I recall, they put out twenty mines that the dolphins could work with. We had one dolphin, a female named Little Bit.

INTERVIEWER: Her name was Little Bit?

DR. RIDGWAY: It was because she was small. We had six dolphins there, and we were going to work with all of them. But Little Bit went out and found all the mines the first morning. Then they had to figure out for the next animal whether they should move the mines around because the trainers then had some idea of where the mines were. Anyway, eventually, all the dolphins got to work, but the one dolphin did it all in a fairly short period of time. The mine commander was quite impressed with that performance. That system then was on all the major exercises in mine hunting from 1980 forward to virtually the present time. The system was improved so that they could locate bottom mines, or buried mines. Then another cadre, a small group of dolphins, was trained to go after deep moored mines. That system is the Mark 9.

INTERVIEWER: Why did you use sea lions for something like ASROC or the deep object location, but use dolphins for the mines?

DR. RIDGWAY: Well, the sea lions don't have sonar. Dolphins have really sophisticated sonar, and they can find things even buried in the bottom. ASROC and the drill mines all have pingers on them. The sea lion would just follow the sound.

INTERVIEWER: Sea lions can hear the pinger?

DR. RIDGWAY: Sea lions can hear the pinger, yes. Now, we have found that the sea lions have fairly sensitive whiskers. They have good low-light level vision. If we can get them near mines or things to recover on the bottom, they will go down and find them, even at a thousand feet. They can hunt. They can search an area on the bottom, so we have used them. But the dolphin's skill is the sonar, and that's why we used them mainly on the mines.

INTERVIEWER: I didn't understand that the sea lions were listening for an acoustic pinger. That now makes sense.

DR. RIDGWAY: Yes. That was the most part on the recovery. They were mostly listening. In recent years, they have been recovering passive targets, or those that on which pingers don't work. They just have to search a bit longer, but they will actually cannonball down to the bottom. After they leave the surface, as Boyle's Law suggests, the chest collapses, the lungs compress, and the animal gets heavier as it dives. We found out that what they do is simply pull their flippers in and rocket down to the bottom. They hit the bottom on all fours. We were amazed.

INTERVIEWER: That's like a cat.

DR. RIDGWAY: We've got pictures. We put a video camera on the cable that they were pulling down, because they pull down a cable to attach to the object. We were amazed, because after they leave the surface, within a hundred feet or so, they just fold their flippers zoom, they just go down. They're not swimming at all.

INTERVIEWER: What kind of speed do they yield?

DR. RIDGWAY: They don't go really terribly fast. They go three knots or a little more .

INTERVIEWER: Wow.

DR. RIDGWAY: They descend at three meters per second. That's a little bit faster, but they're not usually fast. When they hit, they kind of crawl around and they have a grabber and they latch onto the object.

INTERVIEWER: How did you teach the dolphins to set the marker next to the mine or mine-like object, rather than touching it?

DR. RIDGWAY: Well, we train them by what we called 'approximation.' It is a thoroughly difficult thing to do. It takes a fair amount of time. You have to give them an area around the mine in which they're permitted to mark. They're not permitted to go any closer than that. You have to know the area that's marked. If it's too far away, the thing maybe become lost. You have to get it within a fairly narrow proximity to the object. That's just done by repetition. They're rewarded if they do it correctly. If they mark on it or too near to it, then you don't reward them. If they're marked too far away, you don't reward them. They just learn that they have to mark it in that narrow range. It's just done by repetition, repetition, repetition. Once, on an airplane going to Hawaii, I managed to get an upgrade. I happened to be sitting by an NFL quarterback who was going out there for the Pro Bowl. I asked, "How in the world do you learn to run backward so quickly?" He said, "Repetition. That's what it's all about. You just repeat it until you can do it better and better and better." It's the same thing with the dolphin. You just repeat it over and over and over again, and they will get it. In the case of the human, of course, as you're repeating it you're building up muscles that allow you to do that.

INTERVIEWER: Did you find that particular dolphins were more capable of learning than others? Did you find that they are like people, that the range of intelligence is similar, or is one animal essentially as trainable as another is?

DR. RIDGWAY: Yes. There is a lot of difference in individuals, a huge range of difference. Once, I took a psychology course, and my professor said if someone asked you what the normal range of intelligence is, or any other capabilities is within a group of people, most people would say the best individual would be ten times better than worst. But that really isn't true, he said. On many different skills the best individual is 2,000 or 3,000 or 10,000 times better than the poorest individual on this the scales. I won't say that quite such a range applies to dolphins, but some animals are much better than the ones that don't make it. In fact, some just flunk out for various reasons. We employ them in research, or we find that they'll do something else exceptionally well.

INTERVIEWER: Tuffy was pretty exceptional.

DR. RIDGWAY: He was very exceptional, yes. That's right. We have others now that are just as capable, or more capable, because they've been around longer.

INTERVIEWER: But if you're first dolphin hadn't been so smart, would the program have continued?

DR. RIDGWAY: If our first dolphin had been an idiot, no, we probably wouldn't have lasted past 1966 or so. It would have killed the program. Yes, we were just lucky we got a good one with which to start.

INTERVIEWER: What other marine animals have you worked with?

DR. RIDGWAY: We worked with white whales. They are very good divers. We found out that they could dive to over 2,000 feet on command. We had them retrieving test torpedoes off the

coast of Canada and the Pacific Northwest. We also had them dive down to 1,000 feet and rest on a hearing test station and test their hearing at depth. We were interested in seeing if depth decreased hearing sensitivity, because there was a theory that stated that the middle ear, if you put a lot of pressure on it, the air becomes more dense, and that could theoretically decrease hearing capability and increase the threshold. We did a study to see if that happened in whales. It does not. They hear just as well at 1,000 feet as they do at the surface. It's probably because the sound comes through the body tissues to the ear on a fairly direct path and doesn't require the tympanic membrane or the ear canal for hearing. Although the acicular chain is still there and may be important as an inertial mass between the cochlea and the middle ear, the eardrum and ear canal are probably not functional, as far as hearing goes. The whale demonstrated that at depth. We had evidence about it from previous neurological studies. But this was a demonstration that the animal in the open ocean can hear. The way we did that was by playing a tone to the animal, a 500-millisecond tone, and we had the animal whistle when it heard the tone. We presented a tone and the animal whistled. We presented another tone and the animal whistled, and we kept bringing the tone down in what is called a 'stair step fashion.'

INTERVIEWER: Is it like an audiogram?

DR. RIDGWAY: It is just like an audiogram, exactly. After a series of those, we sounded a bridge, watched the animal on television from above, and the whale would come up and get a fish reward. A few minutes later, we all went down and did it again. We were able to do that near the surface and at increments of a hundred meters. We showed that they hear just as well at depth as they do on the surface. I have a paper on that, too.

You asked about breeding dolphins and about capturing them from the wild. Our first dolphins were, of course, captured in the Gulf of Mexico or from the east coast of the United

States. The initial group of dolphins was from MarineLand in St. Augustine, Florida, and that group was composed of three dolphins. Previous to that, there had a group of five dolphins that included Tuffy, and they were from Gulfport, Mississippi, in the Mississippi Sound. The largest percentage of our dolphins came from that area of the Mississippi Sound. The Mississippi River is a great engine that flows into the Gulf of Mexico, and it makes for a very rich area, a very productive area. That's where all the Louisiana shrimpers and Gulf coast fishing people go. Thus, there are a lot of dolphins there. Of course, dolphins live in fairly shallow water, and that makes them fairly easy to collect. For the Navy's purposes, because that water is very murky, almost opaque, the dolphins that live in that area have excellent sonar because they need it. You can't see your hand in front of your face underwater there. That's why the majority of our dolphins were collected there. In the late 1980s we decided that we wouldn't take anymore dolphins from the wild because of the public pressure against it. Also, we wanted to see if breeding our own would not improve our capability to train them faster, perhaps. We caught the last dolphins from the Mississippi Sound in 1989. Since Then we've been breeding our own. Now, for the normal dolphin in the Navy program should be with us for twenty years. We have some that have been with us almost twice that long. We have one dolphin that served in Vietnam and was initially captured in Florida in 1966. She's still here. She's kind of retired now.

INTERVIEWER: What's her name?

DR. RIDGWAY: She has a very bad name. She's a wonderful female, but her name is Toad. That's just what one of our red-necked trainers named her when he first got her, and so that's what she's still called. She's a wonderful, beautiful animal. Anyway, we've got a number of animals that have been with us since the early 1970s. Two of our best animals in helped with the mine clearance in Operation Iraqi Freedom, in Umm Qasr, have been with us since the early

1970s. They were either caught in 1970 or 1971, or in one or two cases, 1974, and have been with the program ever since. We are getting better at their healthcare and keeping them fit and conditioned and working with us for longer and longer periods. We've been able to extend the useful life for many of the animals from twenty years to thirty years in some cases. We don't really know how long these animals live. We know that some females that live into their early fifties, at least. Males usually don't live past their mid-thirties, but we've got some that are in their late thirties now and still seem pretty active. We are still learning more about how long they live, and how to take care of their major things.

INTERVIEWER: You said that one of the goals of breeding the dolphins was that it would improve their performance. Has that panned out, or made them easier to train?

INTERVIEWER: Well, not so far. I couldn't say that it has so far. But we're in fairly early stages of that. The first dolphin we have that was born here was born in 1979, and she's quite a good animal. At the time, she was needed more for research purposes than for the Navy systems. As a result, she never got into the Navy systems. We had some others that were born in the 1980s that actually haven't done extremely well for reason or another. We have another one that was born in early 1980s that's been just a real champion. We think genetics probably has a lot to do with it. We probably need to introduce our best performing males with our best performing females. We noticed that one animal that was born in 1983 has bad teeth, and both of its parents have bad teeth. I guess you have to expect that. But he's been very good at some things, and not very good at other things.

INTERVIEWER: Do the dolphins learn from each other. If you have one trained dolphin, will that dolphin help you teach another dolphin?

DR. RIDGWAY: We're trying to find out. The way we're trying to find out is we start exercising and doing some tasks with the mother and her calf at a fairly early age. We think that a young animal will pay more attention to its mother and learn more from its mother than any other animal. It's probably a complex learning situation, and the animal that would be a so-called 'teacher' has to be an animal that is somehow going to be paid attention to by the animal you're trying to train. We don't know the key to that yet, but we were trying to use that type of relationship to see if we can improve the training. I think we've got a long time before we'll know how much good it does.

INTERVIEWER: It's not as simple as one animal seeing that the other animal gets fed when he does a certain behavior.

DR. RIDGWAY: No. It doesn't seem to be. We've still got a lot to learn about the training, and about animal perception, intelligence, motivation, and those types of things. We just don't know nearly enough about that yet.

INTERVIEWER: Which animals do you find easier to train, dolphins, sea lions, or the white whales?

DR. RIDGWAY: My perception is that it is easier to train the white whales because they are a much more mildly tempered animal and pretty consistent from one day to the next. It might be just the ones that we have had. Maybe we've just been lucky. They are also large and very, for lack of a better term, mellow. Sea lions and dolphins can both be fairly aggressive. The white whale is a little slower, but they tend to be more consistent from day to day. Again, we have worked with only a small number of animals, and any animal that eats can be trained. Depending on what you're training, it can be better for the animal to be a little bit dumb. Motivation is a difficult thing to understand. But the animal gets some reward, and it's not always fish. For

example, on our hearing test, we give the animal one tone and the animal will respond. We don't give him the fish immediately. The animal may get another tone at a lower level. The animal will respond to that. But responding to the following tones will be for the reward. They can do a long series of behaviors without getting food for it. That's lucky for us, because we train them to do things that will be employed in the open ocean and away from us. We can't be giving them a reward when we're not even there. It's difficult to give them a fish reward if they are at depth, for example.

Each step in the process seems to have its motivational features. You can be consistent if the animal dives down and the apparatus is there. That is motivation. That is consistency. The apparatus gives them a tone, or does whatever it's supposed to do. That's another motivational feature. That gives the animal confidence that he's in the situation in which he's supposed to be. They enjoy these procedures so much that when the trainers come to the enclosure with their boat, and the animal is trained to slide out on the rubber mat to go and work at sea, the animals are very excited, much like your dog at home. Some dogs love to go in the car. If you rattle the car keys, the dog gets excited and goes jumping around. That's the way our dolphins are when they're coming to work. When we're working them in enclosures, like doing some hearing tests or something else, oftentimes they line up and kind of compete to get to go first. They're motivated to do their work because it's rewarding. It's not just about getting fish, I think. The work itself is rewarding because it's interaction.

INTERVIEWER: Speaking of interaction, because Navy guys come and go every few years through normal rotation, is that a problem? Do the animals have to adjust to a new trainer, or are they pretty flexible that way?

DR. RIDGWAY: They're fairly flexible that way, as long as the equipment, the sounds, the boats and all the different parts that make up the marine mammal system are there, you can change trainers. Sometimes you have a little bit of difficulty changing from one trainer to the other, but usually more than one trainer works with the animal anyway. There is not too much difficulty with that.

INTERVIEWER: When you first started out in 1961, there really wasn't much known about dolphin or marine mammal physiology.

DR. RIDGWAY: No. There was not much at all. That was good in a way, because it enabled us to learn a lot on our own and rely on what was known about other species. It had had its difficulties because we couldn't, at the time, use some of the modern methods that we have now. Now, we use ultrasound extensively, for example. At that time, we didn't have ultrasound that we could use with the animals. We didn't know nearly as much about their anatomy and physiology, but we got to learn for ourselves. That, in a way, was an advantage because we had to learn it, and we had to learn it on our own. But there were some with great whales. There was anatomy work done by the Germans back in the 1800s, and work done by the British, especially with big whales that were killed on whaling expeditions. There was some work done with some smaller animals, as well. There was a lot known about skeletal material, because skeletons have been collected in museums. There were good old drawings that one could find in the library, the big University of California-Los Angeles' Biomedical Library, the Los Angeles County Museum of Natural History, or places such as the San Diego Museum of Natural History. Some of them, of course, are very good drawings because people had more time to sit and draw things like whale bones than they do now. Doing that now would cost a tremendous amount of money. Back Then people had more time to do that sort of thing, or at least it seems that they did because they

did a lot more of it. You had to work harder to find it and put it together. A lot of it was there already. There were some old studies. My friend, John Kanwisher, from Woods Hole, published a number of papers. He was very interested in physiology. He worked with us early on at Point Mugu with the Tuffy diving work. He was a colleague of Pete Scholander, who was a Norwegian physiologist and diving physiologist who came to Scripps, and Scholander finished his career in La Jolla. He did a series of studies that were very helpful, so we had a lot of useful information. There was also an M.D., John Lilly, a neurophysiologist. He had a lot of ideas about dolphin communication, and a lot of them were very outlandish. He wrote several fairly mystical books about dolphins, but if you could filter out his mysticism, he had a lot of useful information. Those were all coming out about the time I started. Those were helpful, too.

INTERVIEWER: How complex is dolphin communication?

DR. RIDGWAY: Well, we still really don't know. They use whistles and burst false sound. They use echolocation quirks. They click at different rates. Some people think that their communication is done at a fairly high level. They think dolphins do things that are only done by higher animals, like chimpanzees, for example. But that's been disputed to a certain extent. In our Navy program, we've never carried that line of investigation very far because it wasn't really necessary. The people who started out working on that weren't able to carry it very far. They kind of ended up in blind alleys, so to speak. Instead, we focused on what we could do with them, and we always think about it and are interested in it, but because of the mysticism that has been attached to it in the past, it's very difficult to get a research project to really work on that. It would take some years to make progress. Nobody has come up with a really brilliant idea about how to do it. Our best approach is to interact with the animal through a computer so that we get the human somewhat out of the loop because the human can mess up results by telegraphing

information. We give the animal a call and the animal whistles. Then we can work with that basic element and make everything more complex. In order to get funding, we've done it from the standpoint of learning about their hearing and their basic responses, rather than just learning about communication *per se*.

INTERVIEWER: If you hadn't come here in the 1960s when you left the Air Force, what do you think you would have done?

DR. RIDGWAY: Well, I guess I would have had a pet hospital somewhere.

INTERVIEWER: You would have gone into practice.

DR. RIDGWAY: I would have gone into practice, yes.

INTERVIEWER: You didn't see yourself as a researcher.

DR. RIDGWAY: Well, I was interested in it. By going with the Navy I was able to get a fellowship to Cambridge University and get a Ph.D., and that solidified my research capability. If I hadn't done that, why, yes, I probably would have gone into private practice somewhere, maybe in California, because I was already here. The Air Force sent me here. I wanted to go overseas, but they sent me to California instead.

INTERVIEWER: I would like to go to California, but they keep sending me overseas instead.

DR. RIDGWAY: Yes. They know these things. They say, "What does this guy like?"

INTERVIEWER: That's true.

DR. RIDGWAY: They say, "He wants to go to Germany. Let's send him to California. He might be less dangerous over there." It is hard to know. I just read an article about happiness. As I understand it, really, you can probably be happy doing a lot of different things. You think that one big event that puts you off course will send you into a tailspin. But they say that usually doesn't happen. You usually come out and sometimes it is for the better and sometimes it is not.

Eventually, you usually come out being just as happy. They determine this by asking people questions, and keeping track of people who have had things happen to them, like the death of a spouse, winning the lottery or other major events. That's their theory, at least. I don't know. Maybe if I hadn't gone into the Navy I would have been happy doing something else. Who knows? All you can do is speculate.

INTERVIEWER: Looking back over almost about four decades working with marine mammals, what have been some of your most satisfying experiences?

DR. RIDGWAY: I think my early experiences with this dolphin, Tuffy, and the ability to work with the animal in the open ocean was very satisfying. I've also been satisfied by getting to work with a lot of people who were very capable that were interested, such as divers. I've gotten to work with regular Navy salvage divers on occasion, when we would take the animals on grill mine recoveries. For a number of years a SEAL team handled the animals people, and I got to know a lot of them. For about twenty years we always had SEAL team corpsmen work with us to help with the medical care of the animals, and they were very good guys, and I really enjoyed working with them. There are also the Explosive Ordnance Disposal (EOD) people, with whom we work now. That's been really enjoyable. It's been enjoyable to be able to deploy with human/animal teams. In the early days it was all secret, so we would come out here at midnight and load up our dolphins and go across to the old pier across the base and over to a big black airplane that was sitting out there on the tarmac. We would load our dolphins and take off. Oftentimes I wondered, "You know, we're taking off over San Diego at two o'clock in the morning in this big barn of an aircraft. What would people think if they knew what we were doing? We would have these dolphins that would be whistling, you know, as we take off. A lot of them kind of became excited and whistled. We'd go halfway across the country or halfway

around the world and land somewhere, and they'd take us off to a remote location and unload us. Then we would go and do our work. Of course, now, it's all unclassified, so they don't have to do that. But I always found it was kind of exciting that we were doing stuff that nobody knew about.

INTERVIEWER: Were there any setbacks along the way that were particularly disheartening?

DR. RIDGWAY: Well, one setback for me was when Tuffy died. We had a number of setbacks like that, when really good animals died. We, of course, know a lot more now about how to take care of them. Some setbacks occurred when the animal didn't perform up to expectations for unknown reasons. I know one mine exercise on which we didn't perform very well at all. Mines were sitting on top of a rocky bottom. The animals, for some reason, just didn't recognize them. The mines weren't like what they'd been finding. They'd been finding mines in much harder environments. It was too easy. They figured it wasn't what they were supposed to do, you know. That's the way it seemed. That happened really only once that I know about. I think we've been very fortunate, other than losing some really good animals. We had one major setback with SeaLab III. We had animals trained to work with SeaLab III, which was at something like 600 feet down at San Clemente Island. We were getting ready to take the dolphins out there, and we had assured ourselves that they could perform very well at that depth. But by putting the habitat down, one diving officer lost his life.

INTERVIEWER: Yes. He was Berry Cannon.

DR. RIDGWAY: Yes. Berry Cannon was the diver. That's right. The whole thing was cancelled. At the time that seemed a big setback. But, as it worked out for us, it wasn't such a big setback because it kind of demonstrated that diving to 600 or 700 feet is a dangerous thing for people to do. It's kind of ordinary activity for dolphins. As a result, doing some of those things with

dolphins became more credible and more important. Still, our work has always been in conjunction with divers and it has always been a human/animal team. We know dolphins and sea lions can do these things. It's no risk for them. If they can do it, it's probably a good idea to utilize them when you can. In some cases you cannot use dolphins and you need that human down there to do complicated work. But if it can be made simple and repetitive, the animals can do it very well. Dolphins have a really good sonar system that allows them to even see through the bottom of the ocean, to a certain extent. That is a capability that we certainly can exploit.

INTERVIEWER: Do you think we will ever be able to duplicate it with technology?

DR. RIDGWAY: Oh, I think so, yes. I think so. I think they're getting closer and closer every year. We've always been working on a five year program, that is we work as if we expect to go out of business at the end of five years. We've done that since the early 1980s, at least. Now, I think it's kind of a ten-year program. I think at the end of these ten years, it may be that at least some of these things will be done by robots and different kinds of simple undersea vehicles. Mine hunting, for example, will probably be done. Hopefully, what some people in the program have learned about the dolphin's sonar ability will be useful in helping that come to pass.

INTERVIEWER: What do you see us accomplishing, Then in the next ten years?

DR. RIDGWAY: My hope is that if we learn to replace the animals with different robots and so forth, that we will take the opportunity to use the highly trained animals we have to learn more about them in the open ocean. We could research things like hearing at depth, which we have learned about. There are a lot of other things that we'd like to learn about, like pollution effects on animals in the wild and bubble formation. There are a lot of things that we can employ. Because this group of Navy dolphins is highly trained, we could employ them in research from

which we can just learn an awful lot. They could work with us in the open ocean. That's what I would hope will happen in a few years.

INTERVIEWER: What different types of dolphins do you use? Are they mostly the Atlantic bottle-nosed dolphins?

DR. RIDGWAY: Yes, we use Atlantic and Pacific bottle-nosed dolphins. They're two kinds.

INTERVIEWER: Is there much difference between the two types?

DR. RIDGWAY: There is not much difference, no. There is a little bit of difference in their coloration, but they're the same species. They're regarded as the same species. They will interbreed. If you're experienced, you can look and tell the difference, but most people wouldn't recognize it.

INTERVIEWER: Did you experiment with any other types of dolphins?

DR. RIDGWAY: Oh, yes. We experimented with Pacific white-sided dolphins, common dolphins, Dahl's porpoises, but the bottle-nosed have excellent sonar. Of course, I mentioned the white whales, they're bigger. We were doing things in the Arctic. They're Arctic animals and can adapt to the environment here because they swim under northern rivers in the summer to breed. The temperature in those rivers is about the same as it is in San Diego Bay. But they can also winter inside Arctic pack ice. We thought there might be a need for recovering torpedoes in very cold waters. That was why we worked with them. We worked also with pilot and killer whales for a few years. Those animals, for our purposes, really have no advantage over the bottle-nosed dolphins. A pilot whale can dive a little bit deeper, but they're much bigger animals and harder to angle.

INTERVIEWER: Are they harder to transport?

DR. RIDGWAY: They are harder to transport, yes.

INTERVIEWER: What about the killer whale, the Orca? It would seem like they would be hard to work with.

DR. RIDGWAY: Yes, they're harder to work with. They just require such heavy equipment and they're so large. As far as we could tell, they couldn't dive any deeper than the dolphins.

INTERVIEWER: Are they more dangerous to handle? Are they more aggressive?

DR. RIDGWAY: The ones that we had were not. They were not aggressive. Of course, you wouldn't want to make them mad, you know. They have big teeth.

INTERVIEWER: Every so often a sea lion will snap at the guys who handles it, and the guy will get a bite. That's one thing if it is a sea lion. But if you get an Orca, with that many teeth, it would be really bad.

DR. RIDGWAY: Yes. A sea lion is bad enough. That would be bad. We didn't work with the Orcas for very long. That was at the end of our time at Point Mugu. Well, I can't think of anything else right.

INTERVIEWER: All right, sir. Well, thank you very much.

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UNDERSEA & HYPERBARIC MEDICAL SOCIETY

**ORAL HISTORY OF THE MAJOR PARTICIPANTS
IN U.S. NAVY UNDERSEA TECHNICAL DEVELOPMENTS**

**INTERVIEW OF
SCOTT CARPENTER**

Sunday, August 24, 2003

PROCEEDINGS

INTERVIEWER: When and where were you born, Scott?

MR. CARPENTER: I was born in Boulder, Colorado in 1925, and I consider myself very fortunate to have been able to stay close to that town until I grew up, joined the Navy and moved away.

INTERVIEWER: Where did you go to school?

MR. CARPENTER: I went to school, from kindergarten through high school and college in Boulder.

INTERVIEWER: Did you play sports or participate in any extracurricular activities?

MR. CARPENTER: Mainly, I was a tumbler, a wrestler, an ice skater, a skier, and a tennis player.

INTERVIEWER: What influenced you to join the Navy?

MR. CARPENTER: I got out of high school in 1943, World War II was on, of course, and that was a very popular war for 17-year-old boys and we all wanted to fight for our country. I saw a movie titled *Wake Island*, which glorified naval aviators. I decided I wanted to be one of them, and I enlisted in the Navy before I got out of high school.

INTERVIEWER: How did you get into diving?

MR. CARPENTER: That's sort of an interesting thing. I was inspired greatly by Cousteau, by what he wrote and his films. But the first instance of my interest in that sort of work that I can remember, came as a result of an aircraft accident right off the end of the runway at the Naval Air Test Center in Patuxent River, Maryland.

The plane went into water about thirty feet deep. The canopy was locked. It didn't open. The rescue helicopter came overhead, but the crewman aboard was powerless to go down thirty

feet in the water and help that trapped aviator because there was no SCUBA gear in the helicopter.

I wrote the Chief of Naval Operations about my idea that those fellows should be given underwater breathing equipment. Nothing ever came from it, but it was what I remember as my first intellectual involvement with the business of underwater work. In Hawaii, during my first squadron duty, we were doing a ditching exercise, in which we practiced all the maneuvers that might be required if you had to ditch your airplane with eight or nine crewmen. We jumped overboard and got into our raft and were doing all the required housekeeping, preparing for four hours in the open water, and simulating being adrift at sea. One of the most important pieces of equipment was the corner reflector, which was made out of steel or aluminum mesh. It gave a very good return to search radar.

Without a corner reflector, your chances of being picked up in the open ocean by radar were close to nil. We had unpacked it from its stowed container and it went overboard. I realized that was something critically needed, but I was afraid to jump over the side of the raft and try and catch it on the way down, but my gunner's mate was not. He went overboard and was gone for quite a while, but he came up with it. I was ashamed that I was unable to do what one of my crewmen was not afraid to do. I recognized my fear of deep ocean critters, namely sharks, as an unreasoned fear. I've always been uncomfortable with unreasoned fear, but I had to live with that.

I vowed that I was going to conquer it somehow. Years later, I saw in SeaLab I a chance to get back into that environment and stay there for a while. I had it in my head that such an experience would bring about the disappearance of my unreasoned fear. That was one of the

motivating driver, and it worked for me. Cousteau was also helpful in my wanting to get involved. Curiosity was also a motivator.

INTERVIEWER: Was your first diving with the National Aeronautics and Space Administration (NASA) when you were trained for weightlessness?

MR. CARPENTER: The first diving I did was to do some spear fishing, and I was enchanted right away by the beauty of Cousteau's silent world. When we all got together at NASA, I had a talk with our boss, Bob Gilruth, who at the time was the head of what was called the 'Space Task Group.' I thought that it would be good to go down to Little Creek, Virginia and get the SEALs to give us some training in their swimming pool, with their gear and underwater tasks. I thought that training on their obstacle course was not only good physical training, but also a good idea because we were going to have to land in the water.

I thought familiarity, to that degree, would be good for all of us. It turned out that Deke Slayton, one of the seven, didn't even know how to swim. He went through SEAL training as a non-swimmer. I always tipped my hat at him for that. He didn't tell anybody, but his wife talked about how he practiced in the kitchen sink, exhaling underwater through his nose, turning his head and inhaling through his mouth at the side. It was good training for all of us, and it gave me a familiarity with that scary environment. But it really had nothing to do with weightless training. It had only to do with physical training.

INTERVIEWER: What affiliation did you have with Navy diving in the past?

MR. CARPENTER: The first time was with the SEAL team guys at Little Creek. Then through Cousteau, I met George Bond. He told me about SeaLab, and I went and told George Bond that I was fascinated with what Cousteau was doing. I said this to Cousteau, too. I said that I could be a representative of NASA technology, which was keeping men alive in space. I thought it had a lot

of trade-offs with his technology, which was not anywhere nearly as well funded as NASA's, in keeping men alive underwater. If I could be a team member, I could be a representative of that technology and I might be helpful. Cousteau said, "You speak the wrong language. We can't pay you very much, but the technology might be of value to underwater work. Why don't you go see your own Navy and George Bond?" I did. George said, "Come aboard." That was my first association with Navy diving. That was SeaLab I.

INTERVIEWER: What was the date of that?

MR. CARPENTER: Well, it was in 1963, I think, or maybe 1964. I've forgotten. That's part of the record, but it was where I met my good friend and mentor, Bob Barth. It was under his wing that I got my first training, but I didn't make the SeaLab I dive in Bermuda. I had a motorcycle accident, broke an arm, and couldn't dive, but I went back to the Navy for SeaLab II, which took place in 1965.

INTERVIEWER: You were in space in 1962?

MR. CARPENTER: Yes.

INTERVIEWER: Bob Barth was your mentor and the person who influenced you most in your diving career?

MR. CARPENTER: Yes, he is forever my mentor. He was a big motivator. George Bond was, too. George and Bob joined the primary motivator, who was Cousteau, in that order. There were others. Joe McGinnis was a great influence on me, as was Peter Gimble. I've met a lot of people in the diving world, for whom I have great respect.

INTERVIEWER: Could you say that any one of them had more influence than any others, or is that very difficult?

MR. CARPENTER: Well, Cousteau was the most influential, Bond the second, and Barth the third. But, of course, Barth is still around. The others are not, and I consider Barth the primary influence in my continued interest in underwater work.

INTERVIEWER: You consider him extraordinary?

MR. CARPENTER: I do. I have to mention Jan Koblich, too. He's another inspirational fellow to me.

INTERVIEWER: Was there anyone in the undersea community who you consider to be a role model, or someone who made a significant impact on you personally, or are they the people you mentioned?

MR. CARPENTER: Well, there is Dick Anderson, Ian Koblick, and Murray Black, but I don't think of any others. They're all role models. All of them are heroes to me.

INTERVIEWER: You've probably been to a lot of different diving schools, with specialized courses, during your underwater career. In your opinion, what was the best school you attended?

MR. CARPENTER: The best training I received was with the new breathing apparatus that we had planned to use for SeaLab III. I never got any training in completely closed circuit gear. I regret that. But the best training was throughout the SeaLab series.

INTERVIEWER: What was the toughest part of your diver training?

MR. CARPENTER: I don't think of it as being tough. The most difficult thing for me was the cold water. That was unpleasant, but I don't think of anything else as being tough. It was just the cold water.

INTERVIEWER: During your training, what made the most lasting impression on you?

MR. CARPENTER: I think when Bob Barth and I volunteered to go down to something like 220 or 230 feet to recover a camera that one of the SeaLab II guys, a civilian from the Scripps

Institute named Bill Bunton, had lost. It was sitting on the bottom, and Bob and I were diving as a buddy team to go down and get it. We went down the descending line and got to about 200 feet, I guess, and I spotted the camera. I was always trying to prove my merit to Bob Barth, because I was an imposter, you know, from the aviation Navy. But I saw that camera, and I took off at full speed for it. Bob kept his cool and watched the neophyte run himself into nitrogen narcosis.

He saw me come back, and we started back up. He didn't say, "No, don't do that," but he was smart enough not to do it himself. He let me exert myself, which, of course, made it worse. I learned about "rapture of the deep" from that. It was a good lesson. I was undone and, of course, he hadn't exerted himself and was fine. I was loony.

INTERVIEWER: Why did you choose the particular type of diving? Did you go into saturation diving because of SeaLab?

MR. CARPENTER: Oh, sure. The only way for me to get into diving was through that program. It accepted me from the outside.

INTERVIEWER: In your entire Navy diving career, what would you consider to be a highlight?

MR. CARPENTER: The entire SeaLab II experience was the acme of my underwater work.

INTERVIEWER: How did your Navy diving career affect your later life?

MR. CARPENTER: Well, it gave me great personal satisfaction knowing that I had been accepted by the Navy divers and the others in the SeaLab crew. I had reason to believe that I had been accepted into a group of divers for whom I had great respect. That gave me great self-satisfaction.

INTERVIEWER: What was your first experience underwater?

MR. CARPENTER: Well, it probably doesn't work well for this story, but it was being able to swim all the way across the pool underwater. It was when I learned the self-imposed discipline that you have to use when you're holding your breath and swimming underwater. I also once got some help in that regard flying from Kodiak to Adak as a navigator, at the navigation table in a P2V. It was right after I got to the squadron and wasn't flying in the right or left seats. I was still at the navigator's desk and I was bored. I took the oxygen mask and breathed pure oxygen for quite a while to see how long I could hold my breath with pre-oxygenation. I did it for almost five minutes, four minutes and fifty seconds to be exact, before I gave out. I realized that I could do a lot of hard things if I put my mind to it.

INTERVIEWER: State your most memorable experience, once you qualified as a diver.

MR. CARPENTER: It was probably going with Wilbur Eaton down to SeaLab II, unbolting the hatch and climbing aboard to live on the ocean floor.

INTERVIEWER: Did you have any dangerous or life-threatening experiences?

MR. CARPENTER: Well, my "hooka"-supplied semi-closed circuit gear that supplied gas from the SeaLab had some problems. It was a night dive, and I was out with another diver. Something happened to my rig. I couldn't breathe. I never knew what it was, but I made it back to the lab. The umbilical was only thirty or forty feet, I think. I was scared because I couldn't breathe. I got back inside, and I realized that I had left my buddy out there by himself, and I kept asking the guys in the trunk, "Where is Kaufmann?" His name was Kaufmann. He came back and was OK. I was frightened because I couldn't breathe.

INTERVIEWER: What diving missions were you assigned to? What equipment did you use?

MR. CARPENTER: Everybody did sort of the same work out of the lab. There were physical strength and hand-eye coordination tests in that low light level. A lot of the exercises were

strength tests both inside and outside. We worked with the Navy salvage gear. We worked with Tuffy. That was fun.

INTERVIEWER: Tuffy was the porpoise?

MR. CARPENTER: Yes. We did some surveying, driving stakes at certain directions and distances. We had a hydrophonic farm, we did marine geology, and marine biology; and we did a lot of tests inside the lab, too. Most of them had to do with hyperbaric exposure.

INTERVIEWER: What kinds of missions were you assigned to during the SeaLab?

MR. CARPENTER: I was the team leader, and I'd set up the diving schedule for everybody. I was the right hand man for Walt Mazzone and George Bond. They were in control of the mission from topside. I was the middleman on the bottom. Except for the diving duty, I was an administrator.

INTERVIEWER: In the water, what missions were SeaLab divers assigned to in general?

MR. CARPENTER: Well, Scripps trained some of them in Marine biology studies. Everybody did physiology tests on themselves in the water and in the lab. There were some Marine geologists. There were some physical oceanographers from Scripps making current, salinity and visibility measurements on a regular basis. I did some surveying. I did a lot of the physiology work. I evaluated a number of the salvage tools that helped us do away with the torque from a rotating tool.

INTERVIEWER: Was that for SeaLab II and SeaLab III?

MR. CARPENTER: Well, of course, it was for the Navy, but we did those analyses out of SeaLab II, to be carried on later at a greater depth in SeaLab III, but that never materialized.

INTERVIEWER: You told me how you first got into diving. Are there any other aspects of entering your diving career that you remember?

MR. CARPENTER: Other than that, I think the unique experience with fear was in that ditching experience, which impelled me to conquer that fear. That was a very important thing that happened to me. My respect for those great heroes who get no acclaim at all is important, too. I don't know whether that answers your question or not. It's simply the train of thought that started. I just became so proud and inwardly satisfied to have arrived at a place at which I could be considered an equal and a team member in that group of guys. Very few people appreciate what divers do.

INTERVIEWER: Ocean floor habitat diving was moving along at a remarkable pace during the early part of the last half of the twentieth century, at least until we lost Berry Cannon during the operations of the Navy SeaLab III. From Then habitat diving lost its luster. What is your opinion as to why? Was it Berry Cannon's unfortunate death? Was it something else? Also, if Berry Cannon had not died, what is your opinion as to what the Navy would have developed from the SeaLab III experiments in which you were so intimately involved?

MR. CARPENTER: I think Berry Cannon's death had a big impact on the whole experiment that George Bond started in underwater habitation. I have an idea that about that time, when it became apparent to the people who were doing it, that we were not at the beginning of an open experiment that was unlimited as far as depth was concerned. High Pressure Nervous Syndrome (HPNS) came to the fore, and we all realized that we couldn't do what the narration of the SeaLab II documentary dictate, like dive to 2,000 feet in the future. We can't do that. Physiologically, that was a showstopper. There was that. Of course, we lost its greatest proponent in Bond. I don't know if the world situation may have had something to do with it, but

the Navy never really had a mission to develop undersea habitation. The idea fell out of favor at high levels of Navy jurisdiction. We lost our resolve. Berry's loss was part of that. I don't really know what happened. But if George had been given a free hand and more money, we would have gone to 2,000 feet.

INTERVIEWER: I remember that the SeaLab bumper sticker read, "the ocean's floor is more interesting than the moon's behind."

MR. CARPENTER: Yes, and we know more about the moon's behind than we do about the ocean's bottom.

INTERVIEWER: The difference between the funding in space and the funding of the ocean exploration was significant. But you mentioned Berry Cannon's death as being a factor in the slowdown or cancellation of ocean habitat. How would that compare with the death of Gus Grissom and his crew? Is that too sensitive?

MR. CARPENTER: They were both showstoppers, but the nation had a vested interest in the glorious pursuit of preeminence in space. That was part of our national defense. The nation realized that we had to have preeminence in space. Forget preeminence in the deep ocean.

INTERVIEWER: Deep submergence rescue vehicles (DSRV) are going out of service and are being replaced by another type of submarine rescue system. What is your opinion about the utility of the DSRVs during your lifetime?

MR. CARPENTER: I think it was a great concept, and I don't know why it was abandoned. I can understand it if we can get one to do the job by remote control. To be able to control the DSRV and have it latch onto the escape hatch of a submarine if she has rolled more than thirty or forty degrees, or whatever, could be difficult. There are limits. That would be a very tough rescue job.

Maybe robots could do it. The idea of rescuing stranded crewmembers of a sunken submarine in the deep ocean is a very tricky job.

INTERVIEWER: Are you familiar with the new submarine system, the submarine rescue and diving recompression system, the SRDRS?

MR. CARPENTER: I don't know enough about that.

INTERVIEWER: It's being explored. What is your opinion of equipment that was developed for submarine rescue, such as the one atmosphere diving suit?

MR. CARPENTER: I think it has great promise for doing work in very deep water. I've never had the occasion to think about its use as a rescue device for the crew of a sunken submarine. I don't understand quite how that would work.

INTERVIEWER: Well, when we were working on JIM IV, we had JIM hook on a connector to a simulated submarine, so my own feeling is that there could be some use for it. You're right, though. If it's off at an angle or a tilt, nothing is going to be able to get through to it.

MR. CARPENTER: JIM could go down and latch onto a sunken submarine. I thought you were talking about using the JIM suit to bring stranded crewmembers up.

INTERVIEWER: Oh, no. No, but we demonstrated that it could hook on with connectors.

MR. CARPENTER: Oh, of course. What would be done with that connector, though?

INTERVIEWER: Well, it would be connected to the chamber, or connected to topside.

MR. CARPENTER: You could use it as a guide for the robot. I see that.

INTERVIEWER: Yes, but it's also for connecting the chamber. What about the submarine escape immersion equipment? Are you familiar with that?

MR. CARPENTER: No, sir. I'm not.

INTERVIEWER: Do you know of the British submarine personnel escape system that was derived from Sir Robert Davis's work years ago?

MR. CARPENTER: I'm sorry, no, I don't.

INTERVIEWER: In your particular area, what has proven to be the one thing that has brought you the most satisfaction?

MR. CARPENTER: The perseverance of the men who do these things has brought me the most satisfaction.

INTERVIEWER: Of what experience or job or operation are you the most proud?

MR. CARPENTER: Well, SeaLab II, in my experience, was wonderful. It was a great triumph.

INTERVIEWER: What do you consider your most important contribution to diving?

MR. CARPENTER: What I did, anybody could do. But my status as a spaceman brought attention to it, and I think that was helpful.

INTERVIEWER: I remember that on SeaLab III, whenever a reporter or photographer came close to the buildings, you always called other members of the SeaLab III crew around so that you never were photographed alone. I thought that, in your eminence as a spaceman, you did share this.

MR. CARPENTER: I remember that need.

INTERVIEWER: It was very gracious and very much a part of you. Talk about something you helped to create, establish, initiate, develop, or change.

MR. CARPENTER: I think I brought something of value from the aviation Navy's procedures and attention to detail to the underwater Navy habits and procedures.

INTERVIEWER: Those were from NASA?

MR. CARPENTER: Yes, they were from both NASA and aviation procedures and practices. I thought them to be more precise, more practiced, better documented, and better followed than were those in the diving Navy. I think I helped bring those good habits to underwater work.

INTERVIEWER: I think you're right. We were talking about how aviation reporting and the reporting of accidents was much more thorough and accurate than in other fields.

MR. CARPENTER: Yes.

INTERVIEWER: That was just one component of the accuracy and the detail. Do you have any regrets or disappointments related to your career in underwater activity?

MR. CARPENTER: I regret the chain of circumstances that brought about Berry Cannon's death. I regret my accident that kept me out of SeaLab I. But who knows what would have happened, otherwise? But the worst thing for SeaLab was Berry Cannon's death. That shot us down on SeaLab III, but the Navy might have shut down the whole underwater living project even had Berry not been killed.

INTERVIEWER: Is there a story or incident that you've never told? If so, can you tell it now?

MR. CARPENTER: Yes, I suppose I do have...some stories I will never tell.

INTERVIEWER: If you had the opportunity to do it again, would you? If not, why not?

MR. CARPENTER: I would. It was one of the most satisfying experiences of my life. I would take, however, this time, I hope, a heated suit.

INTERVIEWER: If you had your career to live over, thinking in terms of constraints under which you developed your career, what personal decisions would you change, and why?

MR. CARPENTER: I don't think I would change any decisions. They were all a result of what came before. I don't think I made any bad choices as far as my Navy career was concerned.

INTERVIEWER: Your career is one of those targeted for inclusion in this book of major historical events that molded the direction the Navy took in undersea technology, as undersea technology has been developed. Would you recommend yourself as a career model to young men today?

MR. CARPENTER: I would do that.

INTERVIEWER: Why?

MR. CARPENTER: Well, I would do that because I worked hard at what I did and apparently had a number of useful qualities. But I think if I got a chance to try to inspire youngsters on the way up to follow a career in the Navy, I would cite curiosity as being the most important driver and perseverance as the most important tool.

INTERVIEWER: Of all the things you did during your career, what do you rate as the most significant in advancing Navy undersea technology?

MR. CARPENTER: I consider devotion the most important thing.

INTERVIEWER: What do you consider the most significant achievement made in the underwater field in the past fifty years?

MR. CARPENTER: I think the most significant development is that of closed circuit re-breathers.

INTERVIEWER: Why?

MR. CARPENTER: They extend our limits, both in time and depth.

INTERVIEWER: Can you describe any significant events in diving history that occurred during your tours?

MR. CARPENTER: Yes. That would be the development of closed circuit re-breathers.

INTERVIEWER: What advances in diving practices and technology do you believe contributed the most to successful operations over the years?

MR. CARPENTER: Well, of course, underwater communication, such as the helium voice unscrambler and electronics that allowed communications with the divers from the surface or from the habitat, and between divers, was an important advance. The refinement of breathing equipment, the development of diver heating devices and the dry suit were also good things. I did use a dry suit with McGinnis in Resolute Bay. But the dry suit is tough to work with. It's not as tough as JIM is, I guess, but a wetsuit is best. If you could just heat it, that would be the way to go.

INTERVIEWER: Think back about your career in undersea technology. If all barriers had been removed and you had been given absolute authority to do anything you wanted, what would you have changed?

MR. CARPENTER: I would have changed the Navy's interest in what we were doing, and I would have given them a better realization of how important that work was. Not everyone is as inspired as I am by what we can learn from doing work in the deep ocean; living there and staying there.

INTERVIEWER: We're looking at a hundred-year timeline of the development of undersea technology for this book. Of the many events that took place over that century, what do you believe are the top three events that caused major changes in the way man viewed undersea technology and the philosophy of Man in the Sea?

MR. CARPENTER: I think submarine failures played a big part in developing things like the Momsen Lung and trying to get to those poor men who were stranded. That was, I think, an important motivator. I think that another important motivator has always been sunken treasure,

and the *Titanic* and other sunken ships. Our ability to go underwater there and stay for a while changed its availability, and it made it more attractive to people. The fact that we can recover sunken gold is attractive. To develop a way to save stranded submariners is very important.

INTERVIEWER: For the first half of the century, the Navy was the world leader in diving. Since that time, many Navy divers have been leaders in the commercial diving field. Currently, neither of these facts seems to be prevalent. What are your thoughts on this?

MR. CARPENTER: I don't know why that happened. I think that Navy trained people are the best and I don't know why they are not in demand now. One thing that may be a factor is that there are better commercial diving schools now than there were years ago.

INTERVIEWER: Based on our hundred-year history on where we have been with undersea technology, what is your prognosis for the future?

MR. CARPENTER: I don't know. I see this brick wall at 2,000 feet for the free-swimming diver. I don't hold out a lot of hope for any progress in depth or duration. We're not in the business of saturation diving anymore. I don't know where we're going. It seems like we have lost our way.

INTERVIEWER: Do you have any feeling as to why we lost interest in saturation diving? There have been people who have said if there had been a saturation diving capability when TWA 800 went down, the recovery could have been done faster and safer.

MR. CARPENTER: Well, I'm sure that's right. But where is the need for doing it faster? We didn't lose any divers, did we?

INTERVIEWER: No.

MR. CARPENTER: It's easier, but there are those in top Navy circles who would say that would work, but it would cost too much.

INTERVIEWER: A number of achievements have been made in our diving over the last hundred years. Some of them are listed here as a refresher, and I'll give you a list of the achievements. I would like for you to think about which of these or any other achievements that you would characterize as being the highly significant accomplishments. For example, were air decompression tables significant?

MR. CARPENTER: Oh, sure.

INTERVIEWER: How about submarine rescue chambers?

MR. CARPENTER: Well, I don't think that was so significant.

INTERVIEWER: What about mixed gas diving?

MR. CARPENTER: Yes. That was important.

INTERVIEWER: How about SCUBA?

MR. CARPENTER: Sure. It's the granddaddy.

INTERVIEWER: Were underwater habitats significant?

MR. CARPENTER: I think they have great potential, but they don't seem to have the chance of realization they once had.

INTERVIEWER: What about the closed circuit UBA?

MR. CARPENTER: Closed circuit was quite important, yes. It was a crucial part of mixed gas diving.

INTERVIEWER: How about saturation bell diving?

MR. CARPENTER: I don't know. If you want consider saturation diving habitat diving, a bell is short-term. I don't think it has the future that underwater habitation has. If you mean a bell that mates to a deck decompression chamber, then sure, that has promise.

INTERVIEWER: Are there any other thoughts that you have about the future of Navy diving that you would share with us?

MR. CARPENTER: Yes. I wrote about this a little bit in my novels. I think there is a way to do decompression better, maybe chemically in some way. I'm sure there is a way to do away with this mysterious high pressure nervous syndrome. There has got to be a way we can lick that.

INTERVIEWER: Do you think HPNS and decompression are the major barriers to deep diving?

MR. CARPENTER: I do.

INTERVIEWER: Well, thank you so much.

MR. CARPENTER: It's fun to talk about it, but I should be asking you these questions, you know.

INTERVIEWER: I'm going to be asked them.

MR. CARPENTER: Good.

(Whereupon, the interview of SCOTT CARPENTER was concluded.)

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UNDERSEA & HYPERBARIC MEDICAL SOCIETY

ORAL HISTORY INTERVIEW
CAPTAIN STEVEN N. ANASTASION

Monday, November 17, 2003

PROCEEDINGS

INTERVIEWER: I'm talking to Captain Steven N. Anastasion of Chocowinity, North Carolina.

Why don't you say something and make sure I'm capturing you, also?

CPT. ANASTASION: This is Steve Anastasion. I'm talking with Bob Bornmann on his project.

INTERVIEWER: I think we are set but just to make sure let's do some just chatting, some schmoozing here. I understand that you are of Greek descent and proud of it. Is that correct?

CPT. ANASTASION: Oh, yes. My parents were born in Turkey. They arrived in the U.S. They're Greek. Well, let me put it this way. They were born in Turkey.

INTERVIEWER: Where in Turkey?

CPT. ANASTASION: They were born in the middle of Turkey in a little town called Permata, which may or may not exist now. My father came over about 1908 and my mother followed him. They weren't married at the time. She came over with her mother-in-law about 1919 or so, when there was an exchange between the Greeks and the Turks, right after World War I.

INTERVIEWER: Was she from the same area?

CPT. ANASTASION: She was born in the same town. They were spoken for each other when she was born.

INTERVIEWER: It was one of those things?

CPT. ANASTASION: Yes.

INTERVIEWER: Now, let me ask you about your name. This is a hobby of mine and my knowledge of Greek comes only from my medical dictionary but 'stasis' means 'standing still.'

CPT. ANASTASION: Yes.

INTERVIEWER: 'Ana' could mean either 'up,' as in the direction, or it could be a negative.

CPT. ANASTASION: No. My name has a very, very specific meaning. My first name in Greek is 'Stavros,' which, in essence, means 'a cross,' as in the Cross. My last name, Anastasiou, comes from anastasis, which is 'resurrection.'

INTERVIEWER: Spell that for me again, Anastasis?

CPT. ANASTASION: Phonetically, it's A-n-a-s-t-a-s-i-s.

INTERVIEWER: That's what I was looking for, Anastasis.

CPT. ANASTASION: Right.

INTERVIEWER: That means 'resurrection?'

CPT. ANASTASION: Yes.

INTERVIEWER: I'm going to have to check that out with my pastor. Stavros, now, is that a saint's name?

CPT. ANASTASION: Stavros is a cross, as in the crucifixion, the cross.

INTERVIEWER: It is allied with resurrection, so that's significant, the combination?

CPT. ANASTASION: I would think so.

INTERVIEWER: That's great. You were born in New Haven?

CPT. ANASTASION: I was born in New Haven, Connecticut, the first born of an immigrant family. The whole family, including my father and his two brothers, came over together very early in the 1900s. I was the first born.

INTERVIEWER: What year were you born?

CPT. ANASTASION: I was born in 1921.

INTERVIEWER: Did you go to a parochial school?

CPT. ANASTASION: No. I went to public schools.

INTERVIEWER: Then you graduated from New Haven High School?

CPT. ANASTASION: Yes, in 1938.

INTERVIEWER: When did you enter the Naval Academy?

CPT. ANASTASION: I entered in 1939.

INTERVIEWER: You were originally in the class of 1943?

CPT. ANASTASION: Yes.

INTERVIEWER: But the war came along and you were accelerated. You finished in three years?

CPT. ANASTASION: I finished in June of 1942.

INTERVIEWER: That became the class of 1942?

CPT. ANASTASION: No. It was the class of 1943.

INTERVIEWER: The class of 1943 graduated in June of 1942?

CPT. ANASTASION: That's right.

INTERVIEWER: I noticed that you went to the USS *Champlain* and were the executive officer (XO) in two years. If you had graduated on time, you would have still been an ensign on a battleship in 1944.

CPT. ANASTASION: It would have been different.

INTERVIEWER: Were you a junior grade in 1944 or a lieutenant?

CPT. ANASTASION: I was a lieutenant.

INTERVIEWER: I'm sure that you were quite capable. They made you XO. You were on there until 1945?

CPT. ANASTASION: I was taken off in 1945 to go to postgraduate school in Annapolis.

INTERVIEWER: The *Champlain* was mostly in the European theater?

CPT. ANASTASION: Yes. It was until the last year. We moved around through the canal into San Diego, took off the torpedoes, put on machine guns, and the day before I left, I was transferred.

INTERVIEWER: That was what month in 1945?

CPT. ANASTASION: Let's see. It was in June or July. I'm not sure which.

INTERVIEWER: But the war was essentially over?

CPT. ANASTASION: That was when they went out into the Pacific for Iwo Jima and Okinawa.

INTERVIEWER: You got your degree from MIT in 1948. Were you there for three years?

CPT. ANASTASION: No. I went to the PG School in Annapolis for one year and from there, we were selected depending on our interests and how well we performed in Annapolis, and they allowed us to request the schools to which we wanted to go. There were five of us chosen to go to MIT.

The course, at that time, was called 'ordnance physics.' After one semester at MIT, the Bureau or OPNAV decided they needed some physics students because of the atomic energy programs. Two of us were selected to move into physics.

INTERVIEWER: You spent two years at MIT?

CPT. ANASTASION: Yes. I graduated in February of 1948.

INTERVIEWER: What were you doing from 1948 to 1952?

CPT. ANASTASION: Well, when I graduated from MIT in February of 1948, the Navy sent me on a tour of a number of places. I went to what was it, Dahlgren Proving Ground for three months for weaponry, to the Armed Forces Special Weapons Project at Sandia Base in Albuquerque for three months, and then to Los Alamos, New Mexico, for three months. I was

put into work situations with the people who were working on weapons research and development. At Los Alamos, Admiral Parsons came up and visited with me.

INTERVIEWER: That was Deke Parsons, the guy that armed the first atomic bomb drop on Hiroshima?

CPT. ANASTASION: That's right. He was rear admiral Then head of OPNAV's Atomic Energy Office. He came and spent a day or so with me. He said, in essence, "Steve, we're taking you out of here. We didn't pay you to become a Ph.D. You're going to sea." Then I was sent to the Coral Sea. I was on the *Coral Sea* about two weeks later as the assistant gunnery officer and special weapons officer after my visit with Admiral Parsons. I stayed aboard the ship for about nine or ten months.

INTERVIEWER: That would get you up to 1952?

CPT. ANASTASION: Is that right? I guess.

INTERVIEWER: According to my calculations, it would be 1952.

CPT. ANASTASION: It was nine months after I graduated, so it was still around 1949.

INTERVIEWER: Oh, sorry. In 1949, you went to the *Coral Sea* and were there nine months.

CPT. ANASTASION: That's right, so that makes it about 1950. From there, I received a message from the Office of the Chief of Naval Operation's (CNO). It said, "If you volunteer, we're offering you a job with Task Group 3.1." Dr. Graves was preparing for tests in Enewitok, Operation Greenhouse, so I volunteered. Alvin Graves was heading the technical part of the operation, and General Pete Quesada was the head of the whole task force.

INTERVIEWER: He was later the head of the FAA?

CPT. ANASTASION: I think so.

INTERVIEWER: That would take you through to 1952?

CPT. ANASTASION: We did spend three months at Enewitok. I was responsible for developing, producing, installing, recovering and analyzing air blast measuring devices, working with two civilian engineers who were working on the taping and recording of the measurements. This lasted until about 1951.

When that was over, I got orders to go to the Bureau of Ordnance in the Office of the Special Assistant for Atomic Energy Applications. The director at that time was Captain Ed Hooper. I was with that office for one year. I did the analysis and study for developing an atomic weapon for large Navy ships.

INTERVIEWER: Now, was it an aircraft weapon?

CPT. ANASTASION: It was a surface weapon.

INTERVIEWER: Was it a rocket or a missile?

CPT. ANASTASION: It was a gun-launched weapon. After a year, I got orders to the USS Melvin R. Norman (DE-416) as the commanding officer (CO).

INTERVIEWER: You were on board until 1954?

CPT. ANASTASION: From there, I went back to Albuquerque.

INTERVIEWER: Was that to Sandia?

CPT. ANASTASION: I went to Sandia Base for three years, first as the director of the nuclear school and for the last of the three years, as the director of all individual technical weapons training.

INTERVIEWER: What rank were you Then a commander?

CPT. ANASTASION: I was a lieutenant commander when I went out and commander during the last year.

INTERVIEWER: Then in 1957, you went to the Naval War College?

CPT. ANASTASION: I went to the war college for one year.

INTERVIEWER: That was in Newport?

CPT. ANASTASION: Yes. It was in Newport, Rhode Island.

INTERVIEWER: Then in 1958, you went to the *Hawkins* (DDR 873)?

CPT. ANASTASION: That was at Newport. I stayed with the *Hawkins* for two years as the CO.

INTERVIEWER: Then you went to the Secretary of the Navy's (SECNAV) office?

CPT. ANASTASION: Then I got a call from Admiral Weakley, who said that I was being sent to Washington for an interview with Dr. James Wakelin, who had just transformed his office from Assistant Secretary for Air to Assistant Secretary for Research and Development

INTERVIEWER: This was a point that I was curious about. When he was appointed and took office in the Eisenhower administration, he was originally the Assistant Secretary for Air?

CPT. ANASTASION: That's right.

INTERVIEWER: After the Frank Report, they changed that title. They changed the office to ASN for R&D?

CPT. ANASTASION: That's right. As a matter of fact, all services had research and development secretaries then.

INTERVIEWER: That was the year before you arrived, though?

CPT. ANASTASION: Yes.

INTERVIEWER: The Frank Report came out in 1959.

CPT. ANASTASION: I arrived in 1960.

INTERVIEWER: It was in September of 1960, you said? Another thing that I am dim about, which someone mentioned, but I have no historical memory, is that Wakelin continued into the Kennedy administration?

CPT. ANASTASION: Yes.

INTERVIEWER: He did so even though Republicans appointed him?

CPT. ANASTASION: That's right.

INTERVIEWER: He may have been a Republican himself. I don't know. But when Kennedy took office, he appointed John Connally as Secretary of the Navy.

CPT. ANASTASION: That's probably right.

INTERVIEWER: Connally served less than 12 full months and resigned to run for Governor of Texas and was successful in that election.

CPT. ANASTASION: Then Korth came on.

INTERVIEWER: Now, was Korth the undersecretary?

CPT. ANASTASION: I don't remember that.

INTERVIEWER: What I'm leading up to is that I heard a story that after Connally resigned, Kennedy appointed someone who died before he could come to Washington and take office.

CPT. ANASTASION: I don't have a recollection of that.

INTERVIEWER: You don't remember that? It's just one of these little stories of politics and persons in Washington about which someone says, "I have a glimmer of a memory but can't remember names or dates or anything like that." Korth was the secretary and yet again, there is a story that Kennedy nominated Paul Nitze, who was in the State Department, but his confirmation was held up for some time, or until Kennedy was assassinated. Johnson took over, and within a week, Nitze was the new Secretary of the Navy. Oh, sorry. Korth had left the first of November and Paul Fay, the undersecretary, took over for about three weeks and there was a changeover then. Fay left and Nitze came in. Is that correct, to your memory?

CPT. ANASTASION: It may be, Bob. My memory is very dim about that office.

INTERVIEWER: Actually, you left before those events took place.

CPT. ANASTASION: I left where?

INTERVIEWER: You left the Secretary's office.

CPT. ANASTASION: I left in 1963, I guess.

INTERVIEWER: You sent me an e-mail that said you left in August of 1963.

CPT. ANASTASION: That's right. I went to the Industrial College of the Armed Forces for a year.

INTERVIEWER: Tell me, did you have an overlap with Ed Snyder?

CPT. ANASTASION: No. After three years, I decided that I should get out and do something else. What we did in the secretary's office was very useful. But I wanted to go back to sea or do something else.

I thought three years in the Secretary's office was a lot of time. I had intended to go in two, but Dr. Wakelin asked me to stay on. I stayed on for a third year. I wanted to go to sea but was ordered to the industrial college instead. During that period, for the last couple of months I was with Dr. Wakelin, we interviewed several naval officers. On one of those occasions, we were in Newport with Secretary Wakelin. He made speeches at Raytheon and the War College.

INTERVIEWER: Raytheon was in Boston?

CPT. ANASTASION: No. It was in Newport-Portsmouth. We had an opportunity to go on board Ed Snider's ship, which was an engineering research-kind of destroyer. We met him and Dr. Wakelin asked me to bring him back to Washington for an interview. He was the one selected to take my place. We did not have an overlap except for maybe two or three or four days.

INTERVIEWER: That was in August?

CPT. ANASTASION: It was maybe very early August because I had some leave before I went to the industrial college at the end of August.

INTERVIEWER: The ICAF started in August. You took some leave?

CPT. ANASTASION: Yes.

INTERVIEWER: That fits because he said that he was interviewed, that his destroyer was going into the shipyard and he wanted to continue as commanding officer for another three months, but during that period, he was sent TAD to BUSANDA in the Pentagon and was available to Secretary Wakelin.

CPT. ANASTASION: However it happened.

INTERVIEWER: Then you went to the industrial college. You went from there to command the USS *Leahy*, which was a new type of ship, right?

CPT. ANASTASION: Yes. It was the first of a new class, and I was its second commanding officer. At that time, they were designated 'destroyer leaders' but were later re-designated as missile cruisers. The Leahy class was the first of the type that missiles as the main armament. We had a couple of three-inch guns, but the main armament was missiles, both fore and aft.

INTERVIEWER: The USS *Ricketts* was a sister ship?

CPT. ANASTASION: No. The *Ricketts* was a single-ender destroyer. It had a missile battery, but I think that was only on the forward end. The *Leahy* had missiles fore and aft. Its sister ships were the USS *Yarnell*, the USS *Halsey* and a few others.

INTERVIEWER: Well, the reason I bring that up is because I wanted to know if you remember the death of Admiral Ricketts.

CPT. ANASTASION: I recall it, but that's about all.

INTERVIEWER: As a Navy medical officer, I'm trying to get more information because someone told me that Admiral Ricketts was four-star, the Vice Chief of Naval Operations (VCNO) and died in his doctor's office in Bethesda from a heart attack.

CPT. ANASTASION: That I don't know.

INTERVIEWER: I'll have to find somebody else. Do you remember Jan Herman, the historian in the Bureau of Medicine and Surgery's Surgeon General's office?

CPT. ANASTASION: No.

INTERVIEWER: Well, he's working with us on these oral histories. I thought that the death of the Vice Chief of Naval Operations from a heart attack, plus the death of Forrest Sherman ten years before, led to annual physicals for flag officers and important individuals within the Bureau of Medicine and Surgery. Ed Coyle was the head of that office in Bethesda.

CPT. ANASTASION: I have a recollection that those things were very important events in our lives in those days, but beyond that, I don't remember and wouldn't have even remembered it now if you hadn't brought it up.

INTERVIEWER: Well, as a young man, a young officer, you hear about the death of an Admiral and say, "too bad, but that opens up the ladder a little, so let's get to work." What did you do after you left command of the *Leahy*?

CPT. ANASTASION: I got orders back to the secretary's office as the Assistant Director in the Secretary's Office of Program Appraisal and was responsible for all studies and analyses. I was there for about two years from 1967 to 1969, and I had great bosses. We worked pretty much directly with the secretary, running in to see him often for briefings. Essentially, and it may not be the best way to say this, but we were a secretary's counterpart to Alan Entow in McNamara's office.

INTERVIEWER: Who was the secretary at that time?

CPT. ANASTASION: There were several.

INTERVIEWER: This was the Secretary of the Navy?

CPT. ANASTASION: Ignatius was one, I recall. John Warner, I think, was undersecretary at the time, whom I got to know very well. There may have been some others. That slips my mind, Bob.

INTERVIEWER: You've mentioned this was in the McNamara era. What you were doing in program appraisal was very important not only for survival, but also for future direction of the Navy as a service.

CPT. ANASTASION: That's right. We had to prepare what I think he called 'presidential memoranda.' We spent hours and hours, often until one or two or three in the morning, preparing these under difficult deadlines in response to requests from the Secretary of Defense's office.

When I look at it now, they seemed very important then. I'm not sure how important they really turned out, like most of those things. It was a marvelous exercise because it brought us into very, very important analyses of specific items either countered or supported proposals or preliminary decisions from the Secretary of Defense's office, providing support to the CNO, the VCNO, the Secretary and all the people trying to promote, or at least justify, Navy proposals and programs.

We helped develop the secretary's shipbuilding program and a number of things like that. For example, we did the analyses and work considering the future utility of the mothballed destroyers from World War II. It eventually worked well because we were able to gradually

eliminate the mothballed destroyers and start building other classes of destroyers that were more modern and more capable.

INTERVIEWER: I remember they used to call them 'snowflakes.' They would typically come out on a Friday morning. You'd have to come back with a response by Monday morning or your budget would be eliminated.

CPT. ANASTASION: If you didn't respond, it would probably be taken as an acknowledgement that no further discussion was required. But I don't remember any instances of not responding.

INTERVIEWER: I agree with your assessment that it was very effective program management, but it was a terrible way to run some excellent and very capable staff people.

CPT. ANASTASION: There weren't very many of us in those days. During the three years I was at Jim Wakelin's office, there were only two of us in the technical side, myself and Carl Holmquist, who later became Chief of Naval Research.

There were two aides while I was there, one Marine and one Navy. Two civilians were brought in, an engineer and a scientist. That was the whole office. Later, when I went back to OPA in, let's see, 1967 to 1969, there were some forty people in that office. It was a big expansion and probably due to additional responsibilities. The work in surface warfare and oceanography that I had been doing, for instance, was then being handled by five or six people. The responsibilities had exploded. Many more staff had to be brought in. It was very nice, very simple and very productive, just four of us working in our office, supporting the secretary.

INTERVIEWER: You were an unrestricted line officer all through that period?

CPT. ANASTASION: Yes.

INTERVIEWER: You had a master's degree. You had the recognition in your record that you had a background in physics and weapons. You still went on and your career was marked by the command of several very important surface ships?

CPT. ANASTASION: In those days, you had a major field as a line officer and had the subspecialty so that when you came ashore, you were often targeted for that subspecialty. My area was primarily ordnance, although I did get into the secretary's office for studies.

INTERVIEWER: Were you ever recruited to shift to ordnance engineering only?

CPT. ANASTASION: No. That was an EDO specialty, not the line designation.

INTERVIEWER: They didn't ask you if you wanted to consider it?

CPT. ANASTASION: Yes. They did in the beginning, absolutely. I was even sent a certificate that stated that I was designated an 'ordnance engineer.' I still have that certificate.

It was just the recognition of the fact that I was becoming known and an expert in the ordnance area, but I was not an EDO.

INTERVIEWER: Was that because you chose not to be?

CPT. ANASTASION: Well, I wanted to go to sea and command ships.

INTERVIEWER: That's right. I was a staff officer. I was a medical officer, but I talked to line officers and the truly successful were those who wanted to go to sea in command.

CPT. ANASTASION: That's right. I analyzed at when I was a young officer and felt that if I stayed in the Navy, I wanted to go to sea and search for command. If I wanted to be an engineer after MIT, and do engineering and scientific work, then the Navy would not have necessarily been the place for me.

INTERVIEWER: I understand that very well because we had a problem with uniform medical officers in research labs. They wanted to stay eight to ten years in the same lab. You say, "well,

what's the purpose of having a uniform if you're going to stay eight to ten years? Why don't you get a civilian?" That was a big problem and is a problem even today. The pendulum keeps sweeping back and forth, back and forth. What year did you retire from active duty?

CPT. ANASTASION: I retired the first of February in 1972.

INTERVIEWER: What had you done between leaving the SECNAV's office in 1969 to your retirement?

CPT. ANASTASION: I was selected to relieve John Chase, from the class of 1940, as the commander of the naval weapons lab at Dahlgren, a magnificent assignment with new things happening. There was new weaponry, modern weaponry, supporting in special cases the Air Force and the Army with their weapons programs. It was becoming a preeminent computer laboratory for the Navy, taking on many of the program developments for submarine ballistic missiles and air-to-air missiles. It was a very, very complex operation and a very rewarding one.

INTERVIEWER: It was also in a lovely setting?

CPT. ANASTASION: It was beautiful down there. It was isolated, but there were 4500 or 4600 acres of land for which we were responsible. We still carried on some of the old proving ground activities, like shooting bullets down the Potomac River. I think it was beginning to diminish. Then although it couldn't completely because we didn't have anyplace else to prove out some of the ballistic tables and pieces of ammunition over water.

INTERVIEWER: What's the Dahlgren lab doing now? Do you know?

CPT. ANASTASION: Well, they did the Aegis weapon system, for instance. They had the land, so the prototypes were put on land down there. Then I guess they did a number of things like that. We were developing guided bullets coming out of guns. We were checking out eight-inch guns for destroyers.

They have marvelous laboratories down there for chemistry, computer analyses, and computer development and program development. You name it. Now, the Naval Ordnance Laboratory in White Oak doesn't exist anymore. Dahlgren has become the Center for Surface Warfare.

INTERVIEWER: I think that's what it is called now. Isn't it the 'Naval Surface Warfare Center?'

CPT. ANASTASION: Yes. It wasn't the Surface Warfare Center at the time. The name 'Naval Weapons Laboratory' was really wrong. There were five laboratories there, each one of them working in different areas. The weapons laboratory was a complex of five laboratories.

INTERVIEWER: I'll have to look into that, but after you retired in 1972, you went over to the National Oceanic and Atmospheric Administration (NOAA)?

CPT. ANASTASION: I got a call three or four months before I retired from a fellow named Don Martineau, who was in the Secretary of Defense's office when I was with Dr. Wakelin. He was the one responsible for following us in our oceanographic programs development.

John Kennedy had pronounced the oceans as an important thing to do. I think either Eisenhower or Kennedy asked the Navy to set up an inter-agency committee. Jim Wakelin was the head of the interagency committee. Since I was the surface weapons officer for Dr. Wakelin, I became the executive director or secretary of putting the thing together. Don Martineau and I worked very closely together. When NOAA was formed about a year before, I went to it. He was with the Central Intelligence Agency (CIA) then. He went from the CIA over to NOAA. He called me on the phone and said, "Steve, we're starting up this new agency. How about leaving the Navy and come and join us?"

INTERVIEWER: Now, what was his first name again?

CPT. ANASTASION: Don Martineau. He was a civilian.

INTERVIEWER: It was after ESSA that you went to NOAA?

CPT. ANASTASION: ESSA was transformed and brought into NOAA along with the Coast and Geodetic Survey, part of the Coast Guard and a few other things. That became NOAA. I joined it in February of 1972.

INTERVIEWER: You were still involved in ocean science, ocean engineering?

CPT. ANASTASION: Well, from Dahlgren, I went to a brand new outfit that was just beginning to find its roots. They were having a little trouble because they were now responsible for putting out an annual report to the president and Congress on the state of ocean affairs in the U.S., or at least in the federal government. It just wasn't working well, so they put me on it right away. I brought in a group of people from other agencies. We worked on that and got it out in time. Then that became the beginning of the Interagency Committee for Marine Science and Engineering. I was with the Office of Marine Research in NOAA and one of my jobs was to manage the Interagency Committee on Marine Science and Engineering. Eventually, I became the Director for Programming and Planning for Marine Resources. After a while, I became the Director of the Office of Ocean Engineering for NOAA. That lasted from 1972 to 1980.

INTERVIEWER: Your CV says that in 1976, you were named Director of the Office of Ocean Engineering.

CPT. ANASTASION: That lasted then for four years. I left that in 1980.

INTERVIEWER: You left NOAA to go to the National Advisory Committee on Oceans and Atmosphere (NACOA)?

CPT. ANASTASION: That's right. NACOA had a temporary executive director. I was interviewed and asked to join them and become the executive director. I stayed with that for about five years.

INTERVIEWER: Now, was that a presidential appointment?

CPT. ANASTASION: Mine was not, but every committee member was a presidential appointee.

INTERVIEWER: You were the executive director.

CPT. ANASTASION: There are specific Federal Advisory Committee Act laws that require the executive director to be appointed at a senior level by the department. He is the one who controls the agenda and the meeting and can call it off or do whatever is required, although it's a very sensitive position when you have 18 Presidential appointees there. The chairman is also a presidential appointee.

INTERVIEWER: Where were your offices?

CPT. ANASTASION: The offices, when we started out, were at the Department of Commerce's main building. Then it was moved to Whitehall Street on upper Wisconsin Avenue.

INTERVIEWER: Was that at the Page Building?

CPT. ANASTASION: Yes. It was at the Page Building.

INTERVIEWER: You had a conference room there?

CPT. ANASTASION: We had a conference room there.

INTERVIEWER: Who was the guy who lived in Leesburg? He was on television and the radio and played the ukulele?

CPT. ANASTASION: I don't know. Do I know him?

INTERVIEWER: Well, it seems to me he was a member and attended your meetings. He was Arthur Godfrey.

CPT. ANASTASION: That was before I got there. He was one of the original members of NACOA, when it was first formed back about 1972, I guess.

INTERVIEWER: Back in 1978, I had an office there. Ed Snyder was the naval deputy to NOAA and NOAA was in those buildings. One day, I went up to the meeting and Arthur Godfrey saw me. I was in uniform that day and was surprised that he said, “good morning, Doctor.” It turned out that during World War I, or shortly after, he'd been a sailor in the Navy and knew the insignia for the Medical Corps. He was just a wonderful personality. That was the only time I ever met him.

CPT. ANASTASION: Well, these meetings of NACOA were great when he was there. They were all held downtown in the main building. I remember that he was one of the original members brought in because he was an aviator and had knowledge of naval aviation weather.

INTERVIEWER: These entertainment persons are often people of great experience and awareness and intelligence.

CPT. ANASTASION: Well, not only that, he was all of those things and also brought a lot of notoriety and publicity to the committee's work itself, just because people were interested in what Arthur Godfrey was doing. In my time on NACOA, I had almost the same thing, but not quite. Charlie Black was a member and his wife is Shirley Temple.

INTERVIEWER: Shirley Temple Black, yes, of course.

CPT. ANASTASION: She attended some of our meetings.

INTERVIEWER: You served with NACOA from 1980 until 1985?

CPT. ANASTASION: That's right.

INTERVIEWER: What did you do then?

CPT. ANASTASION: Well, Bob White had just become the President of the National Academy of Engineering. He and I worked together in NOAA for many years. He called me and wanted to talk to me.

I went over to the National Academy of Engineering. We went out to lunch and he said that NAE had been asked by the National Science Foundation to do a study on international cooperation in engineering, like the transfer of knowledge and those kinds of things. He asked if I'd like to have you come over and run the study. I thought about it a little bit. Let's see. At that time, I was about 64 years old. I said, "it's about time I left government service to do something else."

I became a private consultant and went over and started doing things for the National Academy of Engineering. The first thing I did was ask to work with Guy Stever, who had been the president's science advisor. He was the Foreign Secretary of the National Academy of Engineering. I worked out of his office and the program office of the National Academy of Engineering as a private consultant. That study took about two and a half years. There were two major committees that we pulled together. One was composed solely of industrial people and the second committee was academics. The report came out. It was called "National Cooperation of Engineering."

INTERVIEWER: As an aside, Dr. Bob White's brother was the writer. Who was he, Ted White?

CPT. ANASTASION: He was Theodore White.

INTERVIEWER: He was Theodore White, yes. They were the famous brothers. You were a private consultant but worked fairly full-time in that office?

CPT. ANASTASION: I came in maybe two or three days a week.

INTERVIEWER: The office was not then in that Temple Building, the architectural beauty on Constitution Avenue?

CPT. ANASTASION: That was where it was.

INTERVIEWER: It was? That was where you were working?

CPT. ANASTASION: That's right. While I was working, doing things for the National Academy of Engineering, I operated out of that building.

INTERVIEWER: That was across the street from the Navy Surgeon General's Office?

CPT. ANASTASION: It is still across the street from the Lincoln Memorial.

INTERVIEWER: And the State Department, a beautiful building, actually. It must have been nice to work there.

CPT. ANASTASION: It was.

INTERVIEWER: You were supervising an interchange of cooperation agreements with France and Japan?

CPT. ANASTASION: That was something else. It started when I was with NOAA. I was first asked by a fellow named Slater, who was with the Department of the Interior and working with the Department of State as the U.S. leader for the U.S.-Japan Natural Resources Agreement. In that agreement, there was a Marine Research and Engineering Coordinating Committee. I was asked to take that over. Later, I was asked to take over the whole thing.

In addition to that, back in about 1973 or 1974, I was asked to take over the administration of the U.S.-France cooperation on oceanography and was given the title of chief scientist. That lasted all the way through my time with NACOA.

INTERVIEWER: You took it with you. Are those agreements still in effect? Do you know?

CPT. ANASTASION: I followed them for a couple of years, two or three years. The agreements were still in effect then and may still be. I don't know.

INTERVIEWER: Well, I know that some friends of mine went to Japan last year for the meetings of the cooperative agreement with them.

CPT. ANASTASION: You were part of the French one, Bob.

INTERVIEWER: Yes. I went with John Howland. We went to Paris. I had a wonderful time.

CPT. ANASTASION: There were parts of it that were very productive. The diving one, in particular, was very productive. The deep-water submersible part was very productive. It was also something that kept the scientists and engineers in the two countries cooperating and talking to each other. It was very useful.

The Japanese one was also useful because we have some very prominent people. Jack Flipse of Newport Shipbuilding and later of Texas A&M headed a particular group in engineering. Seabed Surveys was another group that kept us in touch with what they were doing and kept them in touch with what we were doing. It was a way of transferring knowledge among people.

INTERVIEWER: The other thing is that by just getting people to talk to each other, you can also eliminate misunderstandings.

CPT. ANASTASION: It was not only that, but very fine friendships were formed and that can eliminate a lot of problems.

INTERVIEWER: I wanted to talk to you about some of the things that you remember from your time in Dr. Wakelin's office, when the modern ocean science programs of the Navy were founded and established. Now, we are going back to 1960?

CPT. ANASTASION: That was when I went to Wakelin's office.

INTERVIEWER: You went to Wakelin's office. Wakelin came there in 1959. You went there in 1960.

CPT. ANASTASION: That's right.

INTERVIEWER: It was actually during the presidential election.

CPT. ANASTASION: Kennedy took over the following year, which was just a few months later, actually.

INTERVIEWER: It was January of 1961.

CPT. ANASTASION: That's right.

INTERVIEWER: You said in your CV that you were the technical assistant. Were you also the Special Assistant for Surface Weapons?

CPT. ANASTASION: That is probably a better title, the Special Assistant for Weapons Warfare.

INTERVIEWER: Did they change the title when you took on the ocean science or oceanography responsibilities?

CPT. ANASTASION: No.

INTERVIEWER: You were still surface warfare?

CPT. ANASTASION: Yes.

INTERVIEWER: Was Bob Abel in the office at that time?

CPT. ANASTASION: No. Remember that he was not part of the office. When I first got there, I was told that I was taking on the oceanography responsibility. The first thing I did was go to the dictionary and look up 'oceanography.' It was a new term, believe it or not, at least for me. He said, "don't worry about it. You're the manager of this thing. We're going to bring over someone from the Office of Naval Research (ONR) to be your assistant on this." They sent Bob Abel over. He was still attached to the Office of Naval Research and did not have an office in our wing except when he was sitting in mine.

INTERVIEWER: The Office of Naval Research came under the Assistant Secretary for Research and Development?

CPT. ANASTASION: Yes. It was one of those attachment things, sure.

INTERVIEWER: The other thing I want to comment on is a personal aside. You are an excellent example of the fact that graduate education is not supposed to cram an individual with a lot of information about a small specialty but to teach him how to approach a problem and solve it.

CPT. ANASTASION: Exactly.

INTERVIEWER: Unfortunately, in our Navy labs, at least on the medical side, we had a lot of Ph.Ds who didn't understand that. They wanted to spend the rest of their careers being paid to use the instruments they had been trained to use in their Ph.D. programs.

CPT. ANASTASION: I have to tell you, Bob, I have to thank Admiral Parsons for that. When I went up to Los Alamos, I really got into a group of people doing the explosives work for weapons. I was having a ball helping analyze, increasing the productivity of their work. I just didn't want to leave. You're right. I really wanted to stay on and become a scientist. But Parsons came along and put me back to sea and it really straightened me out. You're right that you get caught up in a particular field and say, "I want to use my knowledge."

Later on, when I was in Albuquerque as the Director of Nuclear Engineering, Ed Hooper, with whom I had worked in the Bureau of Ordnance, a good friend. I wrote him a letter and told him that I had been through the MIT program. I had a degree, a master's degree, in a particular field related to atomic weapons. I said, "I don't think you need a specialized field anymore. What you need are graduates in the traditional fields, mechanical, chemical and whatever. Forget focusing on a particular weapon to develop in a graduate program. The best thing I got out of going to MIT was how to approach scientific problems or technical or engineering programs."

INTERVIEWER: Absolutely.

CPT. ANASTASION: That applied not only to technical work when I was with the secretary's office or doing studies, but also at sea, looking at problems I faced at sea.

INTERVIEWER: It also helped in running the labs at Dahlgren.

CPT. ANASTASION: It helped in running the labs, as well. That's right.

INTERVIEWER: Let's go back to 1960 and 1961. The people who are putting this book together have a strong interest in saturation diving, in the SeaLab, and in the work of the medical labs.

Tell me what you remember of Dr. Wakelin's interest in saturation diving, his contact with Cousteau and with George Bond and with anybody else that you can remember.

CPT. ANASTASION: Well, Wakelin was taken with George Bond. Bond came up to our office a number of times and talked about his program and Wakelin was very supportive of that program. He talked about specific diving gases and things like that. I am not sure we ever really got into very much. I didn't get into it with him, at least. But there wasn't anything about oceanography that he didn't really support. The best part of Jim Wakelin was his ability to get people from other agencies to work together. He got people from the Bureau of Commercial Fisheries, for example. He was working with those guys, bringing them together and developing something that really had a very high regard and acceptance in Congress and in the president's office after just about a year and a half.

I remember sitting in the office one day when a fellow in the Bureau of the Budget came up to my office, sat down and said, "Steve, President Kennedy wants to put an additional twenty-five million dollars into the oceanography program of the federal government. Where should we put it?" In other words, that was lying on my desk and Jim Wakelin and I talked it over.

INTERVIEWER: You were commander at the time?

CPT. ANASTASION: Yes. Jim said, "Well, I know that the Bureau of Commercial Fisheries needs a new kind of a trawler. Let's put some of that money into letting them build a trawler instead of taking it all into the Navy." We suggested money for Coast and Geodetic money and

the Coast Guard, as well. The Navy got very little of that twenty five million, mainly because Jim Wakelin saw that we needed to build up a federal presence in oceanography, not just the Navy presence.

INTERVIEWER: He was a remarkable guy.

CPT. ANASTASION: I think he was.

INTERVIEWER: He was an aeronautical engineer?

CPT. ANASTASION: No, he was a feral chemist. I think that was it.

INTERVIEWER: I'm sorry. What kind of a chemist was he?

CPT. ANASTASION: He was a feral, an 'iron' chemist.

INTERVIEWER: Iron? But I had heard he came from Ryan Aviation in San Diego.

CPT. ANASTASION: He had a number of jobs like that. He was the Research Advisory Committee for Republic or Lyon. I think he went to Yale University and became a chemist. But I have to tell you; very honestly, he changed my view of the whole Navy structure when I was up there. He was a magnificent man, actually. He changed the way I looked at admirals, in particular.

INTERVIEWER: He had been in the Navy during the World War II?

CPT. ANASTASION: I think so, yes.

INTERVIEWER: But you don't know?

CPT. ANASTASION: No. I don't know.

INTERVIEWER: I had heard somewhere that he was assigned not to the Office of Naval Research, because that didn't exist until after the war, but to the Navy's research program somewhere.

CPT. ANASTASION: He may have been.

INTERVIEWER: I'll just have to look that up and find out where.

CPT. ANASTASION: I'm sure, Bob, at one time, I knew all this.

INTERVIEWER: I know exactly what you're talking about. I share that problem. Fortunately, I have books around. Then the problem is to find the book. Even when you know what book you're looking for, you can't remember where you put it. You said that Dr. Wakelin had several encounters with George Bond while you were working for him?

CPT. ANASTASION: Yes. Bond came up into Wakelin's office and talked quite a bit about his activities.

INTERVIEWER: Can you remember specifically what he was doing?

CPT. ANASTASION: No. I wish I could.

INTERVIEWER: That was before he did his human exposures.

CPT. ANASTASION: I don't know, Bob. I'm sorry.

INTERVIEWER: He was a man of vision. He was also a salesman. He was a very good public speaker.

CPT. ANASTASION: Oh, yes.

INTERVIEWER: He may have just been plowing the field, laying the groundwork, knowing that he'd have to come back in the future to get approval to do specific things. As I recall, at that time, he was trying to raise money.

CPT. ANASTASION: He was trying to get the program adopted and accepted, right.

INTERVIEWER: Yes, but he needed a chamber. He didn't have an adequate chamber and needed money to build a chamber at a time when those chambers didn't exist. There was no chamber at the University of Pennsylvania. There was no chamber at Duke University, et cetera. Those all came within the next ten years.

CPT. ANASTASION: That's right. Even when I was at NOAA, as you may recall, chambers were a real problem around the world.

INTERVIEWER: Yes.

CPT. ANASTASION: We were working with a French program, as I recall, and tried to get a joint program together on the adequacy of chambers. That was what, ten years later?

INTERVIEWER: That's tight, but it was remarkable. It lasted for just about a quarter century.

CPT. ANASTASION: He needed a high level of exposure for his program, even in the Navy, to get his work done. I think he went to a lot of places, not just Wakelin's office. But making contacts and getting acceptance in Wakelin's office was a really good step for him.

INTERVIEWER: Now, did you have contact with the Bureau of Medicine and Surgery with anything?

CPT. ANASTASION: No.

INTERVIEWER: Were you aware of a negative feeling? Was there a negative feeling from the Surgeon General's staff toward George Bond in the New London laboratory program that he was proposing?

CPT. ANASTASION: There wasn't a negative feeling, but I knew that he wasn't quite accepted everywhere.

INTERVIEWER: You went with Dr. Wakelin to visit George in the laboratory in Groton at the submarine base?

CPT. ANASTASION: I think so. That's right. That was probably part of the trip, that Raytheon trip I told you about.

INTERVIEWER: That's right, but you can't remember what you were shown or what was said?

CPT. ANASTASION: No.

INTERVIEWER: The other subject that comes to mind is the concept of the approval for use of human volunteers as subjects in medical experiments.

CPT. ANASTASION: I don't remember any of that.

INTERVIEWER: My recollection is that it all developed ten years later, that Senator Ted Kennedy was one of the important individuals in addressing the federal government laboratories and contractors funded with federal money.

CPT. ANASTASION: No. I don't remember that.

INTERVIEWER: It was for the protection of human subjects. But it seems to me that came later, in 1972 or 1973.

CPT. ANASTASION: I don't know that.

INTERVIEWER: We did apply for approval from the Secretary of the Navy for some of the programs that we did at the Experimental Diving Unit (EDU). I'm thinking specifically of the dive that we did that took human divers down below 1,000 feet. It must have been at the same time the North Koreans captured the ship, the USS *Pueblo*. That would have been in 1968.

Excuse me, but that's how my memory works.

CPT. ANASTASION: I was in OPA then. I don't remember any of those things.

INTERVIEWER: Well, I'm not quite sure what instruction or directive we were following, but we prepared a paper, a document, asking for approval. The approval probably was for the use of funds to conduct it, as well as the little aside, the approval for use of human subjects and divers, Navy divers. It went up and the Surgeon General reviewed it, the JAG reviewed it, and OPNAV reviewed it. I don't know whether ONR was involved, but it ended up in the secretary's office.

I guess my Navy experience makes me a bureaucrat. I wonder about the paperwork and documents that lie behind some of the things we did. The documents and instructions change.

You did some things in 1965 and did them differently in 1975 because the organization changed the protocol.

CPT. ANASTASION: Or you get somebody new writing instructions.

INTERVIEWER: There have also been problems that changed protocol, like we had a fire at the EDU doing deep dives. Two men were killed. They came in and did a safety review. They did a material review and because of the ferment that was perking along they said, "Well, we've got to protect the subjects." That's still going on. You may have seen the paper. I pay particular attention to it because I was an M.D. and a graduate of the University of Pennsylvania.

They had a pioneering research program there to test new therapies to transfer enzymes into patients who were deficient in enzymes and whose lives were crippled. A guy from Texas, a very fine young man, was killed. Man, they fired the vice president of the university. They got a new dean of the medical school. The program was stopped. There were all these things. There was a national review.

CPT. ANASTASION: You're way beyond my recollections right now, Bob.

INTERVIEWER: It happened five years ago.

CPT. ANASTASION: I don't pay attention to it now.

INTERVIEWER: You don't have to.

CPT. ANASTASION: I'm looking out across the seventeenth fairway right now. That's got my attention.

(Whereupon, the PROCEEDINGS were adjourned.)

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A SEAMAN'S LIFE IN CAMERA

CANDID VIEWS OF SUBMARINES, FLYING AND DIVING
FROM A PHOTOGRAPHER'S PERSPECTIVE

CAPTAIN GLENN "TEX" CAPTAIN BREWER USN (RET)

An Oral History

2003

Interviewer is Captain Robert C. Bornmann, MC, USN (Ret)

INTERVIEWER: While you were in high school, what were your aspirations for the future?

CAPTAIN BREWER: There were two things I really wanted to do while I was in high school. One was to have a motorcycle and the other was to learn to fly a plane. The war was on at the time and Camp Fannon was an infantry replacement training center. They had about 30,000 Army types out there. I think the population of Tyler, Texas, where I was born in 1928, was only 28,000. I grew up there. It was a dry county and city, so that didn't go over too well with all the troops. A few Army officers had planes at our little local airport and there seemed to be a great surge in flying lessons. Everyone was taking lessons and learning to fly. I found out about that and got a job at the airport fueling planes, pushing them around, parking them and all that, just for flying lessons. I wasn't paid, but I got my flying lessons. That was how that came about. I soloed, then went ahead and got my private rating at age 16. There were other teenage kids in the early 1940s doing that. Some were paying their own way, but they were the more affluent ones in high school. I graduated from high school in 1945 and as I remember, there were only three others about my age who got flying licenses.

INTERVIEWER: I can't remember anyone in my 1948 high school class who were flying, but maybe I just wasn't paying attention.

CAPTAIN BREWER: The other two in my class who had licenses had fathers who were flyers in the Army Air Force. That was their incentive, to sort of do what their fathers did. I had thought of going to college. I had worked in the oil fields in the summer, wildcatting. East Texas had a great group of oil fields. Kilgore, Longview, Claywater, and Tyler were where all the affluent oilmen lived. I had a really close friend of mine whose father was one of the vice presidents at Delta Drilling Company. I went along with him when he visited his dad at work and

I met a few of the gents. I noticed that most of them hadn't really come out from wildcatting jobs. They were all geologists, the ones who got out and found that oil. I decided right there that if I was going to be anything in life, I was going to be a petroleum geologist. My whole reason for joining the Navy was to get my draft obligation over with and to get my G.I. bill. Then I would come back and be a petroleum geologist. The money in my part of the country was in the oil business. Originally, I was going to put my four years in the Navy and get out and get my college degree. The Navy wasn't turning out petroleum geologists, but one of the reasons I had for going to the Naval Academy was to get a good education.

After I enlisted and finished boot camp in San Diego, they sent me to combat air crewman school. Somebody must have read something about my flying. I wanted to go to deep sea diving, but they told me pretty quickly that you couldn't go from boot camp to diving school. You had to go out and make a rate. That was still true 15 years later at the first class diving school at the Washington Navy Yard, but not for the other second class diving schools. At that time, I think you had to be an artificer, which meant metal smith or some such. But I wasn't in any position to argue, I was but a seaman first class, E-3.

CAPTAIN BREWER: I stood number two in my class at the combat air crewman school and had my selection of any class A school aviation rate, and that was why I took photomate. When I got to Pensacola, the photo school had SBDs and Douglas dive-bombers. That was what I trained in. Instead of swinging a gun on the back end, you swung cameras around out of the rear cockpit. I had to do photo missions there. There were all these peel offs on which the planes were peeling off and the camera was always on them, following them down. It took a photographer to get that footage. That was the kind of stuff we were learning how to do. However, at about that time, they were pulling the SBDs off the line and we shifted over to the SNJ, to the trainers. Our pilots

were also naval officers going through photo school and took the exact same classes that the enlisted photographers did. They did all the dark room work. They had to operate cameras. I talked with my pilot about having my flying license, and he said fine. I had the same pilot through most of the training. He got a stick and stuck it in the rear cockpit and before too long, he had me doing the takeoffs and landings and I was flying that thing. One day, we came in and he said, "We both can fly this airplane pretty well. Can you tell me why you're in the back seat and I'm in the front seat? I figured out that it was pretty simple. He was an officer and I was a photomate. He asked, "Yes, but why am I an officer and you a photomate?" I said, "Well, sir, you've been to college and gotten your commission and I'm still enlisted." He asked, "Do you plan on going to college?" I said, "Yes, that's the reason I'm in the Navy, to get my G.I. bill to go." He asked, "Did you ever think about going to the Naval Academy?" I said, "My mother did, but we didn't have any of the political pull or anything. Unfortunately, my mother died when I was about 12 years old. My dad didn't remarry until after I was a senior in high school and leaving. It was just sort of dropped there." He said, "Well, they're requesting nominations from the fleet for what was then called 'fleet' or 'secretary of the Navy' appointments. He said, "You're one of the few in this class who qualify for those requirements. Are you interested?" I said, "Yes, sir." I went through an interview board and my physical and all that stuff and before I knew it, I was nominated.

I finished photo school and chose a squadron that was flying the Navy version of the B-24 with a single tail. They had the whole squadron rigged for cameras for mapping purposes. Peru had contracted with our government to have the Navy go and map the whole country. We were taking two photo squadrons to do that, personnel-wise, and I got in on that. I was going to be on flight skins with all per diem paid by the government of Peru. It was to be a big, wild time

there, even though being a Photomate Striker, I'd probably be riding donkeys out and hitting control markers in the mountains and so forth. But by the time I got those orders to go to Peru, I had been selected to go to the Naval Academy Prep School and my orders came in for Bainbridge. I was about to renege on those orders to go to prep school because I wanted to go to Peru. I thought that was the way to go. But my skipper was James A. Ruddy of the photo school, and he said, "I'm directing you to take this man down to the station, put him on the train with his bags, and see that he leaves going north." That was the way I left. Jim Ruddy went on to be a four-stripe aviator. He retired as the commanding officer (CO) of the NAS *Atlantic City*.

The prep school course on Bainbridge was about nine months. Its purpose was to prepare you to pass your entrance exam to the academy. That was the one standard. A few couldn't pass, but everybody who did got appointments. In those days, you didn't have SATs or the competition and so forth. It was just an entrance exam and it was pretty high. I was playing football there, too, and I think that sort of helped my getting scratched over the acceptance exam. I had nine months of swotting to prepare for that exam. It was primarily a review of high school math, English and history, and all the things that could be on the exam.

Then I was at the Naval Academy and graduated in 1951. I went to the USS *O'Bannon*, (DDE-450), and spent three years on board her, mainly because I thought I had picked the hottest- going anti-submarine destroyer. She had just been FRAMed and was designated DDE, which was a super destroyer escort. She was Fletcher class and had been at Pearl Harbor. In those days, we still had a lottery, more or less, of picking our numbers to get our orders rather than by class standing. I was way up at the top, I think at about number seven or something, and I had my pick of almost any destroyer. Before going to submarines, I wanted to go to a destroyer, and she was the hottest-going destroyer there was. I think the USS *Carpenter* was the only one

initially built as a DDE. They established one squadron out in Pearl Harbor with three divisions in it. Our ship had just arrived in Pearl Harbor from Long Beach, where it finished its FRAM the month before I got there. It was 1951 and all the officers had been re-called Reserves and only three of them had been to sea before. The executive officer (XO) was standing underway deck watches. I'm trying to explain why I stayed so long on board. I was the first ensign to report aboard with the new group from the Naval Academy and was asked by the XO what ship I took my first class cruise on. I said, "A destroyer and submarines." He asked, "Did you qualify on the destroyer as OOD underway?" I said, "Yes sir. You have to graduate to have a successful cruise." His next question was if I had skippered the YP 'Yippers,' which were the yard patrol craft we used at the academy to go out and do screen formations and maneuvers that you got over your primary tactical circuits and so forth. I said, "Yes, sir. I qualified in that." He said, "All right, you're a qualified OD." That happened the day I stepped aboard. I had Reserve lieutenants standing JOOD watches under me. That sort of hurt their pride, but we all got along fine.

The problem was that the seventh fleet wanted one of our Pearl divisions with the fleet out in WestPac all the time. That meant a one in three rotation and that was why I had three cruises to WestPac during that time. There was a shortage of lieutenants in the Navy, and all we were getting were new ensigns. As these Reserves went out, only the new ensigns were coming aboard. There I was. I was made the engineering officer when I was an ensign. I stayed engineer, was a navigator, and ended up the senior watch officer as a JG. That was in my second and third year. Finally, we started getting some lieutenants and I got a qualified relief on board. Only then did I get orders to go to sub school.

I had managed to go to a four-week diving course at the second class school at the training tank in Pearl Harbor. I did that when we came back from our first WestPac cruise. It was double duty all the way through because everybody there was TAD from their commands. A lot of it was just getting people qualified in Jack Browns for their ship. Being a smart-ass, I was going to get all I could get. They gave it to me. Bob Sheats, in particular, gave it to me in the hard hat portion.

I went to sub school in 1954. Ken Wilson was there at the PCO course. I knew him by name because there were a couple of times on the destroyer when I was trying to change my request from sub school to deep sea diving school. That didn't help me get off any sooner. I hadn't really ever called back to the diving school or written any letters or anything, but I had researched a bit. I knew that Kenny Wilson was there and the other ASR skippers out in Pearl Harbor were telling me about him. He had been OinC of the experimental diving unit (EDU) and the diving school. Before that, he was the skipper of the ASR *Kittiwake*. I spent a bit of time over at the diving school in Pearl Harbor after I got through the course. I met some of those characters. Boy, it was really something great to see Ken Wilson at sub school and be able to talk with him. I was just a JG and he was a commander, but that was not a problem. There were a lot of JGs who were very reluctant to approach a senior officer and then again, there were a lot of them who wouldn't hesitate. I only approached him for information on diving and how to get to diving school. He said that he would help see that I got there. If I had to go to a submarine, he'd be glad to have me come to the USS *Thornback*. Much later, CDR Ken Wilson was the XO of the fleet sonar school in Key West, and when he was promoted to captain, he was transferred to the staff of the admiral commanding the Navy base, just in time for the Cuban Missile Crisis. He was very open, charming, intelligent, and just an all around wonderful guy. Ken Wilson said that

he'd be happy to have me on board. I had to request the *Thornback* but was fortunate that I stood high enough in sub school to get my orders to it. I was still flying. I had my own plane. After reporting, I had bought a Ryan STA-Sport aerobatic sleek open cockpit two seat, low-wing airplane, which was the same model that 'Tex' Johnson flew to win the 1938 International Aerobatic Championship. I kept the plane at Stewart Field outside New London, for in those days, Trumble Airport in Groton was closed. Stewart Field was really a grass strip but about twenty or so planes were tied down there with no hangar. On one occasion, Fleet Admiral Bill Halsey, who lived on Fishers Island, drove up to get his regular charter flight out to the island. The owner's plane was not operable that day, so I was asked if I would fly the admiral home. I, a would-be submariner, fly the most famous aviator in the Navy in my little sport plane? The admiral thought it would be fun. After getting on board and cranked up, I asked him if he would like to fly it. He actually flew me out to the island for one of the most awe-inspiring moments of my life. I painted five little silver stars on the side of my front cockpit.

I was married while I was at Pearl. Part of our honeymoon was going out there. I had met my wife when I was a combat air crewman, a little 17-year-old sailor. I was in Jacksonville, Florida, at the air station there before I went to Pensacola. I had gone down to the Riverside Baptist Church because I knew that BTU was where all the teenagers usually went. Baptist Training Union was a teenage group that would meet an hour before before church on Sunday nights. It was a social time, more or less. I didn't drink or anything in those days and didn't care about bars or playing a regular sailor. I was one of those goodie two shoe types. There was this pretty little thing sitting over there. But it took me about two weeks before I ever spoke to Jeanne Fort. Her family wasn't too happy about a sailor being her boyfriend. I had to wait five years. But after I got my appointment to the academy, I became sort of accepted potential. She had

really pulled a good one on her family that spring when I met her. She was graduating high school and wanted me to take her to the senior prom. Well, that caused a few aunts to raise their eyebrows and so forth because they had other expectations about who was to be escorting her to the senior prom. But as I said, later, after I got my nomination to go to prep school, I became a little more socially acceptable. She was going to Wesleyan College in Georgia, but when I entered the Naval Academy, she got her dad to transfer her to Goucher College in Baltimore. She graduated from Goucher a year before I finished at the academy. She was Jeanne Fort of Jacksonville. Her father was the first orthopedic surgeon in Florida. She comes from a medical family. Her father passed away in the 1970s.

In Key West, Dr. Rosenberg and Dr. Ramsdell were trying to see how the effects of nitrogen narcosis in diving were like alcohol intoxication. Subjects were taken to 300 feet on air in a compression chamber and their reactions were measured. Then for comparison, the subjects would be taken to the bar at the O Club and fed eight or nine martinis, or until they achieved the same score on the reaction test. That was the fun part. I actually received a letter of commendation for participating. The tests may have been part of their qualification work for submarine medical dolphins. They used their own money for the booze, but everything else was a Navy project. I don't know. They were buying the drinks and we were just drinking them. There was only about four of us, I think. Dr. Ramsdell may have relieved Charlie Aquadro as SUBRON 12 Medical Officer because Jim Stark had already left by that time. Stark was there while I was on the *Thornback*. He saved a guy's life after a line had popped. A cable parted and almost cut a guy's arm completely off. I think Jim was the one who was aboard and took care of him. Did the sailor lose his arm? There was another rescue incident involving Dr. Stark. A submariner had an accident. He had hit his head and was unconscious. Stark went out on a

retriever. When they got out there, the sea state was so turbulent that they were reluctant to come alongside. Stark jumped in and swam over even though he had his arm in a cast for a broken wrist. He just slipped the arm out of the cast, swam over to the submarine, went aboard, and treated the injured sailor. He was a character.

INTERVIEWER: I think he went from there to jump school. Well, he certainly went to jump school at some point within the next five years, because when I met him, he had jump wings on, in addition to all his other decorations.

I have read your submarine command qualification thesis. I was very impressed. I was assigned to the Deep Submergence Systems Project in 1968, ten years after you wrote that paper, and that was what they were working on. I have seen other computer studies done in the 1970s that reworked all the things you discussed. They put numbers to how many submarines were operating for what portion of time in harbor entrances, channels, shallow water, deep water and so forth. When they computed that, they came up with the same conclusions you did.

CAPTAIN BREWER: I got most all of my information primarily from ASR skippers and officers on board, and much came from the O club barroom. A couple of pages came from Ken Wilson. What their gripes were and what could be done, or what they thought they should have a way to do was what I asked them about. They talked about redesigning this or that. That was sort of what it amounted to. All those dream factors were put together there.

INTERVIEWER: I remember going over to Ken Wilson's house to visit with him. He was astounding. The amount of information that man had in his head was amazing. He just was phenomenal.

CAPTAIN BREWER: You ought to have been in his wardroom, like back in the days when we went to Havana. That was when that city was all open. We'd go down once a quarter and take the submarine down during part of the operating schedule to vent safety tanks. We left the operating areas on a Friday afternoon and went down and came back to the operating areas Monday morning. None of the wives or girlfriends came down to Havana for that. But there were other trips on which we could bring family. Everybody would go down to do the thing in Havana. Ken Wilson had one absolute rule. No matter where you were, when you stopped for liberty, all officers gathered at the bar of his choosing, the skipper's choosing. We sat there and had our own payoff on large dice and everything else. He collected all the drinks that he could collect from all of us. When he would sit down at the table, the gal would come around, and there would be four drinks for the first order for each person. That would start it. By the time you were ready to go on liberty, you didn't even know where the front door was.

INTERVIEWER: The Cuban embargo changed Key West from being the best duty station to the most miserable one in the Navy.

CAPTAIN BREWER: Well, I'll tell you one thing Kenny Wilson did that was just great, one of the greatest things that happened. Ernest Hemingway was living in Havana at the time, and Ken had met him. He had sort of an open invitation, and when we came to Havana, Hemingway would come down on the ship for lunch with us. Then he would take us back to his bar for the afternoon and evening and afterward, back to his house for more long stories and more libations. That was one of the really super, super interesting times. Whoever may have come up with whatever his sexual priorities were later in life or otherwise, there was absolutely no indication in any way during that time with him or talking with him that you ever would have thought such a thing. Hemingway had a house in Key West, although I don't know if he ever lived in it or not. I

had two tours in Key West and came back later, but the house wasn't occupied any of those times. It was just the Hemingway house, period. It's now a museum. The whole experience with Kenny Wilson, I'll tell you, was some of the best duty I ever had. I probably got in a little more trouble than I should have.

INTERVIEWER: Your wife was living in Key West?

CAPTAIN BREWER: Yes. We had three children. We had the third one there. We had the first one in Pearl Harbor and the second one in sub school. The third one arrived in Key West. We had our fourth child in Washington when I got back there. They were perfectly planned kids, two years apart. We thought that was really smart, except that we got three in college at one time. That was complete bankruptcy.

I was on board the USS *Thornback* for three years, from 1955 to 1957 and then went to SUBRON 12 staff where Wally Schlech was Commodore. He assigned me, based on my photo and my diving experience, to coordinate operations for a Chet Huntley NBC show on submarine rescue. It was to be filmed in Key West. John Light was the diver/photographer for NBC, and we dove together in filming the ASR divers working and the rescue bell mating to the submarine. The program was quite a success in showing the Navy's readiness for submarine rescue operations to the nation. Captain Schlech received kudos, and I benefited from that. When Louis de Rochemont came down to film modern submarine operations for his CineMiracle wide screen movie *Windjammer*, which featured the Norwegian navy's midshipmen and their tall sailing ship *Christian Radich*, I also got assigned to that. That film was a documentation of their ship's tour to the U.S. and their experiences with our submarine force. It included on board operations, like firing torpedoes and diving to recover a practice torpedo, plus some recreational diving on the reefs off of Key West.

INTERVIEWER: This takes us up to 1958. You were still trying to get orders to the diving school and the experimental diving unit? You wanted to go to diving school, but they sent you to the photo unit at Anacostia instead. Then they sent you to the underwater swimmer school (U/WSS)?

CAPTAIN BREWER: They sent me to U/WSS en route to D.C. since I was already in Key West. Dr. Puckett could have been the school's medical officer, but I am not sure. I do recall Hinman, Hamilton, and Rudy Enders, the training officer. There were only three officers there at a time, as I remember, plus a medical officer. The rest of them were super chiefs. Bob Barth was in my class. He was a young quartermaster at that time. He was sent by his submarine to be a qualified SCUBA diver. Once they got the school established, each boat was supposed to get two divers qualified. That was all he was going over there for. I had a little 172 Cessna there then. I got Bob to fly with me a couple of times, and that must have set him off because after he got to Panama City later, he had a plane there for about five years, I guess. He took me flying and showed me that he had finally learned to fly. He was just a youngster at the swim school, and I had requested him to be with us after I got back down there with George Bond to film the aircraft cockpit operation on *Sea Cat*. I think I got Bob over as one of the safety divers, because I just admired him as a performer. That was when I introduced Bob to George Bond. George recruited him and brought him to the New London training tank from there.

INTERVIEWER: One of the things we want to do with this oral history program is to recount associations, to construct a matrix of individuals. Bob Barth was a submariner, and he then went to the training tank and worked with George at the lab. That started a very productive relationship that lasted over 25 years.

CAPTAIN BREWER: I told George about him and that he really should get Bob on his team there. That was when George started talking about saturation diving. Bob, of course, was all for it and raring to go. He did acknowledge that in his book, by the way. In *Sea Dwellers*, he mentions that Lieutenant Glenn CAPTAIN BREWER introduced him to George.

In 1958, I left the Squadron 12 staff, went through the underwater swimmer school and then went to Anacostia, where I was ordered to duty with the Naval Photographic Center as officer in charge of the underwater photo team. BUPERS had been looking for a qualified diving officer who was a graduate of the Navy Photographic School, and my card came up. Now, one thing that comes to mind that I want to earmark, and gosh, I don't know how I didn't include it in this, of all things, is Dr. George Bond's retirement ceremony in 1975 or 1976 in Panama City. I was the master of ceremonies. I was still on active duty then and boy, what a big, wonderful time that was. But you have seen nearly all the footage from his various endeavors and doings and everything from the TV programs down to all the escapes. I found out George had gone to Mercersburg Academy up in Pennsylvania. At the time, I was living in Pennsylvania. In fact, my duty station was at the Rock. Are you familiar with the Rock, the underground command center for the Joint Chiefs of Staff? It's along the Pennsylvania/Maryland border close to Camp David. It's about seven or eight miles across. It was a classified location at that time. We called it 'Site R.' At any rate, I had gone over to Mercersburg to find out about George Bond being there and to see if there was any professor or anybody who remembered him. This one little English gentleman remembered George as a tall, handsome man, and it turned out that George also played the carillon. He was brought over some 40 or 45 years before, when they built the carillon. At Mercersburg Academy, it's in their chapel, which is a copy of a German cathedral in miniature. George must have been in prep school at Mercersburg in about 1932. He first went to

a prep school in Switzerland, but he and his sister ran away from there to go to Paris. He went to McGill Medical School in Canada and graduated from there during the war, I guess. He graduated from college about 1937, plus or minus two years, because he also went to graduate school for a few years before going to medical school. He would have graduated from high school in about 1933. I don't remember the exact date. I think we had it at the time. Anyway, this gentleman was there and remembered George. He made a tape for me of George Bond and all he had done, including him playing "Anchors Aweigh." George had tears in his eyes. Boy, I blindsided George with that tape and everything on it. I had some slides I threw in of Mercersburg and the chapel and all of that, and a picture of his professor. Of course, we had all the other stuff on George. They took him over the coals, too, all the divers and SeaLab people and the works. We had a great time there.

INTERVIEWER: One of the first things you did for the Underwater Photo Team was join up with Bob Workman and Paul Linaweaver and go back down to Key West?

CAPTAIN BREWER: That's right. We shot a lot of stuff there for the medical training film, *Medical Aspects of Deep Sea Diving*. It became a standard film for medical officer diving courses. Then I joined up with George Bond, who was still a commander. First, I went up to the tank in New London, where we were getting stock footage of him with the regular aviator's oxygen mask, which he had modified to use as a SCUBA demand valve. At one time, we were looking at having a swim out bottle for the pilots to use that way, but I think they decided George's proposal required less training and was considered safer than trying to swim out. Then we all went back to Key West, where I photographed George demonstrating escape from a sinking aircraft. The cockpit from an F4D Sky Hawk had been fitted onto the deck of the *Sea Cat*, skippered by Jack Kelly, to simulate the usual glide angle of about 15E underwater and a

sink rate of about ten knots. We were there photographing while the sub submerged, the cockpit went down, and George came out.

In a previous test in Key West, complete aircraft were dropped from fifty feet by a crane into the water and the sequence of events photographed and timed. One of the other things I photographed underwater was shooting off the airplane ejection seat at various depths down to fifty feet with Bill Hamilton from the underwater swim school as the subject in the seat. Bill was an aviator before he went to UDT. He wore his wings and then just volunteered. He quit flying and went to UDT training. He went on to become a pretty high muckety-muck in special operations. He had whatever code that is in ONI when he retired. Charlie Aquadro speaks about Captain Bill Hamilton and has been talking to him on the phone.

Captain Noel Bacon was my skipper at the photo center and was an aviator. That's an interesting story. Noel Bacon was the XO when 'Killer' Kane had command of an aircraft carrier, the USS *Ranger*. It was the training carrier for Pensacola. Noel was a commander then and of course, Kane was a captain. They were in a jet. I guess it was like the F-84, if that was the two-seat trainer. They were flying the two-seat jet and had a flameout. They were low. When Kane saw a big field up ahead of him, he wanted to just go ahead and pancake it in there, and they did. It didn't tip the plane at all. But there was a big barn that they ended up going into and stopped inside. Kane asked Bacon, "Are you all right?" He replied, "Yeah. Are you okay?" Kane said, "I'm fine." Then the roof of the barn fell in and killed Captain Kane. Noel Bacon got a back injury out of that. That was after the war. I don't know what year it was, but Bacon went on to make captain. He had command of the photo center at Anacostia when I came there. Well, there I was a submariner in a naval aviation billet. I was asking about flight skins. I asked, "Can I fly as crewman or whatever it takes to get whatever pay that aviators get when they're on shore duty?"

I sort of got a royal look down the nose on that one. However, I was invited to come over for lunch at the O Club with the captain that day, as a new arrival. I went over to the officer's club there, and that was back in the days when they had off duty chief petty officers as bartenders. He came down the line at the bar, taking orders for the drinks, and I gave my order for a scotch and soda. All the drinks were served except mine. It was forgotten for some reason. I was not going to make a big issue of it. I kept figuring that he'd be back with it sooner or later. Then the captain ordered another round of drinks, and I still didn't get one. Finally, I just called the chief over and said, "Chief, did you forget my drink?" He said, "Well, sir, no, I didn't. This is Naval Air Station Anacostia. This is an aviator's officer's club. If you'll take those dolphins and turn them upside down so that they look like wings, I'll be glad to serve you." Bacon had set him up to do that. I was about ready to go over that bar. I was never so mad in my life, but I just flat turned around and walked out. Well, it so happened that I had just bought the first house I ever owned, and it was in Oxon Hill. Right across the street was the pilot for ---- aircraft and he was a lieutenant. He had been an enlisted pilot. He was a super pilot. He was also exactly my size. I got him to lend me his aviation greens. I first looked up the rules and regulations and they stated that any officer assigned to an aviation billet could wear aviation greens. I was assigned to an aviation billet. It was an aviation activity, and an aviation billet for that activity. Just as I said, all photography was done by aviators. I put on both those greens and my dolphins on and went parading in. I didn't get too far past the quarterdeck and had just gotten up to my office when all of a sudden there was a call: "The captain would like to see you in his office immediately." I went down and he just broke out laughing. He said, "You bastard! Truce. Take off those greens and you can have all the drinks you want." I never got my flight skins, but I did get diving pay. You know how much that was. That was paid strictly per dive in those days. Noel Bacon was

also one of the original Flying Tigers. He was in Group 38, I think. He volunteered. After things really got going, they brought them all back to the Navy. He said that there were ten or so aviators in his group or class or whatever. They volunteered and were permitted to go. Fritz Harlfinger was another officer I remember. He was the commodore of squadron four in Key West. I think that was what *Sea Cat* was in, because I had been in SubRon 12 before. He was also a flotilla commander in San Diego, with two squadrons and the development group. He was still a captain, but that was where he made flag. I was in Omaha, Nebraska, with the target planning staff at about the time he made his flag rank. They always brought all the new Navy admirals out for their indoctrination into strategic weapons systems and targeting methodology. We had to give presentations to them, go have dinner with them, take them out in town and give them Navy liberty in an Air Force town.

I also met Lloyd Bridges. He was on the west coast. I made a trip out there, TAD, trying to find out what kind of camera equipment they were using. I was trying to find out what kind of lenses they were using, what underwater lighting they had and so forth. Of course, they were doing all their filming in tanks and in Silver Springs, Florida. Then I met Bates Littlehales from National Geographic. In 1959, I went back to Key West for *Operation Petticoat*, which was filmed on board the submarine USS *Balao*. The Navy could cooperate with those making the movie, but they would not permit civilian divers or cameramen below submarine sonar domes or around whatever else great secrets we had on the bottom of our submarines, I guess. That was what I understood the reason to be. We would provide that footage. Cary Grant and Tony Curtis and the actresses were allowed on board the submarine. But most of the interior shots were all done in a Hollywood studio. There was just not quite enough room in our passageway. I have a video that I finally got and watch it every once in a while. It gets funnier every time I watch it.

But it was really strange. They had a retired admiral as the technical adviser. I've been trying to dream up his name for God knows how long, and I've just got a total mental blank. He was a super submariner but used to stay drunk all the time. He was supposed to be the technical adviser at script conferences. After the director found out that I was a submariner also, he asked if I'd come on over to script conferences and go over the technical part of the scripts. They wanted to make sure they were using the right lingo and giving the orders the right way and saying the right things. I did. Tony Curtis was married to Janet Leigh and they had their two young daughters with them at one of the big motels out on the best side of Key West. After our section of the script conference was over, the director asked me, "Why don't you go over there and entertain Janet for a while?" I'd have to go over there. She was still wearing a sweater in Key West. Talk about lockjaw. I had the worst case of lock-eyes. That was really something, sitting there and having a normal conversation with Janet Leigh. Mr. Grant really was the pleasant one of the whole group. He was just outstanding. He was talking about it being one of the most exciting things he had ever done in all his moviemaking, and that was why he wouldn't use a double on anything. The script was written for emergency surface, and they wanted him to have the hatch coming open just as the water passed over. I said, "We can do this two ways, depending on what the weather state is out there. The sub may pop up and come back down a little bit. If you've got the hatch open, you're going to get water back through there. Otherwise, you can do the Hollywood trick and have somebody over here with a bucket. We'll already be partially surfaced. Roll the water over it and start the camera, pop the hatch and come on up." They wanted to do it the regular full way. We made a few timing runs. I was out on deck with Denny McClenny, my chief photomate. He's the Hawaiian who was my little photomate and diving partner most of the time. He and I were up in the sail, and we had a hammer. As soon as we saw it just about to

break, we would give a rap to signal to pop the hatch and come on up. If we timed it correctly, the water would wet him down. Sure enough, we did it a couple of times just for timing. Then when they were ready to shoot it, we had the camera topside and had it rolling. At the right time, we rapped with the hammer. The hatch opened, and sure enough, a wave came back over and just totally drowned Cary Grant. We took quite a bit of water down the hatch. We were filming from the deck. No one was filming below. All the stuff from the interior was done in Hollywood, like what would show him going up the hatch to go out. We were getting all the external stuff and ended up filming a nearly drowned movie star. But he talked about how exciting that was. We witnessed the submarine actually being painted pink. We manned cameras in the sail when she made a scripted emergency dive. We filmed the underwater scenes showing torpedo firings, as well as the shot of the nurses' bras and panties being shot out of the forward torpedo tubes. It was a very interesting time, working with the Hollywood crowd.

The next operation was in 1959, when George Bond and Cyril Tuckfield made their buoyant ascents from the USS *Archerfish*. I made lieutenant commander in 1960, so I was then a senior lieutenant but designated as the senior diving officer for the test series. The USS *Penguin* was the surface support ship. The Navy did another series a week earlier. Didn't Walt Mazzone do that? Then Harris Steinke did one after Bond, but his was to test the Steinke Hood. Steinke did a pot dive, too, a deep one, with his hood. I think the first one was Walt doing it from 200 feet. Then George and Tuckfield made their ascents from 300 feet. But those two events were almost a week apart, if I remember. The USS *Petrel* was the other ASR involved. That was before *Petrel* went to Charleston with SubRon Four. Charlie Aquadro was there in 1959, operating the bell. My senior chief, Denny McClenny, was with me. John Light came to cover that for NBC. I think George told John about his plans. We had dived with John before and knew

his capabilities, so we said that was fine. I didn't have any qualms about his diving with us, at least. John Light was always trying to get another group to go back to the (HMS) *Lusitania* for filming purposes. He got some footage and was trying to get NBC to finance an expedition to go there. That was the remainder of his life's effort and it never came to be. But he did all the research to make a movie out of it. John Light was an ex-submariner, too. He was a machinist's mate, I think, a third class. He just did one tour in the Navy. Even after I left the Underwater Photo Team, he'd come down and I would take leave to go to Florida to dive in warm mineral springs with him and Eugenia Clark. Bill Royal was the guy who, more or less, found most of the artifacts in those springs. That was when we found that skull that dated back 10,000 years. I photographed that. I went there on leave and worked with John Light, but that was a lot later.

Then in 1960, I did this wonderful continental tour with Paul Linaweaver. It was a fabulous adventure and I wonder if young officers can do similar things in today's Navy. If they find themselves in a unique situation, some kind of special operations type category, nowadays they could probably get away with something like it. We did it primarily under the ONI, with our orders coming from them. Our mission was to visit all European naval diving activities to acquire and perhaps exchange whatever information could be obtained. We were not only asked to visit Portsmouth, Copenhagen, Stockholm, Oslo, Bonn, The Hague, Paris, Toulon, La Spezia and Cartagena, but were authorized to omit, vary, or revisit any, as we deemed necessary. I think the SCUBA apparatus we were using had a regulator invented by Chris Lambertsen and modified by the Experimental Diving Unit. I kept thinking that we were diving with a Mark VI, but Paul corrected me and said the Mark IV was the initial one. That was the one they had there, and that was what we were using. It was not the Lambertsen oxygen unit, but the constant mass

flow mixed gas regulator. I was told it was designated the Mark IV and the production model was then the Mark V. The Mark IV was not a closed circuit but a semi-closed circuit apparatus.

The places we visited were wonderful. When you visited, they first gave you a technical briefing on what they were doing. Then they took you over to the club and gave you either lunch or dinner or both, with a hospitable exchange of civilities that left your head whirling. I had written my thesis at the Naval Academy on UDT operations, special swimmers and research. But before our trip there wasn't anything I could get from our records. They were still classified. I could only contact some of the UDT skippers directly, and some of the officers whose names and addresses I could discover. But I did all the research on everything that was done mostly in the Italian navy and with the British and their midget submarines, as well as the attack on a Japanese cruiser in Southeast Asia. The Italians sank two British battleships in Alexandria Harbor, the HMS *Queen Elizabeth* and the HMS *Valiant*. They made a movie about that attack. The British attacked a German battleship in Norway. On that trip, I got to meet Ian Fraser VC. He was still walking with a cane all the time, but he took me to their Portsmouth wardroom for one of their typical Limey wardroom super parties, at which they ended up rolling somebody in a carpet and leaving him there for the night. That was an experience. I received a Letter of Commendation from the chief of naval operations. We did touch base with the Office of Naval Research (ONR)-London on the trip, but we weren't doing it for ONR. We were doing it for ONI. On a later trip with Don Walsh and Don Keach, we did spend a lot more time with ONR-London.

My next adventure was in 1960, when I was sent on board the USS *Seadragon* for an extraordinary trip. I was still a lieutenant on that cruise. George Steele was the CO. He later published a book on the trip, and it had more index references to my name than to Rickover's. I

think I was a real thorn in his side most of the time. He admitted that if he ever did it again and had more forethought, we'd never have been doing some of the things we did. I obtained the first photographs of the undersurface of the ice at the North Pole. We encountered an iceberg that was 1500 feet long, 100 feet wide and 300 feet deep. One of the pictures I took of the *Seadragon* was used in a double page spread in LIFE magazine, as well as in the *Washington Post* and the *New York Times*. There were some dangerous operational hazards in the operation, which are chronicled in Captain Steele's book. While surfaced through a polynya at the North Pole, we had a softball game between the officers and the crew on the fairly level snow and ice. With the bases laid out at the top of the world, when one hit a ball to the outfield, it passed from today through tomorrow, and when it was thrown back, it would pass through yesterday. When one hit a home run, he ran around the world as he tagged the bases. From home plate, any direction one looked was south, as there were no east or west directions. The crew won this 'Top of the World Series' 13-10. The sun remained at an altitude of about 30E, just moving around the horizon 24 hours a day.

In the *Seadragon* crew, TM1(SS) Earl Crowley and EN2(SS) Edward Quick were graduates of the underwater swim school and they comprised my diving team. The conventional Navy diving practice was to put two SCUBA divers in the water together as swim buddies with a standby diver topside. I considered it safer to have three in the water under the ice, since two could come to the aid of one a lot better than one trying to help one. LT Lew Seaton, the *Seadragon's* doctor, was a submarine medical officer and our standby safety diver and in charge topside. We made preparatory dives in the Portsmouth, New Hampshire, area, where the ocean water temperature was around 40E. In the northern ice packs, the temperature of the water was 28.35E, which is the coldest salt water can get before freezing. We were the first Navy divers to

make SCUBA dives in Arctic waters in neoprene wetsuits, and we quickly found a design flaw in the metal zippers. They became so cold that they numbed us at ankles and wrists. We cut some extra pieces of canvas and made, more or less, bigger flaps and a fly to help protect that area a bit from the cold metal. There weren't any flies in wet suits in those days. The other thing we did was go into the shower before going topside and get into hot, near-scalding water and get our body temperature up and our wet suits filled with hot, steaming water. We'd be sweating like crazy before the dive. We had twin 80s, and on one of our shallower dives, I said that I wanted to stay in the water. I just kept swimming around in circles down there and didn't use up all the air. I just wanted to see how long I could take it. I think it ended up being almost forty or fifty minutes. But, boy, I'll tell you, I couldn't even feel my legs. Well, just like they are now, they wouldn't work at all. I could get my arms on the ladder but couldn't make my legs move to get on the rungs or otherwise. They pulled me on up and got me on deck and finally got me standing so that I could maneuver. The doctor on the *Seadragon* had already told us that when we got back into the shower, start off with cool water, not hot water. Cold water was warm, compared to our body temperature. I was trying to see how long I could take it, but was just being stupid.

INTERVIEWER: It wasn't the most conservative approach in exposure to a potentially dangerous situation.

CAPTAIN BREWER: We made numerous dives and one bounce dive as deep as 200 feet, taking samples of ice. We took both still and motion pictures of the underside of the ice pack at the North Pole. The depth of water there is 14,000 feet.

As a qualified submarine officer, I stood regular underway watches on the *Seadragon*, but as the head of the Navy Underwater Photo Team, I had been sent to acquire stock footage as documentation of naval submarine operations in the Arctic. It was the first time that Admiral

Rickover permitted even Navy cameras on a nuclear submarine. My main objective was to bring back motion picture footage of a submarine surfacing at the North Pole. Our final evolution at the Pole was to get pictures of the ship surfacing. I was detailed with my assistant and the ship's doctor, LT Lew Seaton, to go out on the ice, set up the camera and on signal, the ship was to submerge and immediately resurface for the movies. It was to be a very simple operation, taking no more than thirty minutes. I put on my parka, got my cameras and went out on the ice. When ready, I signaled the ship and started rolling the camera as the ship began to submerge. I thought it strange to be photographing a submarine submerge stern first with an up-angle, but that was normal procedure in the ice pack. It was done to protect the screws. However, as the ship disappeared and was about to start surfacing procedures, it got caught by strong currents and was carried away from the polynya. The ship had to dive deeper to avoid colliding with the pack ice. It then began an expanding circular search to regain the lost hole in the ice. Up on the ice surface, we could hear the active sonar ping gradually getting weaker as the current moved the submarine away from our position. It finally faded altogether and we wondered how long it would take for them to find the polynya again. It began to sleet and the weather was turning bad. Soon, we were getting uncomfortably cold, for we had not landed any emergency survivor equipment with us. We had no radios, signaling equipment, food, guns or anything. There was nothing to cover the camera with. Shivering and getting colder than I had ever been in my life, I tried to reassure our nervous doctor. I told him that we had color film in the camera for dessert. He wasn't impressed. After about six hours and getting extremely cold, we heard the faint pinging of the sonar and Then after finally locating the polynya, the submarine surfaced, to our cheers. My camera was completely frozen and covered with over three inches of ice. It would not operate. It really didn't matter to me at the time. But thanks to special processing back at the

Naval Photographic Center, the film taken of the submarine submerging was reversed and produced a perfect sequence of a strangely dry *Seadragon* surfacing at the North Pole. Mission accomplished!

The ship had had a special party that took survival gear and camped out, with no communication with the ship except in an emergency, for the three days we were up there. I remember going over to take pictures of them, and I listened to all their comments when they got back, about the cook they had and the rations they were eating and all that stuff. It was polar survival training for them, but I apparently didn't learn anything. It was the stupidest thing in the world for me to do, but when we were told to go out for the photo exercise, we just went out without any preparation. I had a t-shirt on, without thermal underwear or anything else under that parka. Can you believe that?

When I was XO of the USS *Quillback*, I went to the Mediterranean Sea about Christmas time in 1962. We were in Naples, as was the whole fleet. The skipper was angry, and we were all angry, because there were too many American sailors on liberty there. We got them to let us get underway early and move to San Remo. We came in there for the final week of our two-week Christmas and New Year's holiday. I went over to visit CDR Jim Davis, the CO of the USS *Tench*, which was in nearby Monaco. I wanted to discuss with him the operations proposed for the next two weeks. Word came down that one of his crew who was SCUBA diving off the seawall had been injured. Upon arrival at the scene, I saw that his swim buddy had pulled MMFN L. Newcomb from the water. The Monaco fire department EMS was about to apply a resuscitator, believing him drowned. His buddy had reported that Newcomb ditched his bottles at forty feet and swam frantically to the surface. I saw bloody froth at his mouth and recognized from the story that he had probably suffered an air embolism. My French was not pure, but I did

make them understand that we had to get our man to a recompression chamber immediately. We made it to the local fire station, where they had a one man, four-atmosphere chamber, supplied by air bottles. As soon as we got him under pressure, Newcomb regained consciousness and became alert and lucid again. The nearest full capability treatment chamber was located at the French navy's diving school in Toulon, France, some 150 kilometers away. Newcomb was lucky. If they had hit him with a power resuscitator, I'm sure he wouldn't have been with us too long. Not getting him under pressure as soon as they did would have also been terrible. I could not hear a heartbeat on him, and he wasn't really breathing much at all. We kept an oxygen bag over his head. But they got cranked up and rolling and Then we were there. I went with the ambulance for the wildest ride of my life. It was a definite thrill riding that thing. The police had been alerted all along the route and had traffic stopped in every town we passed through. The diver must have thought he was in the LeMans race, for his foot never let up on the accelerator. His emergency vehicle was more of a truck than an ambulance. It had a canvas bag over the back of it, and that was where they carried the chamber. They carried a couple extra bottles with it. The main thing I was impressed with was just being able to lock the transport chamber onto their treatment chamber. I thought they'd be carrying the one-man tank inside. It was small enough to go through the hatches.

INTERVIEWER: It was a minimal system but geared to do a job, and it seemed to work. I was in Monaco in August and September of 1962. I also went to the fire department in Nice and talked to them about their system for taking divers, putting them into a one-man chamber and driving them to Toulon. There, they hooked them up with the French navy's chamber and moved the patient inside for a treatment table, a full treatment table. They had it set up so that you could

hook it right over the hatch, and people inside the chamber would open up the door and take the patient out, still under pressure.

CAPTAIN BREWER: You understood exactly what I was talking about. I made a strong recommendation that we institute something like that for our chamber systems. What I saw was being able to use it for an airlift capability. We could get somebody to fly it back with the patient under pressure the whole time.

INTERVIEWER: I submitted a report to the chief of naval operations in October of 1962, a couple of months before you did. It said the same thing. Nothing ever happened. They sent it from code to code, asking, "What do you think and how could we pay for this?" Momsen sent in a recommendation for submarine rescue to the Bureau of Ships (BUSHIPS) and heard nothing back. Nothing was done. Several years later, he was ordered to BUSHIPS, found his letter in the old files and approved his own recommendation.

CAPTAIN BREWER: In Naples, there were 2,000 liberty men all at once just from the carrier, and you also had the destroyers and everything else at the same time. I couldn't even get seats to the opera. That's the punch line. Joan Sutherland was singing and I tried every way in the world to get tickets to go. That was over Christmas holiday, and there wasn't a seat to be had anywhere. I didn't try my politics. I just went to the bar instead. It was understandable that the captain wanted to go to a smaller port, where our crew would be more welcome.

In Toulon, I went into the chamber with the patient to assist in his treatment. The doctor in charge at GERS was Dr. Pallard, whom I had met on my European diving facilities tour two years back. I gained respect for chamber operators and corpsmen who did that sort of thing. Newcomb had lost control of his bowels at the onset of his attack and was covered with feces. We removed his diving suit and locked it out of the chamber, but we could not eliminate the

stench. It was intense, persistent and pervasive, despite continuous ventilation of the chamber with which the French tried to reduce that odor. I did the whole ride out with him on the French table IV. That was the maximum table the French were using. It took forty hours, and I was inside the whole time. I remember it went on forever. But it worked. After Newcomb got out of the recompression chamber, they kept him under care because they were concerned about scar tissues in the lung that hadn't formed yet. They said that would probably be his only major problem. He was transferred to the American hospital in Naples. He was later returned to full duty as a submariner. I don't know whether he ever tried SCUBA diving again.

INTERVIEWER: On my way to Syracuse in May of 1962, I stopped in Naples and visited our Navy hospital there. That was before I flew out to NAF Sigonella to drive on to Syracuse.

CAPTAIN BREWER: Did you know Jim Davis? He was big, tall, about six foot four, and slender. He was the skipper of the *Tench* at that time. Newcomb was his crewmember. We got underway with the *Quillback* as soon as I got back to San Remo. In fact, I didn't know if I was going to make the sailing or not. Then we went back to Key West after we finished our cruise. We also did a little work there. I think the Bay of Pigs came up about that time. That had nothing to do with diving, but it was a submarine operation that we did off of Cuba.

INTERVIEWER: I must have been in sub school when the Bay of Pigs occurred. Then I was in Key West for a year, went to the Riviera for the summer of 1962 and was in Philadelphia at the University of Pennsylvania when the Cuban Missile Crisis took place. Then in the fall of 1963, which was the next year, Kennedy was assassinated and the administration changed.

CAPTAIN BREWER: That's right. 1963 was when the *Thresher* went down, at Easter. The USS *James Monroe* was extended in the shipyard after the board found that silver brazed piping was a possible cause of the failure. That was when they stopped the one-a-month production program

on the FBMs. We had to stay an extra month or two to get all that work done. I was the XO of the *Quillback* for a regular tour of two years. I reported to the Newport News shipyard in 1962. I was the navigator on the blue crew of the *James Monroe*, which was under construction there. I had not volunteered for nuclear power, but was appointed to the non-nuclear job of navigator. I hate to use the word 'mullets,' but at that time, just after your XO tour and before command, they were taking non-nuclear trained officers into the program as missile officers and navigators because the fleet was expanding so fast. There just were not enough nukes to go around the nuclear train.

In 1963, a request was received for my services, to photograph special underway cavitation tests on the newest design submarine propeller. Obviously, it was because of my experience as the head of the Underwater Photo Team when we had worked with the Pegasus, a diver's photographic vehicle. The Navy had purchased several of them from its designer, Dimitri Rebikoff, in France. It was essentially a small electric torpedo about ten feet long, with control surfaces such that it could actually be flown like an underwater airplane by the diver mounted on it. It was very maneuverable and had a camera attached. Photo Chief McClenny was assigned to assist me on the project, which took place on the range off Bimini, in the Bahamas. We worked with two ships, one boomer and one attack boat, so we photographed both the five bladed and seven bladed designs. With his Pegasus, McClenny took position over the rear of the propeller of the submerged submarine, while I was to be to the rear and under it at a 45E angle, with my camera shooting upwards at a close range. We both were to start our high speed cameras and then signal the submarine to start up and increase propeller revolutions to absolute maximum speed while we were to record any cavitation bubbles as they formed on the leading edges and tips. On our signal flank, speed was rung up immediately, producing a gigantic tidal wave effect,

which sent both of us end-over-end, rolling and hanging on, trying not to lose our cameras.

Chief McClenny was blown to the surface and kicked about in the wake. I leveled off a bit below 200 feet, I think. However, our cameras did record the initial formation of cavitation bubbles and the film produced valuable data used in the design of the super quiet submarine propeller of the era.

Kenny Carr was my XO on the *James Monroe* and I was his senior watch officer, training officer, and third officer on board. He thought that I should be in the program, as did Sandy Sandiford, who was the skipper. They sort of back-doored me into the study program. It was my Naval Academy class standing that drew the line of the criteria for it, more or less. I was in the lower middle third. Is that a good way to say it? At the time, I was reporting in to the group in Washington on my progress in the study program. That was when Rickover finally had a complete meeting with naval personnel on the assignments of officers into the nuclear program. They used a cutoff. I was a lieutenant commander then. The year group below mine was the cutoff for any more senior officer entries into the nuclear program. That got just axed, which hurt in a way. At that time, I would have probably torn my fingernails off from crawling and climbing to get into the nuclear program. But later, after I spent time as chief staff officer and training officer of a nuke submarine nuke squadron, I was sort of glad I was one of those 'diesel boaters forever' type. Later, the focus was changed to fighting the submarine, but at that time, the emphasis was on preparing for inspections. Graduate training and shore duties were second. All primary effort and work was put into keeping those nuclear power plants running cleanly, and they did a beautiful job at that. The Navy has some 125 or more nuclear plants operating, and not a single nuclear incident of a serious nature. You sure have to hand it to Rickover for that.

I made one patrol on the *James Monroe* and another on the USS *Abraham Lincoln*. That's another story. Newport News is a Navy commercial shipyard. They built the aircraft carrier USS *Nimitz* – built most of the Navy, as a matter of fact. In that shipyard, out of both Blue and Gold crews on the *James Monroe*, not one officer or one chief petty officer reporting aboard had ever served on a nuclear missile submarine. That was a big shift, and we were getting ready to go to sea trials. Not one had ever dove or been aboard a big boomer. When you got the size difference between an attack boat and the FBMs, it was something else, as far as handling at sea and diving and so on. I'm not just talking about the junior officers. I'm talking about all the officers, COs and all. Not one had done that. With the *Thresher* delay, there was an extra two months of construction, added to the completion schedule of the boomers, and was filled with work for us. Our crews, both Blue and Gold, worked 12 on and 12 off, around the clock for the whole two years we were there. There were no weekends off or anything. It was just 12 on, 12 off. They would rotate every once in a while so that then you'd work nights and have days off. When we got the delay, they did some make-up time. We were just getting ready for sea trials. Our ship and the weapons systems were almost completed. That was when we were delayed in order to do the silver braze testing on all salt water piping throughout the ship. It was time for make-up leave and everything for all those people who had been working so hard. Guess what? They decided that at least one person should have some patrol experience. Old CAPTAIN BREWER, on the day he was going to start all this leave, got orders to fly over to Holy Loch and the onto the *Abraham Lincoln*. She was getting underway two days from then. I was neatly patched aboard to observe with the navigator all through their patrol. They came off patrol. I got on the plane to fly back and didn't get my thirty days leave in Europe as most boomer crews did,

because I had to get back in time to single up to go on the first sea trial on the *James Monroe*. I didn't get one day's leave out of any of that.

INTERVIEWER: That is amazing. Was that unusual, or have you talked to classmates and other submarine officers who have similar stories from that period?

CAPTAIN BREWER: No. I think that was very unusual. When the USS *Thomas Jefferson*, which was just ahead of us in Newport News, went on its sea trials, I arranged to have one of each of our underway watch sections go aboard and stand behind their duty sections, or watch sections, to observe how they did things. Then with their CO's permission, we could move in and take over the controls, but they would back our people up. We got the experience of diving the boat, surfacing it and going through evolutions like that. That was what got our people pretty well qualified to take our ship out on sea trials without having to have other people ride us as safety backups. That was when things were going fast and furious, but it all turned out great. We had a perfect sea trial almost. We had a good National Aeronautics and Space Administration shoot down at the Cape and got our missiles off right down the pickle barrel. Everything worked beautifully. We finally made our first patrol into the Mediterranean out of Charleston.

While we were in Newport News, Admiral Grenfell was COMSUBLANT and his son-in-law, Eugene Lindsey, was my assistant navigator. Gene was three years behind me at the Naval Academy. Both Jeanne and I had been invited over to the admiral's quarters for family dinners and so forth and got to meet him and know him pretty well. He instituted the policy for the two-crew concept on the boomer so that in the rotation cycles, everyone got thirty days off after a patrol. Some of the crew would be sent to special training for a month while others took leave. When you got back from training for the off-crew period, you could not be assigned any duties or additional training for another thirty days. That was a great advantage. It meant that twice a

year, you could count on thirty days off or thirty days leave. It was just open gangway the other thirty days until the entire crew was back together. When I got my orders for command of the diesel attack submarine USS *Volador* in San Diego, I didn't even get to use all my travel time to get there. I got back off patrol and went home. All our furniture had already been moved out of the house. My wife and the kids were sitting there with sleeping bags. We left the next morning and headed for the west coast from Newport News. I drove straight across the country. The guy I was relieving had his orders changed. He had to report strictly by his deadline date. I was the person who had to sacrifice leave. I made two patrols and a whole new construction program and didn't have one day's leave out of it. In fact, I lost a little travel time. That was really being the mullet. It was all worth it, though and despite the Navy, I've stayed married to the same wonderful wife all these years.

INTERVIEWER: You said that while you were the skipper of the *Volador*, you sank the USS *Sea Devil*. How do they set that up? Was she anchored, adrift or being towed?

CAPTAIN BREWER: Few peacetime submarine skippers get the gratification of firing a war shot and actually sinking a ship. In that instance, the *Sea Devil* was underway on her own power. I think there was a five-man crew on board. They had her all buttoned up. She was running on her diesels on the surface. They could use any kind of a steering situation they wanted. They had a remote radio control system to shut her down if the torpedo missed or if they wanted to get back aboard. If the sea-state changed or there was something unforeseen, they could just shut her engines down by remote control. She was circling. As part of the whole weapons test, we had to first fire two full battery war shots with plaster loads on them. They were war shot torpedoes, as far as the battery system went. Exercise torpedoes and war shots have different types of battery and power situations. We had to use war shots to get two plaster load hits before we could fire

the full war shot with the explosive head. They kept the crew on board when we fired the plaster loads because they had to verify that they saw or heard the hit. We also had to be at 200 feet when we detected the target and then fired from a depth of 200 feet. We also had to start in excess of firing range, or 7,000 yards. Therefore, we normally started somewhere between 10,000 and 15,000 yards. We had PUFFS passive sonar. I don't know if you're familiar with PUFFS, with its shark fins set up at the bow, just after the sail, and also on the stern of our submarine. It was passive sonar with which we could triangulate. With PUFFS, we could get fairly accurate fixes out to those ranges. We had to come up with a firing solution, put the fish in the water and steer it to the target. We couldn't go active at all. We got three hits. It was strictly an operational weapons test with our first-line crew all the way. I had a JG Mustang assigned, John Thomas, who was the last officer on the *Sea Devil*, retained to see her out of commission. He had reported to us but was the guy running the crew, getting her engines going. We brought him over and got him back aboard before the last run. He was the one who had to push the pickle to fire the final war shot torpedo. He had tears in his eyes, but it went almost perfectly. We just put a few guide command corrections to the torpedo on its run. We were trying to bring one up the kilt. She sank in a minute and 25 seconds. That was sort of sad. He sank his old home and had tears in his eyes. But we got all kinds of plaudits and awards. The commodore was up in a helicopter, and I think the flotilla commander was aboard at that time. Everything went perfectly. That was quite an experience.

I also worked with SEALs and some UDTs in lockouts from my submarine. They were from their base in Coronado and came over to our submarines to do their egress and recovery training. We had also done similar exercises in Key West when I was XO of the *Quillback*, working with instructors from the underwater swim school there.

INTERVIEWER: I always wondered about that. I was the medical officer of the swim school in 1961, when Dave Schiabe, our XO, came into my office and asked if I would like to go on a submarine exercise. We left in half an hour. I tagged along without toilet articles or a change of clothes. You were the XO of the submarine and we were very graciously received. It was fun, but I think we were gone two days. I never knew for what purpose it was set up in your squadron operations. I took a tour through your ship when I came on board and observed a chief putting a strongback on the after battery hatch. I asked if that was a normal part of rig for dive and was told, "No, Doctor, it is only for when they will be firing torpedoes at us!" I immediately chased down Dave and inquired if there wasn't something he had neglected to tell me.

CAPTAIN BREWER: Well, I don't remember it as being training for us, since submarines normally didn't do that. But diver lockouts were one of the things I was trying to push in San Diego. Each sub had two crewmembers trained as SCUBA divers. At least flood down, submerge and open up the escape trunk one time to train them. Let them get the hatch open and stick their heads out. Then come back in and blow it dry to come back inside the sub. That training was also necessary for the sub to support SEAL operations. But that never came about and I never was able to get the DIVCOM or anybody else interested in actually doing it. No, I think that was strictly from swim school or your instructors there who wanted to do that.

INTERVIEWER: I wasn't on board for the lockout itself. If you remember, you put me in the ocean naked. I swam over to the retriever in order to be surface safety for the divers as they came out of the submarine. You were one of the group that locked out. As I recall, we had a squall during that operation off of Key West and the retriever couldn't find the divers. One of them told me later that he hoped that the doctor took his glasses with him. But it all worked out okay.

CAPTAIN BREWER: I remember another exercise in which we were trying to retrieve the swimmers. One of them grabbed the periscope as we went by. He was trying to hang on, but we didn't know we had him and were still searching for him. That was one of the ones out of San Diego with the *Volador*. Those things were fun, but they could be pretty sticky, too. You had to work with the ocean and the weather, and that was not completely predictable.

I had two years in command of the *Volador*, from 1964 to 1966. Then I went to an assignment with the Joint Strategic Planning Staff at SAC headquarters in Omaha, Nebraska. I was the Polaris missile targeting officer under Larry From, who was the liaison officer. We were acting as special representatives of the commander-in-chief-Atlantic fleet. It was a result of my two patrols made as a navigator on FBM submarines. Also with us were a captain and commander aviators, who were representing the nuclear strike capability of the fleet air arm. Omaha was where targets were selected and assigned for all nuclear weapons in our operational armed forces. After that duty, which was with the Air Force, I went in 1968 to the Army Senior War College in Carlisle, Pennsylvania, to really round out my joint service experience. In 1969, I went back to San Diego to Submarine Squadron Five as the chief staff officer and training officer. Submarine Development Group One was established at that time as our neighbor at Ballast Point to support the new Deep Submergence Systems programs. I also worked with the USS *Halibut* and the USS *Grayback*. We all interfaced our training and operations in the area. A lot of diving activity was going on. I was also back working with SEALs. You know what the cigar boats are, the ocean racers? There was a special SEAL boat built that had twin Ford inboards in it, and they were jet propelled. They had no propellers on them. This was to be a concept. The *Grayback* was a regular missile submarine, the last of the diesels built, and *Halibut* was the first of the nukes, I think. They had big hangars on the forward deck. The one on the

starboard side was the lockout, swim-out chambers, and the one on the port side was where all the SDVs were stowed. We also stowed this boat in there. I guess the boat was originally to be used as an emergency recovery vehicle for troops ashore, those who couldn't get back to the boat on their SDVs or otherwise. It was also for use if an emergency came and they had to go in and rescue someone. The ship would surface. They would roll this 20-22 foot boat mounted on a dolly back out on deck, close up the hangar hatch, and man the boat. Then we would submerge from underneath, and away she'd go.

Coming back, after they got the troops aboard, they planned to just blow up the boat. But for training purposes, they needed to be able to retrieve it. On the *Grayback*, we placed a square frame on the front deck. The frame was the width of the deck and about 15 feet high or higher. On that we put a block and tackle with a type of motor drive/cable winch system. The *Grayback* would get her decks awash or underwater. If the water were calm enough, the boat would try to make her landing in between this big T-frame. I call it a 'T-frame,' but it was an upside down U-frame. It was a square one, up over the side of the boat in the middle. You reached up and snapped the cable into the lifting ring and then rather than hoisting it away, they just surfaced the submarine completely. Snapping out of the water was the problem. Going in there and getting in the wave action just beat the boat to death on the frames before they could get her clear. Rather than trying to use a winch to haul a boat up, it was a lot easier once you snapped in to just complete a blow to the surface. Then you gently lowered her down into her cradle and rolled her back in the hangar to complete the operation. I had been a boat racer back in those days. That became my other project. The chief staff officer was running that cigar boat, and if that thing could get out in the open ocean, it just jumped from wave to wave. Its top speed was around fifty knots.

They were setting up development group one with Bob Gautier. During its shakedown training, the *Grayback* was under squadron five. Then she went straight on out to the Philippines, and I'm not sure under what command she operated there. But it was evidently through flotilla seven, or whoever was in Japan at the time the submarine was there. She was home ported there and operated out of the Philippines until her demise.

After my tour with squadron five was completed in 1971, I went to PMS 395, back in Washington. It was the Deep Submergence Systems Project, which until just before I arrived had been PM 11 in NAVMAT. Dr. John Craven reorganized things a little bit to bring PM 11 over to NAVSHIPS to get under that part of the shipbuilding program that covered the *NR-1*, the Deep Submergence Rescue Vehicles, and would have covered Man in the Sea. He was the chief scientist of PMS 395 and basically our boss, at least under all of the special operations. I don't remember how he described it in his recent book, *The Silent War*.

That was what was nice at the 2001 Symposium, getting to spend some time with Craven again. He, Don Walsh and Don Keach and I used to meet pretty regularly at his place for 'poker games,' status review conferences and whatever else. We got to be pretty good friends. Don Walsh, at that time, was on the staff of the assistant secretary of the Navy for research. Don Keach was at NAVMAT, head of their oceans research group, working primarily with the oceanographer of the Navy. The three of us went over to Europe as a team to make another tour. Being assigned to 395 brought me into saturation diving. I had a lot of responsibilities. I was the special projects officer who sort of had a finger in everything. I brought my operational experience to this engineer's bureau. It was a whole new learning curve in how to employ saturation diving in an operational mode outside of the old ASRs. That was when we had two catamaran ASRs, the USS *Pigeon* and the USS *Ortolan* designed and built. Plus, the saturation

diving systems were installed on the new ASRs. The PTC, or personnel transfer capsule, was being designed and worked on, too.

INTERVIEWER: Tell me a little bit more about the trip to Europe.

CAPTAIN BREWER: Don Walsh, Don Keach and I made a trip together in 1972 to attend the International Conference on the Oceans held in the Hague, Netherlands. Don Walsh did have his Ph.D. in oceanography. He had also made the deepest dive to the bottom of the Mariana's Trench in 1959 in the Navy's research submersible *Trieste*. Don Keach had piloted the *Trieste* later, when it located the sunken submarine *Thresher*. It was a great team to visit each of the allied navy's deep submersible programs in Europe for an information exchange tour. The trip was not primarily of an intelligence nature. We weren't connected with ONI at all, except that there were a few things we observed that were reported back to them. It was to be an exchange of information and capabilities, a discussion of just what we were doing to explore the ocean. It was truly an international effort with a lot of cooperation. We visited Marseilles, Toulon, St. Tropez, Nice and Monaco. In Monaco, we had lunch with Jacques Cousteau at his Oceanographic Museum and visited the French bathyscaphs and talked to their operators. Cousteau liked having his photograph taken with Don Walsh. We took our wives with us and it was a real social exchange also. We rented two Mercedes to carry the three couples and all our luggage. We couldn't do it with one car. Don Walsh said in a very sensible way, and we all agreed, that rather than spend our liberty and per diem money on booze in the bars we should use it for four star restaurants and fine foods. That was how we made our whole trip. I think we had just a cocktail before dinner and a little wine with dinner. We certainly ate well. It was a marvelous trip for Jeanne also. Joan Walsh and Betty Keach were two of the loveliest people, and we were really the most compatible sextet there could be. In fact, I was about to get my name changed to Don

CAPTAIN BREWER. We could have been the three Dons. If Kenny Wilson could change my name to 'Tex,' then someone else could change it to Don. When Bob Kutzleb was commissioned, his first skipper told him there were already too many Bobs in the wardroom. His name got changed to 'Sam.' We continued on to La Spezia and to Naples in Italy to visit the Italian navy submersibles and commands.

INTERVIEWER: I had another question about your Mediterranean cruise on the *Quillback*. You said you stopped at San Remo on the way from Naples. Did you visit La Spezia?

CAPTAIN BREWER: La Spezia was where they had their submersibles. We went to San Remo in 1962 because of the naval base headquarters there. It was either that or they imported some naval line handlers for us. They did have patrol boats or something tied up there and an officer's club that we went to in San Remo. The Italians certainly were very hospitable. But San Remo was just a liberty visit for us.

We went to the sixth fleet's headquarters in Gaeta, which is close to Naples. We took a trip down from Naples past Mount Vesuvius to where Giuseppe Buono, the Italian engineer who worked on the *Trieste* lived. He had been the main engineer in San Diego in preparation for Walsh's deepest dive. He was the guy Piccard brought with him from the place where they had overhauled and built it. He worked at NEL, I think, for the rest of his career. Don wanted to go down to pay a call and see the family and all of that. It was like Don Walsh was Christ returning to earth. The reception they had for all of us, with the family and down at the local restaurant and at the home was - they were just ever so happy to have somebody like Don Walsh come back. We were on our way on up to Rome after that. We toured Rome for a couple of days to see everything there. Then we flew back to the Netherlands for our conference.

When we came back to Washington, I was transferred to the Joint Chiefs of Staff (JCS) in 1974. With my previous experience both in missile submarines and with the joint strategic targeting staff in Omaha, I had a very good working knowledge of the Red Book, the strategic integrated operations plan. I already had most of the highest clearances in my special operations duties. I was assigned as chief of one of the National Military Command and Control Centers. That was actually the most rewarding duty of my career, for I definitely know first hand the inner working of our national security and our total capabilities. Without a doubt, it allowed me to sleep well at night. I was awarded the Legion of Merit for my duty there when I retired in 1976. After that, I worked as a consultant. When I went to the war college in Carlisle, Pennsylvania, we bought a cottage in the mountains right above Gettysburg. It was in the first line of the South Mountains, about ten miles from Gettysburg. We chose to come back and live there instead of in Washington for my two DC assignments. I commuted back and forth all the time at PMS 395 and at the JCS. Then after retirement, I thought that I was going to be totally free. The Army war college had almost convinced my son to go to West Point. He went up to visit the military academy, and strangely enough, the commandant of the corps of cadets at that time was a classmate of mine at the war college. They gave him a real VIP tour there. But Then he went out to see the Air Force Academy in Colorado. He also thought he might go to the Naval Academy. But he had a football injury in prep school that messed up his kidney and urethra. It required an operation. This was a medical condition that could be waived, as I understand, but that year, they were not granting any medical waivers to the service academies. I had to change plans. I went back to work to get him through college. Otherwise, I was going to go back out to Scripps and working on a Ph.D. there. I had gotten a Master's while I was at the JCS. I had gone to Shippensburg College for political science. I had everything arranged with Dr. S. Q. Duntley. I

don't know if you've ever heard of Duntley, but he was a professor at Scripps in charge of the ocean imaging laboratories. That was the specialty I really wanted to learn. I know that he had been funded about eight million dollars for the next four or five years, so that would cover any project I needed to do a dissertation on. We were going to trade in our cars for bicycles and go live in La Jolla and enjoy Scripps. The entire time I was working at 395 and the JCS, I was commuting from Fayetteville, Pennsylvania. When I retired, we continued to live there. But I was really working for BUAIR on their submarine periscope special imaging systems and also on the deep ocean imaging systems. They had supported PMS 395 in the sleds, the underwater optics, the type of film to use, and the type of lighting. There was a lot of way-out research and development going on in that arena. I came back to work with them as a consultant contractor.

I retired in 1976 and my accident was in 1985. It took place in Pennsylvania, in McConnellsburg. That was our launch site for hang gliding. They called it the 'top of the mountains' there. I got caught in a really high-wind condition and was blown over the backside of the mountain before I got up to start my cross-country. I did not get the altitude that I wanted that day. You have 35-knot winds back over on the turbulent side of the mountain and no control. Plus, you have no lift. I went down and down toward the forest. Just as I was about to go in, the wind picked up vertically, more or less, and I sliced right in. I didn't hang up on any tree limbs but had about a 110-foot fall straight down. I was in a cocoon harness. That looks like a big sleeping bag in the hang glider. After take-off, you pull your legs up in it and zip it back up. You're just hanging there with your arms free. The rest of you is in the cocoon. When I did the freefall down through the trees and hit the ground, the hang glider hit on one wing side and the nose. I didn't actually hit the ground but stopped with a sudden deceleration. Coming down in a fall like that and then just stopping, the body stops, of course, but the organs keep moving. I got

jammed into my cocoon harness and my body was jamming down under my left shoulder. It collapsed my left lung and I think that my shoulder blade was cracked in the back. That was the only other bodily injury, but my aorta ruptured. My helmet was cracked all the way across the top, where it hit the upper frame, and I had also taken off part of my right cheek. Blood ran back up into my helmet and was coming out of the back of my neck. When the EMS people found me with my helmet cracked open and blood in the back, they wouldn't even take my helmet off. They were afraid all my brains were going to fall out. Their diagnosis was that I had a fractured skull. I wasn't paralyzed at that time. That created some confusion, but they admitted that my legs were moving and they transported me. Of course, I later sustained a vascular paralysis up to the T7 level when the nerve cells died from lack of oxygen and blood flow during the aortic repair. I had ruptured my aorta. They took me to the shock-trauma center in Baltimore by helicopter. They have a magnificent center there. Dr. Gens was a senior surgeon when they went in and worked on my heart. He didn't do the actual surgery but was overseeing it. I believe that he's the one who did the operation on President Reagan's heart when he was shot. Gens was the surgeon who was in attendance on him. We figured he has pretty good hands. He was a civilian in Baltimore.

INTERVIEWER: I should look up the gentleman and find out more about him. You make him sound interesting.

CAPTAIN BREWER: I never got to meet him personally, but I think my wife did. As my cardiac surgeon, there was an ex-Navy doctor who did the correction and repair on my aorta. He was the one who had to make the decision to put the clamps on because he couldn't get a shunt put in. At shock-trauma, I did have a few other problems, like a staph infection in the lung and trying to get that lung going again

INTERVIEWER: I knew from talking to you that it had been a really tricky situation, but I had not realized it was a ruptured aorta. That is appalling, but in the end they saved your life. They operated on you, stabilized you, and repaired your aorta. Then they transferred you to the Bethesda?

CAPTAIN BREWER: I kept screaming to go to Bethesda to start with. After I woke up in Baltimore, it took me about two weeks to get my senses back. Then I ended up with thromboses in both legs. That scared them to death. That cleared up, but I went on Coumadin for I don't know how long to keep my blood thin. I finally got to Bethesda Naval Hospital about five weeks later. When I arrived at Bethesda, I received VIP treatment as a retired Navy captain. They were going to do a complete reevaluation of my whole system; where my paralysis was, what type of paralysis, whether it was complete or incomplete and so forth. All my other functions, like my neurogenic bladder and bowels were also great problems, and still are. My problem was that I was not permitted to move until all examinations and tests were completed. What I really wanted, though, was to be placed under a hot shower, since I had not had a real bath in five weeks. But every request for a bath was refused. About the second day, I noticed the corpsmen scrubbing through the ward, swabbing the deck, polishing the brass. I inquired and was told that they were preparing for a visit by the Navy's surgeon general. When he arrived, he turned out to be Lew Seaton, the medical officer on the *Seadragon* and my shipmate on the North Pole cruise in 1960. He was the doctor who had shared my stranding on the ice. He was then a vice admiral and had come to see how I was doing. I was really grateful for his courtesy but had the presence of mind to ask for permission for my shower, which I immediately received. There was also an Italian barber I had patronized for years in Washington and the gentleman graciously came out to Bethesda with his entourage, to the hospital room, and gave me a great shampoo, a shave and the

whole works. He wouldn't charge me a penny for it. While I was lying there, thinking of the things that I missed the most, that was one of them. I was only in Bethesda for about two weeks before they transferred me to Richmond. I was already stabilized. In fact, they had me wheeling around in chairs at shock-trauma and sitting up. I was doing very well at the time. After that much time, I had lost practically every bit of strength I had, even in my arms. They just hadn't moved any. To get exercise in my arms, they tied surgical rubber bands to my bed and got me pulling those up with my wrists. They started me on a little physical therapy at Bethesda just to get me moving and get my arms strengthened and so forth. Then they flew me to Richmond to the VA Medical Center hospital, and that was where the program started.

INTERVIEWER: How long was that program. How long were you there?

CAPTAIN BREWER: It was eight weeks there. I finally got back home in July. I went back to work after I found out you could live in a wheelchair. I got hand controls in the car and could transfer my wheelchair. When I first started out, Jeanne would go with me, but I found out I could handle everything pretty well by myself by that time. I went back to work and stayed at the Navy lodge out at Anacostia. It was the best place because they had the finest wheel-chair-accessible roll-in shower. I'd get to the office and work a regular schedule. The only problem I had was at one of the typical status review conferences. We used to have at a bar in Crystal City. I couldn't get on the darn bar stool. One day, they took me out of my chair and sat me up there on the stool. But Then I totally forgot that I didn't have any torso muscles to hold me up and let go of the bar to explain something with my hands. I fell right off of the barstool. I hadn't even tasted my first drink. Outside of that, sitting up in an office all day, getting on the phone and trying to tell people how to do things out there, was no fun. That was the reason I didn't take a civil service job when I retired from active duty.

INTERVIEWER: What you needed was a purchase on the ceiling of the bar above your favorite stool.

CAPTAIN BREWER: Exactly. I thought of that, too. But they wouldn't put it in. I did end up buying a stand-up wheelchair that allowed me to go back to that bar later. I got it on a trip back to Washington after I moved down here to Georgia. I rolled in, stood up at the bar and had my drink.

INTERVIEWER: What is a stand-up wheelchair? Does it have a seat that lifts itself?

CAPTAIN BREWER: Yes. I like the chairs that do that. Unfortunately, medical insurance won't pay for them because that capability is considered a vocational-type thing. But it actually stands me up in any position, from sitting to vertical. I'm strapped in around my chest but have my hands free to operate with. Then I can maneuver standing up. I can go down the sidewalk carrying on a conversation, eyeball to eyeball, instead of pushing a wheelchair and getting down low. I think I had the device down at the Panama City reunion one year. It got to be a problem transporting it. Also, if anything went wrong with it, I would have just broken both legs again. But I use it here to do work with. It's very handy. But my purpose was to stand up to pee and also to stand up at the bar.

INTERVIEWER: Both of those very important. Why did you choose Fayetteville, Georgia?

CAPTAIN BREWER: I didn't. My wife happens to have her family roots here. Pennsylvania was great, but we knew we were going to be a little older as time went by. We were just getting into our late 50's then. We had to cut all our own firewood, split our own logs, and shoveled our own driveway, which was about 300 feet long, just for the exercise of it. The only problem was that each time it snowed, I was either out on the west coast or in Hawaii and Jeanne did not think so much of all of that. I was going to buy her a snow blower or a little plow or have it done. But she

decided that after my accident, or even before, actually, that we needed to retire somewhere else. I was looking at going back to San Diego, but she drew the line at that. There weren't any seasons there and she wanted seasons. That was why we had stayed up in Pennsylvania. It was after our kids finished school. We were looking at where we were going to retire. She wanted to come back down to Georgia. That was fine with me. I didn't leave anything in Texas. It had to be bigger and better than anything else in the world to brag about. I came down here and became a cracker and can be just as loudmouthed still. At least I talk southern talk, so I was accepted. I wasn't one of these invaders from the north coming down. We were able to purchase the old family pre-Civil War farmhouse in which her grandmother was born. The grandmother's sister inherited the house, and so it had gotten out of her mother's side of the family. But it turned out that none of the heirs in that estate were interested in trying to save the house. They wanted to sell this whole land as a development, bulldoze the house to put a street through and so forth. We were able to purchase it and save the house. That was her payback for all those difficult years with me. We're only two blocks from the courthouse. We couldn't afford the whole estate but purchased 15 acres right through here. Dr. Ferrell Sams, a writer, is our next-door neighbor and family doctor. He's got the lot next door and parallel to ours. Our property is right here in town. We've got some beautiful woods with walking trails behind us.

INTERVIEWER: It sounds like a beautiful setting. With the family connection, it is something to be treasured.

CAPTAIN BREWER: Oh, yes. Jeanne is in hog heaven when she can get out and pull her weeds. For my part, I have wanted not to remain just another disabled handicapped person on the sidelines. You've seen me at our Navy Diver Reunions. At age seventy, I re-qualified as a diver under PADI auspices in the Handicapped SCUBA Association (HSA). I returned to the Florida

Keys for the open water dives leading to qualification as an HSA-certified SCUBA diver. Then we celebrated with drinks all around at Sloppy Joe's bar. I also am involved in wheelchair sports, including track and 10K racing in push chairs, road racing hand cycles, and swimming competitions. I have won over sixty medals in these competitions over the past few years.

INTERVIEWER: That finishes the review of the paper you sent me. Is there anything that you would like to put on the tape, just to highlight something you overlooked?

CAPTAIN BREWER: There wasn't that much more in terms of diving, other than some underwater projects from my consulting days for the Corps of Army Engineers. Out at some dams on the Arkansas River, they were having a problem of determining erosion problems underwater. They needed to inspect the concrete portions, the basic foundation, of the dams. I'd get pictures of them and interpret the water and things like that, but it wasn't anything that exciting. Since I moved to Georgia, I haven't been consulting with the Navy or in the program.

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30 October 2003

UNDERSEA & HYPERBARIC MEDICAL SOCIETY

INTERVIEW OF
STAFF SERGEANT TOM DURAND

Kensington, Maryland
Friday, September 5, 2003

PROCEEDINGS

INTERVIEWER: How long have you been here at the Special Clearance Team?

STAFF SERGEANT DURAND: I've been here since June of 1999.

INTERVIEWER: You've been here over four years?

STAFF SERGEANT DURAND: I've been here over four years.

INTERVIEWER: Where did you come from?

STAFF SERGEANT DURAND: I came from the Second Reconnaissance Battalion.

INTERVIEWER: Tell me what it was like, coming here as a reconnaissance Marine. It was not even the Special Clearance Team Then right?

STAFF SERGEANT DURAND: No. It involved very shallow water mine counter-measures detachment (VSWMCM DET). Coming here, there are a lot of rumors about what it was like. A lot of people I knew found out about it from a *Leatherneck* magazine story on it, I think. It was basically centered on the dolphins. A lot of my buddies thought I was just coming out here to play with Flipper or something.

No one had really heard about the dive platoon and only on paper, the Unmanned Underwater Vehicle (UUV) platoon. When I got out here, the first thing I was asked was, "Do you want to flip fish to dolphins or do you want to dive?" Being a reconnaissance Marine, I'd rather dive. I got put into the dive platoon.

INTERVIEWER: How did you get interested? Was it the *Leatherneck* article that made you want to come here?

STAFF SERGEANT DURAND: Actually, my career counselor decided I needed to take a break from reconnaissance for a little while. She said that since I had done so many deployments back to back, this place would be a chance for me to kind of settle down and smooth out my life a little bit. Little did she know that we deploy just as much here as we did in the reconnaissance battalion.

INTERVIEWER: When you first got here, what was your assignment?

STAFF SERGEANT DURAND: I was assigned with Buddy Ketchum, who was a Navy SEAL in the diving platoon. He and I were in the diving department and we were a dive team. I was the SINS board. We didn't have the little high speed INSS that we have now. As the SINS board, they gave you X, Y and just a bunch of numbers that rolled through.

INTERVIEWER: What did SINS stand for? I think its Swimmer inwater navigation system

STAFF SERGEANT DURAND: I forget. It had something to do with SEALs, I think. At one time, I think it was designed for the SEAL teams for hydro-reconnaissance.

INTERVIEWER: All right. We can add it to the transcript.

STAFF SERGEANT DURAND: Basically, my duty was to drive in the minefield to keep the front end down on lane.

INTERVIEWER: Okay. With what kind of equipment were you diving?

STAFF SERGEANT DURAND: We were diving with either the Draeger Pathfinder or the SIVA 55, at the time. It was kind of like an acquisition stage. Those were the two companies that had drawn something up and given us something with which to play. A majority of us liked the Draeger Pathfinder because we were mostly already familiar with the Draeger LAR V with which we dove.

INTERVIEWER: Was that the LAR V?

STAFF SERGEANT DURAND: I mean, it was pretty similar except that it was semi-closed and there wasn't anything you had to adjust flow. It had shims that adjusted the flow for you.

Usually, once you had it set, you were good to go. It was really basic. It was small.

The SIVA-55 was like diving on a refrigerator. The thing was gigantic on your back. But you didn't have a lot of the problems that you have with the Viper of today. Your cheeks weren't always puffed up. With the 55, you had giant hoses that you had to put weights on to keep down. They were just a lot more comfortable to dive with.

INTERVIEWER: Do you like diving with the Viper VSW?

STAFF SERGEANT DURAND: Sometimes, I do. I mean, there's a lot of stuff hanging off that rig. It makes it kind of troublesome underwater. A lot of people say, "No, it's not that bad." They

only dive during the day. They don't dive during the night . You have a buddy line and you have a cable going to a mine and you're trying to put a buoy or something on the contact. It's just way too many moving parts.

INTERVIEWER: What kind of training were you doing then?

STAFF SERGEANT DURAND: Basically, we just focused on the minefield discipline, diving with the rig and tactics, because they were still drawing up how the platoon would operate in a combat situation, if they came to that. There was a lot of, you know, 'let's give this a try. Oh no, that didn't work. Maybe if we try it this way it'll work.' We manufactured a lot of our stuff.

INTERVIEWER: But at that time, you were a developmental project anyway, weren't you? It was a CNO demonstration project, or something?

STAFF SERGEANT DURAND: It was actually a warfighting laboratory, but we were still supposed to be somewhat operational, in case they needed us. So, we were dual hatted. It was hard to maintain both hats because a lot of time, you just had these vendors come with crazy ideas, to try this or try that.

The command was so open to new suggestions that you were forced to do things, even though you could look at something and say, "There's no way that's going to work." They still wanted you to do it. Sometimes, it didn't make sense; sometimes it did.

Then things started getting crazier, you know. We need to have E&R training.

INTERVIEWER: E&R training?

STAFF SERGEANT DURAND: Escape and Resistance training or Escape and Evasion training. We didn't even know how we were going to dive in the minefield yet, and you wanted to move to get him (the diver) out of the minefield and get him on land. Eventually, it evolved into kind of what we're doing today, with a little bit of chaos still added.

INTERVIEWER: But now, developmentally and doctrinally, you have tactics that work?

STAFF SERGEANT DURAND: They work, but they are still trying to be changed because it's probably still not the best way to do it. It's hard to tell because *Operation Iraqi Freedom* is the first time we have ever had to actually work in a minefield environment. As the Gods would

have it, it's something completely different than for what we actually have been trained. We focused mainly on pre-assault clearance, like clearing the beachhead and letting the Marines land with the amphibious vehicles and the LCACs. We were trying to clear a harbor, an enclosed area, a permissive environment, supposedly. None of our equipment had ever been tested in close quarters like that, though.

INTERVIEWER: When you went to OIF you were with the UUV platoon?

STAFF SERGEANT DURAND: Yes.

INTERVIEWER: What was that like?

STAFF SERGEANT DURAND: It was interesting. A lot of people have a little faith in the program because it's new. I think that because it was a rapid acquisition project, a lot of people don't know what it can do. I think that going directly really opened a lot of eyes with how fast we can help clear an area. You still get the whole dolphin-versus-machine thing. But eventually, hopefully, we will complete our mission and take the dolphin and the man out of the loop and they will all be robots that won't care less about getting blown up.

INTERVIEWER: You guys were able to clear Umm Qasr pretty rapidly or at the very least, map it with the UUV?

STAFF SERGEANT DURAND: We cleared it really rapidly. We were on the ground, and I don't remember which day, but that night, we ran our first mission in the water. Basically, we were driven by the presidential speeches about promising humanitarian aid to the people of Iraq. That pretty much drove our mission. Originally, I think they said that we had a couple of days. We came down and we had 24 hours. We secured our area and Then 'Moneypenny' and I were out in the water that night, running missions.

INTERVIEWER: What was the time between, when you first started running missions, and when they brought in the first humanitarian aid ship?

STAFF SERGEANT DURAND: It was a few days. Apparently, the civilian insurance companies wouldn't insure ships to transit up to the KA because they got reports of mines. But

the *Sir Galahad* came in a day late, I think. That was the first ship that came in. It's a British ship.

They offloaded and made it a big, giant media spectacle, like 'oh, the British are doing this or that,' you know. But it was good to see. I mean, it actually brought the people out in Umm Qasr. I had stood post on the main gate when we weren't running missions. It was like a ghost town, with tumbleweed rolling across. The minute that ship came in, the kids started coming out, and so did the women. It was nice to see people. I said, "Did we just kill everybody here or what?"

INTERVIEWER: After you guys cleared Umm Qasr, what did you do?

STAFF SERGEANT DURAND: We were tasked with two different missions. One team went to clear Az Zubayr, which was the next port north for the British. I think the 3rd Commando Brigade was up there. They were having some issues with trying to get supply ships and stuff up there because it was really ratty. There was an F-18 pilot who was shot down southwest of Baghdad, and I was sent forward to go try to help recover his body. We split into two groups. Four other people and I flew north to the F-18 mission.

INTERVIEWER: What happened there? What did you guys do?

STAFF SERGEANT DURAND: We flew back into Kuwait, met up with a Marine security force company and **and** communicators from SEAL Team 5, assembled all our stuff and jumped on some C-130s to fly to Talil, some hidden base in Iraq that the Iraqis had been using. From there, we flew to what I think is called 'Lake Razzaza,' depending on whom you ask. It's just west of Karbala. We probably landed on the center southern shore.

When we got there, there was an EOD team that had been diving on the plane from coordinates from PJ Air Force Para-Rescue teams that had gone on to look for him. Our mission was to locate the cockpit, the ejection seat, the canopy or the body. They weren't sure what had actually happened. Actually, they probably knew but they just didn't want to tell anybody that it was a Patriot missile that shot him down. Rumors were flying and maybe the biggest one was at the Department of Defense, going off the PJ story. It was that they had found a parachute and reported back that they had found the body, to the family. I think it was more that they didn't

want to have another Lieutenant Stryker incident. So, we went up there and we started running missions to see if we could find the body, the seat or larger portions of the aircraft than what was already out there.

INTERVIEWER: What did you find?

STAFF SERGEANT DURAND: It was like a free-for-all up there, honestly. The Army sent in a dive team, like a bridge construction team, to help recover stuff because the EOD dive team had to go back to Talil to start clearing some of the bunkers that were there. We started marking positions for them on the Global Positioning System. They would go down and do a circle search and pull up whatever we'd find. They'd bring it back. They flew someone in from his squadron to start looking at the parts of the plane and see if he could, you know, identify whether we were getting close or not.

After two or three days, a helicopter that was flying a search pattern found his body floating in the water. We drove over and recovered his body. They put him in a helicopter and flew him back to his squadron.

INTERVIEWER: How big was this lake?

STAFF SERGEANT DURAND: I think it is thirty miles across, at some points. When you look on the map, it's one of those three giant reservoirs. We were at the very southern one, near Karbala. They told us, "Oh, it's little." We got out there and you couldn't even see the other side. It was like looking at the ocean.

INTERVIEWER: How long would it have taken, do you think, to run the UUV across the whole thing, if you had to do that?

STAFF SERGEANT DURAND: We sort of played scientists out there. You could see part of the wreck, where it had impacted. Then we had a plot from one of the PJs who had found a parachute. We kind of licked our fingers, checked the wind and drew a straight line from the wreck to the parachute and figured we'd cover about two hundred yards on each side of that line. We got about halfway on the second or third day. It was easier because we were not looking for anything like a little basketball-sized mine, so we could really spread out our swath on the sonar.

So, we were taking big chunks. We weren't looking for anything small. Unless it was something big, we didn't even mark it. The biggest stickler was that the Army divers weren't very clear on how to do searches. I think that at one time, it took sixty minutes to do a circle search on one mark. You can't blame them. They were construction guys. They were not search divers, but it was nice to see that everyone was coming out to try to find the body.

INTERVIEWER: Did you do any diving while you were there?

STAFF SERGEANT DURAND: No. I did no diving at all.

INTERVIEWER: In your four years here at the Very Shallow Water and Special Clearance Team, what kind of exercises have you gotten?

STAFF SERGEANT DURAND: RimPac seems to be a favorite for this command because it's a mine warfare centered exercise, I think. We've done 'foal eagle.' We've done a bunch of in-house exercises up at Camp Pendleton. If the enemy ever invades Del Mar Boat Basin, we've got them. Also, I have done Fleet Battle Exercises

INTERVIEWER: Have you seen a pretty good progression, over the four years, of improvement in your tactics and equipment?

STAFF SERGEANT DURAND: There's been a huge improvement in tactics. It went from people just flipping over the back of the boat to actually trying to maintain some kind of clandestine nature. They actually came up with plans in case something goes wrong in the water. Before that it was 'if you come up and there's no boat there, go back down and wait out as long as you can. If you come back up and there is still no boat, go to shore and make up an E&R plan as you go.'

We've actually got E&R plans in place now. They are starting to drop cache bags with equipment that you would need to go ashore, but you couldn't dive with it through a minefield because the pistol is metal, and you know what would happen with a magnetic mine.

Now, they are starting to practice putting down weighted drop bags. They put pingers on each of them. The dive team has one to which it is designated to go.

INTERVIEWER: If you had to do an E&R, you'd go back to the pinger, get your equipment and go to the beach?

STAFF SERGEANT DURAND: You'd probably surface-swim into the beach.

INTERVIEWER: If you don't have to, you recover that when you extract?

STAFF SERGEANT DURAND: Yes.

INTERVIEWER: That's neat. They are coming up with all kinds of little ideas. It's interesting, a step outside of the platoons now and see how they're progressing, because I know when I was in I'd say, "God, who is coming up with this stuff?" Then it's frustrating, at times.

STAFF SERGEANT DURAND: Yes. It was really frustrating because you had, you know, and I don't want to knock headquarters, but you had commandos up there in a chair all day saying, "You know, this seems like a great idea. Why don't we have them try that?" You were the guy in the water going, "What fool wanted to put three more feet of rope on me?" Sometimes the ideas just came out of left field.

Even now, there's some heartache with NEDU over how they tested the flow rate for the Viper rig that we've got now. I guess they tested it with a combat swimmer kick rate, and we don't do that. We swim 15 yards and stop and scan. All that pressure builds up in the bag. Then we kick 15 more yards. There is a lot of heartache. Unofficially, I can say that there are people turning down their flow rates to try to compensate for that. Then Carlton Sherwood said, "Oh, we've got a fix for that." They gave us bigger pouches for the lungs on the Vipers, which didn't help. It just gives it more room to inflate now. So, there's heartaches all the way around with the whole command.

INTERVIEWER: Do you think it's a good mix, having reconnaissance Marines, SEALs and EODs?

STAFF SERGEANT DURAND: It's a needed mix. Not to knock the EOD community, but they have no idea about tactics. They are strictly open water permissive, you know, like 'no one is going to come after me in the environment.' That shows a lot, too, in some of the planning that goes on around here.

A big heartache in Iraqi Freedom was 'how we are supposed to use eighty guys to defend a port that big?' You know, they are so centered on 'let's clear the mines.' They didn't think about what would happen if the bad guys came rolling in on us. We'd be in bad shape if we had three guys at the front gate, two hundred meters away we had two more guys, down the way we had two more guys and over on the other side of the port, we had two other guys.

There really wasn't a whole lot of thought in the tactics. I think sometimes EOD just blindly goes into, 'Oh, it's an EOD operation, it's permissive, and that's good.' They went off. You know, they had intelligence that the Marines would secure the port and then turn it over to, I think, two commando brigades. The problem is that it all hinged on them taking the Al Faw Peninsula, which didn't happen because it was mined so heavily. We were minus a commando brigade and when we got into the port, the Marines were getting ready to leave for their push to Baghdad. That left just us, the Australians and the British to figure out how we were going to defend the port because we didn't want the Iraqi people to come back in and just trash it. All the stuff had to work for the United Nations program that was supposedly going to come in and start rolling food out.

Sometimes a lot of us grumble. Maybe the Marines would like to see a Marine commanding officer out here. The SEALs, you know, would like to see Commander James and Commander Flannigan out here. It's a steady argument. The MOBILE Unit is always saying, "Oh, we want an EOD guy because it's an EOD program." It's a lot of pushing and shoving. But you definitely need to have the SEALs and the Marines to augment the EOD. It's a good mix. You know, the EOD guys teach the grunts and the SEALs something besides 'if it's in the way, Blow it up, shoot at it or kick it out of the way.' We would teach them, you know, 'you can't just go banging stuff around and being all noisy.' Sometimes, in development, you run into the problem of where you go for something of a covert nature or do you go for something that can be driven in a minefield?

There's a lot of give and take that comes out of it. There is a lot of ingenuity that comes out of the mix, too. I have been here for four years and they are still trying to develop some way

to put charges on mines. You know, you really get sick of that. They were giving us things like tape on rollers. They'd say, "Here, try this. Go to this mine and wrap the tape around. This is waterproof epoxy. You hold it on the mine and inject it in. You hold it there for a couple of minutes and it will harden." This one guy had a charge that you put on a piece of wood that was weighted, and you had to put it about six inches away from the mine so that when it went off, it would over pressure the mine. You know, we've just seen some amazing ideas. I don't know where these people come up with that stuff. So far, the easiest thing we came up with were these little square pouches that Jeff Moleski, an EOD guy, came up with. You throw in a pound and a half of C-4, put a detonator in it and Velcro that all together and it has bungee cords. You just wrap it around the mine. No one's beat it, yet.

In terms of exercises, Commander James is probably the biggest character I remember, only because he came up with stuff completely out of nowhere. Murphy is always just kicking our butts. Whenever we go anyplace, you know, he says, "Forget this. This breaks. Oh, we've got the British here but we can't jam their bottles because they've got foreign connections versus our standard American style." One day, he was giving a brief. He took out one of those dive knives, the old ones. They never held an edge.

INTERVIEWER: Oh, they were the Mark 3s, yes.

STAFF SERGEANT DURAND: Yes, they were Mark 3s. Out of nowhere, he picked his knife out and jammed it into this podium and yelled about us coming to get Murphy and stuff. We were with the British and the Australians. One of those two units had taken the knife out and put something like a butter knife from the wardroom in it, or something, and all kinds of weird stuff.

We'd play softball and Commander James would be out there playing. All the other teams would say, "Who's that old guy running around out there, falling down and stuff?" A lot of changes have come out of this command. I hope it has opened a lot of eyes as to what actually happens.

I know that when I brief Marines captains or generals and stuff, it's a big eye opener. Honestly, a lot of people don't think that they have to worry about mines anywhere near where

the Marines are operating from a ship in deep water. I think that maybe the Navy needs to increase the awareness program on that. It seems kind of closed, right now, to the EOD community.

INTERVIEWER: You said that they showed you a video when you first got here, right?

STAFF SERGEANT DURAND: They pulled an AMTRAK over a PDM and put a 25-ton vehicle something like twenty feet in the air.

INTERVIEWER: Wow.

STAFF SERGEANT DURAND: It's like you don't even think about that. I know the reconnaissance mentality is 'both motors blaring as fast as you can go, get on a wave. Let the beach kick the motors up, drag the boat in, go ashore and do your mission.' You don't think about hitting a MAL-17 or a MOSC, or running over a MANTA. That would probably pick up the motors whining.

I definitely think that there's still room for education out there. I really think it needs to be pushed. That was one of my biggest complaints out here. You know, we get all kinds of Navy people, you know, Commander this, Commander that, and people for which I didn't know they had commands. They come out and see what we can do, but you hardly ever see any Marines. The last Marine I briefed was MajGen James Battaglini on actions in Operation Iraqi Freedom, only because he's now attached to N-75, Expeditionary Warfare. It's kind of in his office that some of the stuff comes out. I think that just now we're starting to open their eyes. It's important stuff because they need to plan for it.

INTERVIEWER: Would you recommend to other reconnaissance Marines that this is a good tour for them to do?

STAFF SERGEANT DURAND: It's a good tour. I won't lie, it's like Gear Central out here. They give you everything. I don't know how long that's going to keep up because we're testing. But it's definitely something that, as a reconnaissance Marine, I think you should come to, or at least be familiar with what's going on, because what we do will influence how you operate.

The way it seems to be pushing is that everyone thinks the SEALs and reconnaissance go in first. It looks like if it's got anything to do with the ocean, and mines might be there, you're going to have to go in by helicopter, or some other means, while we clear the beach so that follow-up forces can come. It's kind of interesting to see that. That all came out of the Gulf War. It took a few years to get going. Now that we are where we are and we've progressed this far. Then we went back in Gulf War Part Two and it was a mission that never even came up. There was this port. We were lucky enough to know what our mission would be a couple of months in advance, so we altered our training to reflect it.

We started doing training at the Del Mar Boat Basin, the Recruit Creek out here and at Sweetwater Creek. I know that the UUV has problems with signal reverb from its transponders in enclosed spaces. It has navigation issues. We had to work those out with the manufacturer. It's kind of hard, you know. They are were getting ready to put out a final product. We were saying, "Well, can you change this because we might go to war?" It was kind of like they were pulling their hair out and we were pulling our hair out at them. It's been an interesting time. I would recommend it to anybody that can come out here, actually.

INTERVIEWER: You have great faith in the UUV, as the technology of the future?

STAFF SERGEANT DURAND: I do. I mean, I go to some of these working group meetings and stuff. It's amazing what these people are coming up with. You have to keep a leash on them, though, because I notice the whole money pot thing. Some people think, "Oh, we can get more money if we do this. We can get money if we do that."

It's frustrating, the red tape. It drives me nuts. If I need to do something, I just say, "Do it and do it the way I need it. Then give it to me." I don't like any of this 'got to run it through 18 Congressmen' and Senator whoever from Massachusetts wants to stop us from going to this because it's foreign and he's got Wood's Hole in Massachusetts. I guess I'm just not a politician.

INTERVIEWER: Well, is there anything we didn't talk about that I should have asked you about?

STAFF SERGEANT DURAND: I wanted to talk about September 11th, actually. We kind of made a name for the UUV platoon after September 11th. As everyone knows, every base went to super-duper high-speed security and Navy Coronado about shut down. They basically had a list of people who could enter and that was it. The gate was closed, and there was 'see you next Tuesday-type stuff.' We had gotten calls in to start clearing the carrier basins, the piers along 32nd Street and the Coronado Bay Bridge. Even our command was hesitant at first to use UUVs. But I started realizing the scope of what they were being asked to do. I think we had eighty divers at the time. They wanted eighty divers to clear, eight piers, I think, the bridge and two aircraft carriers overnight.

I was living on base at the time, so I could just, you know, walk over here and come to work. A Lieutenant Simmons was here. Basically, he asked me, "Can the UUV do any of this?" I said, "Well sir, we can clear a giant majority of anything in the open." We ended up doing the carrier basin over at North Island. We did the entire basin in, I think, four hours, in one night. We gave them turnover data. We ran two missions. We downloaded the data and while we were waiting for the second mission to finish, we went through and marked out everything that we thought would be suspect from the first mission.

So, when we got back four hours later, we turned something over right away. That caught the eyes of everyone from, you know, the military police on base to the ATFP, or what it is now. The Navy actually ended up investing more money into the UUV Program for force protection than harbor clearance. You know, it was just one of those 'hey, let's give this a try' things.

INTERVIEWER: Are there other units that use that same technique?

STAFF SERGEANT DURAND: There are a lot of units that use it now. There's a MOBILE Unit 7, I think. Mobile Diving Salvage Units (MUDSU) have some of them.

INTERVIEWER: They have a lot.

STAFF SERGEANT DURAND: I think the SEAL teams use them now for hydro-reconnaissance. It's spread out a lot more than what it is right now. I don't know if it's directly

because of that. I think a big part of it is because we did so well and so fast. That started getting the program going. They said, "Well, this thing does work after all."

INTERVIEWER: It gave you a lot of good visibility, right?

STAFF SERGEANT DURAND: It did and it was good. Now, of course, people around here say, "Well, let them mark so much. It will give us time to get better at that stuff."

The UUV just collects the data. Then you go back to the old human eyeball and say, "Huh, what do you think that thing is?" At first, we were thought, "Oh, let's sway to the side of err." At night, out of a 2,000 by 800-meter box, we had 150 contacts. Mammals would come up with sixty. So, there's a lot of argument about what's better, mammals or UUV. They are finding out that the best way to go about it is to not use each system separately, but to just overlap. Anything that mammals and the UUV hit, are things we are definitely going to check out.

Then they ask us what our confidence level is or what would we go after next. That has actually been a problem with the command, too. First, we started out with the confidence level. Then we tried to shadow it off with what the air wings use. They have, I think, confidence levels one through five. It's based on return, shape, shadow, and clarity. They have five set factors. We tried to do that but we noticed they would disregard it unless there was a confidence level three or higher. I guess it's through not knowing or thinking they that they know, you could say. There were a lot of mines that week calling one and two. That was because they were moored mines and it is harder to get a picture of something floating in the water column when it's looking down at an angle. It's harder to see the bottom of the ocean. We started missing MOW 17s and PDM 3s that were moored. So, we went away from that. Then we went to mine-like or non-mine-like. That just created problems from the get-go because we'd say, "Oh, it's not mine-like. Don't worry about it."

Now, if the report is 'mine-like' and we give a measurement of how big across it is, whatever it is, I know the divers like seeing our images because it gives them an idea of what they should be looking for instead of just going to a designated mark. It's nice for them. Also being a diver, I realize it's nice to say, "Oh, I'm looking for something about six feet long. There

is a couple of piles of rocks over here and there's something over here and it's in the middle." It helps vector them to what they are looking for, because we are looking from the top down. Then when they go down with their sonar, they are looking at it sideways.

When they come back, we can compare the two images and try to identify the mine. With the way the program is going now, we're actually working toward using higher resolution sonar. They are putting a digital camera on one for us. There is acoustic sonar. They are trying to get better and better. It's getting there. Definitely in about ten years, I think, the dolphin and the man will be out of the loop. They are already working on UUVs that neutralize mines on their own. They don't fit our mission yet, but for the deep water EOD MCM stuff they work fine.

The problem with us is that right now, everything is geared to go after one mine at a time and our tactics dictate that we get them all at once so that we don't tip our hats to the coming invasion. It's kind of a problem with the vendors. They're working on it. We're getting there. It's definitely progressing forward like it needs to be. Eventually, the mammals will be gone. I know that creates a lot of heartache with EOD guys, and I'm sure a lot of civilian people, because it's been their little breadbasket, their sandbox with the big walls.

Eventually, it's all going to go away and it's going to be some IT or ET on a ship tossing this thing out the back of an LPD or something. We'll be able to say, "We can get through in a couple hours, you know. It's going to do its job." They are talking about putting them on submarines and launching them from the submarines.

We have little ones, and they've got 1500 and 3000 pound AUV's out there that they just let run on their own, after they launch them out of a torpedo tube. They get them and they drop them out of a helicopter. It's amazing what they have out there. It's something on which the Navy has kept stepping forward. I think the Marine Corps is going to start going toward it, too.

As you know, the SEALs and the Marines are still doing hydro reconnaissance, the old **Lead** line and sinker, 'go get a bottom sample and write it down on your board.' What we use just runs along silently in the water. You don't see it. You don't have to make sure everyone is online with the line and everything. The only thing it doesn't do is collect a bottom sample. But

it tells you how deep it is and what the bottom contour looks like. So, there's definitely other applications that are starting to be seen with this program.

INTERVIEWER: That's pretty neat stuff.

STAFF SERGEANT DURAND: Yes, it's amazing.

INTERVIEWER: You're pretty lucky to be on the cutting edge of that.

STAFF SERGEANT DURAND: It's definitely improved my career a lot. I'm actually afraid to go back to the Marine Corps. My fitness reports will just dip down on me and I'll be a normal Marine again. I can't really think of anything else.

INTERVIEWER: Thanks. It was a great interview. We'll send you the transcript.

STAFF SERGEANT DURAND: If I think of anything by the time the transcript gets here, I'll just add it in.

* * * *

Here is a more detailed version of what Happened when we were looking for the Pilot. Its what I sent to the Lt Whites Father after I saw his webpage The Web Page is located here.
<http://ltnathanwhite.rockmancentral.com/>

Ssgt Durand had contacted Dennis White, Nathan's father and asked if he would be interested in any of the details relating to his son's search and rescue (SAR). White's answer to Durand's offer was, "Absolutely!", but only if it did not include any details about his son's condition when he was found. This was Ssgt Durand's reply.

*

Tommy Durand, Ssgt USMC

Mr. White, I will try to answer your questions the best that I can regarding the recovery of your son, Lt Nathan White.

First let me tell you a little a bit about myself and the specialized unit I am part of. I am by training a Recon Marine but as my Corps needed me to go elsewhere I found myself as part of Naval Special Clearance Team One (NSCT-1). By definition we clear naval mine and obstacles from 40 feet of sea water to 10 feet of sea water. My particular Platoon deals with Unmanned Underwater Vehicles (UUV) which is how I came to be involved in the search for your son. I was involved in the clearance of the Iraqi port of Um Qasr where humanitarian aid was to be delivered to the people of Iraq. My unit received a radio message of the need for us to pull out of what we were doing and to prepare to move farther north and closer to the heat of battle in Karbala. My platoon begin preparations for running split team operations both in Um Qasr and where ever they were sending us north. This entailed bringing people who were originally told they would not be anywhere near shore ashore. And sending those of us with combat qualifications north. As we packed up our gear and boarded a Helicopter from HM-14 we began the first night of a long journey to where we had to go.

From the port of Um Qasr we flew to the base of Al jubbar in Kuwait. We stayed the night there on the edge of an airfield still not knowing what our mission was only that we would be going to a lake in central Iraq. We flew from there to Talil (I think it is spelled that way) via Marine and Airforce C-130's there we met up with a company from Marine security forces Bahrain and a 4 man communication team from the Navy Seals. We spent the night at that air base after that we boarded Army CH-47's we were we flew to the location of the crash site (N 32.34.460 E 043.50.320).

Once there we begin the task of being debriefed by the Navy EOD team that had been on site diving the crash site. We also talked to the Airforce PJ's who were the very first ones to look for your son. The Site when the PJ's got there was pretty much the same thing we saw minus the Parachute that they found in the water which was later believed to have been activated by impact of the missile. The tail of the Plane or I should say the rudder of the plane was visible above the water line and a section of the plane later to be confirmed by divers to be a major portion of the

tail was still intact underwater. Upon our arrival and briefing by the divers and PJ's we begin to formulate our plan of how to search the 3 or 4 miles of suspect crash site. To be honest we all thought it was a search for a needle in the haystack, we had so many different things on our minds at the time. I will be honest at first we all thought there was something more to this than just looking for a pilot, the number of assets and importance of some of them to other missions in the war was just too large to be for a pilot. There were many rumors going around as to why we were there. Some thought your son may have been carrying some special weapon and others thought it was that he had crashed into a sight where WMD's had been hidden. No one really knew and to this day I find it hard to exactly recall what went on.

Our first mission we ran our UUV over the crash site of the plane for 4 hours. Upon recovery we reviewed our sonar files and begin marking objects that resembled either ejection seats or in the worst case scenario a human body. Also about this time a Navy dive salvage team showed up with about 30 members and begin getting ready to deploy a towed sonar. The amount of people on or at the crash site after the first day was almost 100, a Company of marines from Fast company, The army Dive Salvage team, My Team from NSCT-1, A NAVY EOD team, and The SEAL Communicators. This was to grow on the day your son was located to include portions of a DSV team that were going to be deployed in the search. My team ran the UUV in large squares moving from the plane NW towards the location of where the parachute was found. We then handed our marks to the divers who in turn went down and tried to locate the items we had seen on sonar. This was complicated by the fact that your son had crashed in an old Republican guard bombing range. We had been finding unexploded ordnance underwater and our first mark the divers went down on was a 500 kilo Russian pfab that had not detonated.

As our search continued we began to talk more with "Santa", LtCmdr Klas Ohman, F/A- 18 pilot from the Kitty Hawk. It was painful to me to see him so worried about his friend. I must admit the day your son's body was located I hesitated to bring him to your son for identification. The searches continued until I believe it was a helo from your sons ship located him. From that helo we got a mark and went out in boats while they flew to a point on shore to deploy a safety perimeter for us. We recovered your sons body. Myself and 4 others carried him to the helicopter where he was returned home to you thankfully.

I myself require no thanks. As I often tell others this is my job and I am Happy that it could bring back a fallen comrade to his home and family. I offer my deepest condolences to you and your family at the loss of your loved one.

Very Respectively,
Tommy Durand, Ssgt USMC

Part of a later e-mail made the description of Nathan's recovery even more poignant.

Mr. White,

. . . I am glad that my services could be used to help find a fallen Comrade. I often get asked why is that as a Marine I am in the unique position to save and preserve life and not take it and if this is what the Marines had originally intended for me to do. I can honestly say that my training has been to do everything but save lives. I am glad that at a time when I personally felt that my training was being wasted on numerous exercises and not being put forth to the good of the

military that I was given the chance to prove myself in combat and in helping your family have their loved one returned. I am most proud of the fact I was able to help Locate and return Nathan to those who loved him. It is in my eyes the pinnacle of my career. I am always going to remember April 2003 as the year I did what I was trained to do and I completed that mission. . . .

V/R

Tom Durand
SSgt/USMC

Department of Naval Architecture and Ocean Engineering



Interview of Tom Odum

For Naval Forces Under the Sea: The Rest of the Story

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UNDERSEA & HYPERBARIC MEDICAL SOCIETY

INTERVIEW OF TOM ODUM

By

LEW NUCKOLS

Panama City, Florida

June 5, 2003

PROCEEDINGS

INTERVIEWER: It's June 5th, 2003. I'm at the home of Tom Odum in The Preserve in Panama City, Florida. Tom, first off, thank you for allowing me to interview you for this project. I wonder if you could, first off, just give me a little bit of background on where you came from, and your education, and how you actually started in diving.

MR. ODUM: Well, as you well know, it's going to be slanted all in our favor, which is perfectly normal, I guess.

I was born in Atlanta, Georgia July 5, 1927 and lived in Selma, Alabama until I was 14. My first diving experience started when I was five or six years old. Using a nail keg as a helmet, I installed a small glass view port and waterproofed the keg with roofing tar. Fortunately, I was not able to adjust buoyancy to keep the helmet in place long enough to deplete the air supply.

We moved to Montgomery when I was 14; and in 1944 I left to enlist in the Marine Corps with service in China. I was honorably discharged from the Marine Corps in 1947 and entered Auburn University, graduating with a BSME in December of 1950. While in high school and at Auburn, I raced motorcycles almost every weekend on tracks from Daytona to Milwaukee and from Shreveport to Atlanta. Harley Davidson Motor Company offered me a job as a design engineer in their racing department during my sophomore year at Auburn. I moved to Milwaukee, Wisconsin upon graduation and enjoyed four years of designing and developing components, engines and motorcycles for Harley.

In 1954 I left Harley Davidson to work for Hayes Aircraft in Birmingham, Alabama, designing components and subsystems for the YKB50 in-flight refueling tanker. In this capacity, I was on a design table eight hours a day five days a week. I soon discovered that I was not compatible with a job consisting of a life with nothing more than a design table. However, while at Hayes, I bought a surplus B4 oxygen diluter demand regulator, waterproofed the inside with rubber cement and started diving in the quarries in the Birmingham area. I had no knowledge of decompression or embolisms and somehow managed to survive. I was diving to depths up to 85 feet, but fortunately a 38 cubic foot fire extinguisher bottle had a very limited air supply especially when used with a regulator with high inhalation pressures.

INTERVIEWER: Did you know of Jacques Cousteau at that time?

MR. ODUM: No, I didn't. Scuba diving was just becoming popular, and there were not many regulators available at that time. Regulators that were available were out of the price range of a young engineer.

INTERVIEWER: So I was going to say, you kind of paralleled what Jacques Cousteau was doing over in France, it sounds like.

MR. ODUM: Well, it was early in the scuba program and when I used my rig, which had a large brass bellows as part of the pressure regulator, in salt water there was considerable electrolyses between the brass and the aluminum. One day at about 20 feet in the Panama City jetties, the brass bellows failed and released the full supply pressure to my bit. Fortunately, I did not have a strong grip on the bit and it blew out of my mouth. Again, blind luck was on my side.

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I applied for an engineering position with the Navy Mine Countermeasures Station (NMCS) in Panama City, Florida and reported for work in June of 1955. The NMCS had numerous name changes through the years and was the Naval Coastal Systems Center when I retired in 1992. I really enjoyed my work at the Center and had tremendous opportunities. My first program was to design a remote operated vehicle (ROV) for mine countermeasures with components of this concept being used in the first ROV in mine countermeasures and maybe even the Navy. We had three civilians qualified by the Navy for diving that were working on a program to support EOD divers in mine countermeasures. Neither of the three were really interested in continuing the diving program. I was in the fortunate position of being a new employee with great enthusiasm for diving and requested the program. The objective of the first program (Project MANFISH) was to develop an underwater TV for the divers in the MCM program. TV cameras were very large at that time and required constant adjustments of several functions. We installed the camera in a brass canister 14 inches in diameter and three feet long.

INTERVIEWER: They had to be pretty heavy, I imagine.

MR. ODUM: They had to be pretty heavy to make it negatively buoyant. It was not much fun lugging that thing around, but it worked and it worked very well. It did its job within limitations and while it was not considered feasible for Fleet uses, it did have the beginnings of a useful tool in MCM, salvage and what have you underwater.

The next program we had was to develop a low influence scuba for EOD

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divers. We made a sintered metal filter for the exhaust and were able to break exhaust air into bubbles 1/16 of an inch in diameter, and reduce the noise to an acceptable level.

INTERVIEWER: And what year was this, approximately.

MR. ODUM: This would be 1955-56. The filter worked fairly good and EOD divers accepted it very well. It didn't add much volume to the breathing system.

In the 1958 timeframe we started a program to develop fiberglass air flasks. At first we had seepage through the fiberglass so we tried different liners. The bottles were approximately four inches in diameter and 20 inches long. We mounted them in banks on a manifold incorporating a quick disconnect valve so the banks could be plugged together to tailor the air supply to the dive. Each bank was enclosed in a neat fiberglass shell. We were not able to introduce these fiberglass bottles into the Fleet because of the unpredictability of fiberglass at that time. However, it did start the process of using fiberglass bottles underwater.

The MK V semi-closed circuit breathing apparatus was approved for Fleet use but after testing, there were a lot of changes that needed to be made. NAVSEA let a contract for the MK VI semi-closed circuit breathing apparatus and tasked us to evaluate the system. A Fleet team consisting of divers from EOD, Special Warfare and Mixed Gas School, Key West came to Panama City for the evaluation. During testing, the team found several discrepancies with the unit. The most interesting problem was that the unit changed mass flow of gas as it descended. The MK VI is based on a constant mass flow

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control regulator which injects a constant mass of gas to the breathing bags regardless of depth. In testing, we found that the regulator would reduce mass flow with increase of ambient pressure. We eventually discovered that the orifice adjusting screw was sealed with an "O" ring and this "O" ring was the only retainer for the adjusting screw. As ambient pressure increased, the "O" ring allowed the screw to move to the extent of the clearance of the threads reducing the flow rate. A jam nut was installed on the screw eliminating the problem.

INTERVIEWER: Did anybody die from the MK VI?

MR. ODUM: I don't know of any fatality with the MK VI. We had some near problems because of the CO₂ canisters. We all thought they were six-hour canisters, and we did not realize how much loss of efficiency we had with cold water. We didn't discover this until we had the hydrospace lab functioning where we could actually analyze the gas under changes of temperature and flow rates. While we were able to find the canister problems with the hydrospace lab, we did not have the means to correct the problems. We did, however, inform everybody about how much efficiency dropped off with temperature.

We did some experiments with the MK V to reduce exhaust noise. We thought if we had a flexible hose from the exhaust to the surface, we could eliminate a lot of the noise from the MK V so the diver could approach acoustic mines.

INTERVIEWER: This was the hard hat?

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MR. ODUM: Yes. The MK V hard hat. This was in the days the divers were having a hard time adjusting to scuba. Some of them actually transferred out of the diving program rather than adjust to scuba. We were trying to work out a system so that the MK V could approach an acoustic mine. We put a flexible hose on the exhaust of the MK V and it vented the gas from the MK V very well. But as a slug of gas moved up the hose, the hose would collapse behind the gas. When it collapsed, it actually amplified the noise of the MK V quite severely. That was, of course, an effort that failed.

An interesting story--this is a sideline from the work. When we were testing the MK VI semi-closed mixed gas unit against the instrumented mine apparatus, Wilber Eaton, as so many people knew, made a dive on an instrumented mine. Ten minutes later, he was floating on the surface, unconscious. We pulled him on board and got him all squared away. We could not find anything wrong with the MK VI, so I took it and went down below the boat and swam on the bottom with no problem. I asked Wilbur how late had he been out the night before, and he said he had been out a while with a bunch of the visiting teams. I asked Wilbur to get a good night's sleep. The next morning, 10 minutes after Wilbur went into the water, he was on the surface unconscious. So, we stopped everything. I entered the recompression chamber with the MK VI and worked real hard—nothing happened. We went to 80 feet and still nothing happened. So we decided to take every screw off the MK VI to find out what was going on. It turns out, the hoses were delivered from the factory with no check valves in the mouth bit. Wilbur's lung capacity was such, that he was breathing shallow and was chasing the gas back and forth in the hoses and bags without going through the scrubber. I was breathing

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deep and pushing it through the scrubber enough to keep me going. It was just one of those things that you come across that you do not think about.

The MK VI was very successful. It lasted for about eight to ten years in service. There are still a few of them around, but I doubt they are used any more.

INTERVIEWER: I've got one at the Academy just as a demonstrator.

MR. ODUM: You have? Uh-huh. I liked the MK VI—it was a good rig. We had an accident with it down in St. Thomas, when the divers went to the charging manifold and charged 70-30 instead of 30-70. One of the guys passed out but he was rescued and was okay.

Well, let's see now. Dr. George Bond was doing his studies in the late 50's and early 60's at New London on saturation diving. In the late 50's, I attended a meeting chaired by Captain Bill Searle to determine the Navy's requirements for research chambers. I requested a facility that was capable of 1000 psi (2000 FSW). It was agreed that Panama City would get the second chamber and NMRI would get the first chamber. Based on this agreement, I prepared the first MILCON request for what became the Ocean Simulation Facility. When Dr. Bond was ready to test his theory of saturation diving in open water, I approached him to let us build the habitat at Panama City. I told him that we had some cylinders that were left over from a mine countermeasures experiment that would be easily modified to make the habitat. He agreed, and I asked NAVSEA to task us with \$50,000 to build a habitat for the SeaLab I program.

We cut the tail cone off the cylinder and put on spherical noses and then put it on stilts with large bins on the bottom for ballast weights. We used railroad axles

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which we could rent for almost nothing to ballast it down. It, of course, was a nightmare to handle that many axles.

The electrical system was housed in a compartment in the front end of the SeaLab. All of our electrical connections terminated in the forward compartment and were fed out throughout the apartment part of the SeaLab.

We built the SeaLab I habitat in three months and ran into several problems that you wouldn't normally think of. The first severe problem we had was that the cylinders were made out of HY80 steel. Who would expect a cylinder, in those days, being made of HY80 steel? It was unheard of—that was very new material.

We had welded most of the habitat. One March night, the temperature dropped down into the 30s, and all the welds cracked—we had cracks all the way around it. Since we did not know it was HY80, we did not preheat the cylinder. When the welds cracked, we had to figure out how to preheat that large of a cylinder. The cylinders were 15 feet in diameter and difficult to preheat with no ovens that size available. We wound up wrapping steel banding over an asbestos insulator around the full cylinder and preheated it with the welding machine. We got enough preheat to weld the HY80 and the welding worked out well.

We had a lot of sailors from the base who volunteered time to do the chipping and painting. This made it possible to meet the schedule and also saved a lot of funds. All of the engineers, of course, were salaried and they worked long hours without any overtime pay.

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We were running three shifts a day to make the deadline. We had to ask NAVSEA for \$35,000 to modify the control platform, which was the YFNB 12. We made things like a transfer pump for large volumes of oxygen for mixing gas. We did so by taking two large cylinders with a connecting loop on the bottom—we put water in the right hand cylinder and pumped compressed air on top of the water, forcing the water into the other cylinder to compress the oxygen. That was the only way we could get the volume in those days to charge the storage banks.

SeaLab I was finished in three months and was to be tested in the Gulf before going to Bermuda. Instructions required the hatches to remain closed on the surface. However, a hatch was left open and as the SeaLab was being ballasted, a swell went over the top of it, and then it was like a dog chasing his tail. It went right to the bottom and flooded. This was on Friday and it was supposed to leave on Monday for Bermuda. We had to put everybody we could find on it. We washed it down real good and had all the motors rewound. The local electrical shop stayed open and rewound all of our motors for us over the weekend. We had it ready to go on Monday morning.

The only failure they had at Bermuda was one light circuit burned out, so it was a real successful series of tests.

INTERVIEWER: And what about all the equipment inside? Obviously, that was flooded.

MR. ODUM: Well, we had to scrub everything or replace it, and in that short time, we didn't have much time to replace anything. So, we had to scrub it all down and then get everything else ready to go.

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I'm sure you know all the specifics of the SeaLab habitat, so I won't go into those. But all in all, it worked out well. Dr. Bond was at the Laboratory the whole time with all the aquanauts, including Scott Carpenter, who had a lot of press when he was present. I always thought I was—let me put it in the right words. I was naïve enough to think that I could limit the press to certain times. So, I called everybody in and said that we were going to have a press day—and that was going to be the only day we're going to have the press. We could not make our three month schedule, taking off every four or five hours for the press. Dr. Bond said, Tom, don't worry about it—it will work out okay. I said, no, Dr. Bond, we've got to either have the SeaLab or the press—I can't have both. Of course, every time they'd come, we'd have to take everybody out of the SeaLab and let the press go in. We had one or two that were really persistent—they wanted to have a single day by themselves. Dr. Bond got pretty upset with me when I told him that I wasn't going to let the press in on a routine. It was naïve of me to think I could control the press to one day, so we had to break down and let the press in, occasionally. We tried to hold it to people like *Time* and *Life*, rather than just letting every newspaper throughout the Southeast come in on any day.

But we got it ready to go. It was loaded on the YFNB 12 and it went to Bermuda. Like I said earlier, the only failure they had was one light circuit failed. It was a successful series of tests, except they had to cut it short because of storm warnings.

The personnel transfer capsule was an old chamber that we inverted to the vertical position and put feet on it, so they could sit on the bottom. It was parked right outside the entrance to the SeaLab, so that in emergencies, they could go in, close the

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hatch, and pull it up. They did the decompression on Argus Island, which was an offshore research tower out from Bermuda.

Most of the aquanauts returned for the SeaLab II program and into the start of SeaLab III. It was amazing to see the difference in the interest and the difference in the way things went from SeaLab I to SeaLab II to SeaLab III.

We did SeaLab I completely in three months with \$85,000. SeaLab II was a multimillion dollar experiment that took over a year to prepare for it—then SeaLab III was quadruple the price of that one.

It was something to see the difference in the fact that people who were not trained in underwater equipment, nor in physiological process, came into the program; and to see the mistakes they made, not knowing the background in diving, was really tremendous. We spent most of our time at the Laboratory trying to correct those things that were happening.

INTERVIEWER: The SeaLab II was all on the West Coast.

MR. ODUM: Yes.

INTERVIEWER: And who was building the SeaLab II?

MR. ODUM: Captain Mel Mckennan, who was head of Hunter's Point Navy Shipyard fabricated the habitat.

They did some real innovative work. Like, they did some explosive forming of the dish heads for the ends of the habitat. That was something that was unique for that timeframe.

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They put a whole series of explosives next to a steel plate, and when they fired it into a mold, it formed just perfectly. They machined the ends of it and welded it to the habitat.

Captain McKennan did some good work. We did the preliminary design and they made the detailed designs. At the Laboratory, Bill Culpepper, Bob Porter and George Combs were the three engineers involved in SeaLab II at that time. They had been involved in SeaLab I and had gained valuable experience. They were involved with our diving work along the way—so, it was not something new to them. They had the background and the knowledge to do the SeaLab program.

SeaLab II was a successful program which operated off of Scripps in the canyon in 200 feet of water. Bob Dill, Dale Good and I made a preliminary search for a spot and the best place we found had about a 10 degree slope on it. SeaLab II was placed on the slope, and they called it the “Tiltin’ Hilton”. That made it fairly uncomfortable for them during the whole test; but that was the best place we could find in the time that we were limited to in 200 feet of water with scuba.

SeaLab II tests went very well. There were no serious problems. Scott Carpenter was stung by a scorpion as he was coming up.

INTERVIEWER: Is that a scorpion fish?

MR. ODUM: Yes. A scorpion fish.

They advanced our technology quite a bit in the process of building SeaLab II. We had money and time that we didn’t have for SeaLab I. So, they had a

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much better organized ballast system and a much better organized air supply system. The whole system was better.

SeaLab II had a pressure hull, whereas we went with an ambient hull on SeaLab I. Backing up just a little bit on the SeaLab I program, we had a big meeting on whether a pressure hull or an ambient pressure hull, full pressure versus ambient pressure. I made the decision to go with an ambient pressure hull because, first of all, we did not have time to build and test a pressure hull. Certification was not really a word in our vocabulary at that time. It was just beginning to show up; and unfortunately, the—I think it was about the Wednesday before SeaLab I was scheduled to go to Bermuda on the following Monday, I got a call and was told we had to certify the SeaLab. Of course, I thought this was the end of it, because there was no way we could certify a pressure hull in four days' time. So I went to Washington and reported that SeaLab I did not require certification, because it was an ambient pressure hull and there were no requirements to certify it as a pressure hull. And they bought it-- I was shocked that they bought it—but they did. Fortunately, we were able to go ahead and ship on the scheduled date.

SeaLab II was a full pressure hull; and, of course, it was designed for certification as a pressure vessel. It had much better facilities as far as creature comforts were concerned—it was a much improved habitat. It was designed to be used for SeaLaab II, which was to be in 200 feet of water, and SeaLab III, which was to be designed to go to 600 feet. After SeaLab II, the habitat was rehabbed at Hunter's Point with Captain Mel McKennon in charge.

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Things were going fairly well—the usual delays, you know, the last minute delays of things happening.

On SeaLab III, they had to have a longer cable but failed to use a helium blocked cable. No one caught the fact that they did not have a helium blocked cable and when they pressurized it, all the helium leaked back to the surface through the cable. So, they tried to pressurize it by just pumping more helium in and, in doing so, they put a positive pressure on the lower hatch. On the first day, Barry Cannon attempted to open the hatch; however, the hatch would not open because of the positive pressure. So, they returned to the decompression module on the surface and spent the night. Barry had lost a lot of body heat on the first day's dive, and apparently his body temperature did not come up to normal overnight. He went out the next day to open the hatch—he worked really hard—he passed out and never recovered.

It was reported that Barry had no CO₂ absorbent in his canister. What happened to the canister, I do not know. But, I do not believe the CO₂ absorbent was left out of the canister. But, very sadly, Barry passed away. And, of course, that killed the SeaLab programs at the time.

I do not think the Navy has had a bottom-mounted habitat since then, We had the MK I Deep Dive System after that for saturation diving but have not had a program in bottom habitats since then.

INTERVIEWER: Now, getting back to Barry Cannon and the CO₂ scrubber. I've heard people talk about sabotage. Do you—what are your feelings on this?

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MR. ODUM: Well, my feeling is that somebody deliberately emptied the canister. Why, anyone would do that, I have no idea—unless they did not want the program to succeed.

INTERVIEWER: What do you think would have happened if Barry Cannon hadn't died?

MR. ODUM: I think the SeaLab III program would have been a success and the Navy would have operating habitats throughout the world today. You know, they would make excellent research stations and excellent sonar stations. There are any number of things they could use the bottom-mounted habitats for—in salvage diving, it would make a lot of sense to put the divers on the bottom and leave them there to work normal shifts rather than hauling them back to the surface every day.

There's a lot of argument as to which way is the more efficient. In certain cases, I can see where the bottom-mounted habitat would be better, and in other cases, the vertical elevators would be my choice. If the tragedy of losing Barry Cannon had not happened, I think we would be a lot further ahead in saturation diving today. It probably set us back 10 years in our research in diving. A lot of research was continued in the dry chambers and in the wet chamber of EDU. But I think, had the program not been canceled like it was, we would be a lot further ahead than we are today.

INTERVIEWER: I wonder if I could just ask you, then. It seemed as though during that era, that the Navy was really leading the world in development.

MR. ODUM: That's right.

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INTERVIEWER: And it seems as though, today—that that's not the case any longer.

MR. ODUM: Yes. I agree with that. I won't point a finger, because I don't know anybody to point the finger at. But we were leading the world. You know, Cousteau consulted with Dr. Bond—he actually came to Dr. Bond—and he took that data, and went back and did his first habitat.

Cousteau was not limited by the requirements that the Navy had, the safety requirements of the Navy, or the required research that went into the Genesis program. Cousteau was able to just go ahead and do it, whereas we had to go through the normal procedures to get the job done.

At that time, like you say, we were leading the world in naval diving, period. With the hardware we were developing and with the medical research being accomplished—we were leading the world. But after the Barry Cannon tragedy, we lost a lot of our lead capability in those years.

Dr. Bond passed on a few years later. But he did some work at the Laboratory in Trimex and a lot of the thermal protection studies. So Dr. Bond actually did quite a bit of work after the SeaLab program was ended.

However, the funding for research was not as good as it could have been, and attitudes changed a lot at that time. Some of our other programs carried saturation diving further; but as the general Navy was concerned, saturation diving died with Barry Cannon.

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We had some shakeups in the management of diving, which further set us back—some problems came along that caused scrutiny in the whole program. That close scrutiny meant we had to be squeaky clean in everything we did from then on out. You know, you can bend a rule here and get a lot done, whereas if you've got to stick strictly to the formal rules on every little thing, you can be stifled.

When we were doing the MK VI work—MK VI, the semi-closed breathing apparatus—we would design a part today, build it in the shop tonight, and dive it tomorrow. Now, it takes several months or more, because you've got to design it, get your design certified, then build it and get your fabrication certified. And then you've got to go through unmanned testing, manned testing in the chambers, and finally go to sea with it.

Of course, the fire at Canaveral, put certification in our vocabulary. That fire, plus the fire in the chamber in Washington a little earlier, put certification in everybody's vocabulary. Certification is good—but sometimes, it is the controlling element of R&D. There should be a reasonable approach to certification; after all, certification is only as good as the integrity of the people who are doing the work.

In my opinion, certification is a good requirement, but it needs to be done with a little bit of reasoning—not just a black hammer to slow down R&D. Sometimes, it seems, it is used that way.

INTERVIEWER: Well, this might be an appropriate question. I think, back in your career in underwater technology, if all barriers were removed, and you had

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absolute authority, is there anything you would have changed? And if so, what would it have been?

That may be a thought question, but—

MR. ODUM: Well, the first thing I would do is go back and spend money to develop a CO₂ sensor that is good underwater. With a CO₂ sensor that functions well underwater, you could have absolute control of any workable breathing system you could build.

We tried, and we found a series of crystals that I believe had good promise—they were lithium chloride crystals, as well as I remember. They were built by a gentleman in India and looked good as a CO₂ sensor system, as well as a O₂ sensor system. One set of crystals could detect both CO₂ and O₂. After testing the crystals, we were unable to relocate the gentleman in India again—he may have been lost in the Bophal situation there when they had the gas leak. With that CO₂ sensor, you could have a closed circuit breathing apparatus that was totally dependable, because you would have a known CO₂ content and a known O₂ content. With those two sensors working good, you could stay down longer—there would not be a problem of ensuring life support.

Let's see. What else would I do if I had absolute control? Of course, funding would be a preliminary requirement to put good Ph.D.s working on the program so that we could get more minds involved in it.

We had some dedicated, quality people, with an intuition into the requirements of diving, that got us where we were. But just think, if we could have

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had MIT and some of the other big schools working on some of our problems, how much further we could have gone.

INTERVIEWER: You indicated that in '55, there were essentially three people who started out the program. How many people were involved in the diving development effort here in Panama City in the glory years—in the sixties?

MR. ODUM: Well, I started into the program working on the three projects I told you about. Bill Quigley came into the program next and then Roger Johnson. For several years, it was the three of us. Then we got Bill Culpepper and Bob Porter involved and it gradually grew—when I retired in 1992 we had probably 200 people working in diving. At that time, the Department had all the engineering labs, the test ranges, the Special Warfare Program and the Diving and Salvage Program. So of the 300 people we had in the Department, I'd say 200 of them were dedicated to diving.

Let's go back to some of the hardware that we worked on. We tried a cryogenic breathing system. I'm not sure you are familiar with that or not.

INTERVIEWER: Yes, I was.

MR. ODUM: Okay. You worked on it a bit, did you?

INTERVIEWER: No. I read some reports on it.

MR. ODUM: Okay. Well, the theory was that we could freeze the CO₂ out, using the liquid helium as a cooling agent for the CO₂ canister—and it worked fine. However, the absorbent canister, the freeze out canister, was made of flimsy material. I believe it was a clear, flexible plastic. It withstood the temperature well, but at that temperature, it was very fragile. But worse than that, CO₂ would freeze out and chunks

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of CO₂ ice would start breaking off and going through the system—then all of a sudden, you would get a slug of dry ice.

INTERVIEWER: Dry ice.

MR. ODUM: I think that could have been improved. It still has merit in a firefighter's breathing apparatus where you are in a protective suit--or an environmental suit where you are in a totally enclosed atmosphere, with no way to get the heat out of the system, using a cryogenic breathing system would probably do a good job.

For thermal protection, we tried a blubber suit, which was microballoons in a gel of castor oil. It provided good thermal protection and was non-compressive, so you did not lose buoyancy as you descended. Of course, it probably took 75 pounds to make it neutrally buoyant, but then you still used the same 75 pounds at 200 feet as you used on the surface. We did that in an attempt to eliminate the buoyancy change and to increase thermal protection. It worked well in theory, but not very well in application.

In thermal protection, we also tried a device, burning magnesium chips in a pure oxygen environment. We circulated water through the combustion chamber into a tube suit to provide heat to the diver. The water temperature was controlled, plus or minus a degree, by controlling the amount of oxygen going into a combustion chamber. It worked well. However, once you snuffed it out, it would not restart; so if you had a flame-out, you were exposed to the cold. We used a device similar to a flashbulb to ignite the magnesium chips in the combustion chamber; and it burned fairly well. We got good combustion of the whole charge and it produced a good heat supply.

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It had several practical problems and the concept of burning magnesium in a pure oxygen environment kind of shook up some people. So, it was dropped fairly early in the game—we did not really get a chance to perfect it. But to me, it was a good heat source—it was a small canister and it didn't take all that much oxygen to feed it.

Well, let's see now. How about a cup of coffee?

(Pause)

MR. ODUM: I think that if we solved three problems, we would have unlimited capability. Of course, the first one is the physiology to 2,000 feet—if it is possible.

The second is the thermal protection problem. I think your system of putting hydrogen into the breathing medium is really a breakthrough. Once, we get that accepted, I think the thermal protection problem is essentially gone. If you can heat the torso and can transmit the heated blood to the extremities, you no longer have a thermal problem.

The third is need for a life support system that is truly closed circuit and is truly a long duration breathing system.

We tried lithium hydroxide as an absorbent and it proved to be an outstanding absorbent with very little degradation in low temperatures. With lithium hydroxide we can get a 20-hour duration out of a standard sized canister without any problem at all. However, it is very caustic and until we can develop a canister that guarantees no lithium hydroxide coming into the system, it is prohibited.

So, if we can solve these three problems—the physiology, the thermal protection, and the unlimited life support—we can do anything we want to underwater. Without the solving of these three problems, we are limited to 1,000 feet and a few hours of duration because of thermal protection. We have got to put research money into the program and into the resolution of these problems to accomplish what is really needed.

We mentioned earlier that things came unglued after Barry Cannon's death. The resulting investigations and all that went on with it killed the initiative in saturation diving in bottom-mounted habitats.

There is still some interest in Europe in the bottom-mounted habitats. But in our country, it is very limited, and mostly by the universities, and not by the Navy. We are essentially out of that business as far as the Navy is concerned.

INTERVIEWER: There are some people that say with the advancements in underwater vehicles, that the diver is no longer necessary.

MR. ODUM: That will never be. You will always have to have a human brain on site—the dexterity and the thinking ability of a person on site is just non-replaceable. It may not be to the extent that we have today; it may be limited to a few construction jobs, inspection jobs, and military jobs.

But, yes, I agree that vehicles, ROVs, and UUVs are a thing of the future, but they will never eliminate the diver as far as I'm concerned. You will always need the human brain on site for our dexterity and our ability to make decisions.

INTERVIEWER: Speaking of vehicles, this might be a good time to talk about the developments that you did in vehicles.

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MR. ODUM: We started here evaluating the MK I and MK II vehicles.

The MK I was what they call a SPU (swimmer propulsion unit). It had silver zinc batteries; it was one that you rode on the backside of it and controlled it with body English. But the Navy, at that time, decided there would never be an application where they needed individual swimmers and the idea was dropped. Up until that time, the Navy was interested in the Pegasus, which was a French-designed and –built that worked very well. It had three axes of freedom, and was very controllable—you could roll it, you could flip it or do just about anything you wanted to do with the craft.

INTERVIEWER: What approximate year was that in?

MR. ODUM: That was probably in the '59 and '60 timeframe.

Evaluating the Pegasus, the MK I and the MK II was when we first entered the vehicle business.

The MK II was the Navy's first attempt at sophistication. It had a fluxgate compass, a gyro and a series of thrusters on it so you could rotate it or move it up and down with fairly good control at slow speeds. The company that did the original study felt like all of the divers would be claustrophobic in a closed vehicle underwater and decided to make it look like something that was an everyday occurrence. They chose a 1950 or '52 Ford pickup truck as their model. If you looked at it, it looked like a '52 pickup truck and it also had the underwater stability of a pickup truck.

We tried putting fins on it—we tried everything to stabilize it. But it never got to the point that you could fly hands off--you had to nurse it the full time.

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INTERVIEWER: These are wet submersibles?

MR. ODUM: These are all wet submersibles. The Navy's interest in dry submersibles was very limited. It is still limited to the ASDS.

INTERVIEWER: So you were—I think you were talking about the Pegasus.

MR. ODUM: Yes. The Pegasus used lead acid batteries and, of course, had a limited duration. But like I said, it was very agile—it did about every acrobat that could be done with a performance aircraft. Not having the stress of gravity on it and not having the velocities that an aircraft had, it was very capable.

We tried all kinds of propulsion units that were coming down the road at that time. One of the most interesting was an Aqueon developed by Aerojet Corporation. It consisted of a series of hydrofoils that worked with your legs through the water—it was a fairly good propulsion system. In fact, you were hard-pressed to outrun it with your fins. It was a drastic increase in the efficiency of the application of your muscles in propulsion.

The first vehicle that we were involved with, as far as design and fabrication, was the MK VI. The MK VI was a streamlined body of revolution that was very stable. You could put it on a course, take your hands off, and it would fly itself along that course until you changed the settings. It was good for six knots and several hours, using silver zinc batteries—it had a very good trim system. As part of the frame, we had a large donut-shaped tank in the front and in the rear. Those donuts were tied

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together with stainless steel tubing and with a pump so that you could pump water fore and aft. You could trim the boat out very nicely in just a few seconds.

The silver zinc batteries, of course, had the same problems as all other silver zinc batteries. It took a lot of maintenance to keep the batteries charged properly. But the vehicle was very good. It had forward and stern planes to control azimuth and elevation. It had a high metacentric height so you had no problems with roll. It was a stable vehicle with a Doppler navigation system. It was designed so the hull could be separated and a center pod could be added so you could carry additional personnel, cargo, or sonars. Much of the technology was transferred to the MK VIII. We made a test in which we launched the MK VI from the deck of a submarine and made a five mile run into Stage 1 (a tower in the Gulf at that time), then we made a five mile run in a different direction and rendezvoused with the submarine—never exposing the vehicle from the time of launch to recovery.

We did use an acoustic marker for the final homing to get aboard the cradle on the deck. A deck crew locked out of the submarine and gripped the boat down into its cradle. As far as I know, that was one of the most successful early starts in the launch and recovery of an SDV from a submarine.

INTERVIEWER: And that was what era?

MR. ODUM: That must have been 1965 or '66. There were other submarine launches and recoveries, but I do not think any of them made that kind of a range and recovery.

For propulsion we tried an experiment early in the game, using compressed air from the breathing medium, expanding it through a cylinder, and then going to the diver for breathing. We used a long rubber fin, like a fishtail, for propulsion and we got very good results. It was later installed into a vehicle, using an electrical drive instead of the gas drive. With the expanding gas drive, of course, you only had a three-quarter horsepower hour in your tank--at the best. The fishtail concept was used for a couple of years as a quiet propulsion system in an experimental mine countermeasures vehicle.

We built six vehicles for use in Vietnam. We were given only two months to develop these boats and have them ready for use. We took the Italian Sea Horse, added silver zinc batteries and a bigger motor to increase performance. We also streamlined it and closed it so that we could get more speed and endurance. It was shipped to Vietnam on time.

Then we built a four-man vehicle, using the Italian Trasc as a starting point. Again, we used silver zinc batteries, a larger motor and enclosed the canopy. It was a good, small vehicle for use by the Vietnamese.

The MK VIII was originally designed and built by Aerojet Corporation. The Special Warfare Group I on the West Coast developed it further. The Laboratory was tasked to add a SLEP program that gave it longer life, better navigation, better electronics and made it into what is essentially in the Fleet now. We continued to upgrade the MK VIII to the—what is the MK VIII MOD I.

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We looked at other vehicles and purchased a French PR77, which was a lead acid battery-driven boat that was a good, stable boat that worked very well.

From that background, we developed the MK VI. One interesting sideline on the French PR77—it was advertised to have watertight bulkheads and watertight compartments throughout. But here again, they did not gas block the cables and hydrogen leaked into the main switch. Don Patterson was performing a pre-dive test and when he hit the switch, an explosion skinned the whole vehicle and the inspection cover went through the roof of the machine shop. Don could not hear for about three days, but it was amazing that he survived because of the size of the explosion. It was our only experience with a SDV battery explosion and, at that point, we realized we had to hydrogen-block everything. We installed hydrogen catalyst in all the battery compartments, evacuated all the oxygen out of the system and then back-filled with nitrogen to reduce the possibility of a hydrogen explosion in the future.

Some batteries do off-gas oxygen, as well as hydrogen, on charge and discharge. So to have a completely safe system, all switches and ignition sources must be taken out of the battery compartments and located in totally watertight compartments elsewhere. Hydrogen-blocked cables must be used throughout the battery compartment. We should have learned from the submarine people early on, but we didn't.

INTERVIEWER: You had to deal with lead acid batteries for a number of years.

MR. ODUM: Yes. A small amount of seawater in lead acid batteries is not very healthy in a closed cycle atmosphere.

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INTERVIEWER: Tom, can you give us a little bit of information on your background, as far as training in diving, and how you got involved in different types of diving.

MR. ODUM: To begin with, you know, I mentioned the fact that I started diving in the quarries in Birmingham without any training. Luckily, I survived that. But when I got into the development of diving equipment at the Laboratory, I went through a scuba school here at Panama City. This was before the Diving and Salvage Training Center moved here, of course. We were certified for several years to train our own people and occasionally, we would train people from other government organizations; but our school certified military and civilian divers in scuba only.

In my class, we started out with 64 people. The water temperature was pretty cold—it was in the fall of the year. Out of those 64 students, four people graduated—two military and two civilians. The day the two military personnel received their diploma, they resigned from diving—they did not want any part of diving any more. So essentially, only two of us continued in diving. The ironic part of it was the other civilian student that finished with me was a little bit claustic. At the start he would put the mouth bit in his mouth and go up-chuck; but he had the determination to stick with it and graduate. He became a very good diver.

INTERVIEWER: Do you remember his name?

MR. ODUM: Tom Williford, I believe was his name.

INTERVIEWER: What was the training like? How long a period of time?

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MR. ODUM: It was in a time when most divers felt like you had to be real macho to be a diver. We got a lot of harassment, a lot of extended swims in cold water, which actually by today's standard would be very dangerous. Some of the students could not tell you their name when they got out of the water because of the loss of body temperature. They put us through inspections of the buoy chains on the Battleship Buoy—where you had to swim down through three feet of mud to get to the chain. The mud was so thick, your breathing was very restricted because of the fluid friction of the thick water inside the breathing regulators. Then they would come along and jerk your mouth bit off while you were in the mud. They considered things like that were required in those days—it was just, you know, the attitude.

It was a little too severe, because it cost a lot of money to put a student through dive school. We lost a lot—because of the harassment.

After I graduated, we started developing a breathing system for the helicopter pilots so they could come out of an aircraft that had crashed into the ocean while flying mine countermeasures missions close to the water. It was a mixed gas system. In the process of testing this, one of the people from NAVSEA happened to be present, and said that I could not dive the rig because I wasn't qualified. So they threw me in the briar patch and sent me to Key West for four weeks of training, which I thoroughly enjoyed. It qualified me in closed circuit oxygen and semi-closed circuit mixed gas.

INTERVIEWER: What year was this?

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MR. ODUM: This was 1957 or '58, somewhere along in there. I got those two qualifications but never went through a school on surface support. I've been able to dive several of the rigs, but I've never been to school on surface supported systems.

INTERVIEWER: Tom, can you go a little bit more in-depth in the actual training program, both scuba and the semi-closed?

MR. ODUM: The scuba course we had at the Laboratory here in Panama City was certified by the training command and was allowed to train civilian divers, and some military divers. Most of the training was for our civilian scientific divers that needed to qualify in diving for work in support of other technical underwater programs. It consisted of four weeks of training, which included a fair amount of physical training, and a very good course in diving physiology taught by a very capable young Corpsman. It exposed our people to a good background in diving physiology; and from that, we started out diving in a small test pool back of Building 110. We would go through the normal routine of dropping your mask, dropping your bottles, going into the water and picking up your bottles and other similar drills. We gradually worked into the bay. As I mentioned earlier, we got a lot of harassment throughout this program, which I believe made us much more confident in our performance underwater—we had to stay alive.

INTERVIEWER: Confidence building.

MR. ODUM: Confidence building. Yes. We had a lot of that and we had a fair amount of long swims. We would swim from the end of the dock at the Lab, out to the old Battleship Buoy—out there and back several times. In fact, that's the way we

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started out the initial qualifying test to see whether we could swim or not. We swam out to the buoy and back; the water temperature was probably 60 degrees and it took maybe 20 minutes to make the swim. So 20 minutes in 60 degree water, with no thermal protection, proved to be a pretty good eliminator right there.

All in all, it was an excellent course. We had good instructors. Like I said, in those days, the attitude was total macho—you had to have a certain amount of physical stamina and conditioning to meet their requirements. In diving at the Center, we never had an on-duty accident at Panama City in our diving locker. We did have two unfortunate fatalities in our civilian corps. The first one was an off-duty, recreational cave dive at Morrison Springs, in which two men went in the cave not totally prepared. One man apparently lost his light, and in the process of looking, he stirred up the mud and could not find his way out. Fortunately, his partner found his way out. It was not a diving accident attributable to the Center—it was a cave diving accident that should not have happened. The second one, of course, was Barry Cannon who died under the auspices of the SeaLab program, not under the auspices of the Center. Both accidents were extremely sobering to the community.

But the training program, like I said, was a good program that continued for about 15 years. We had at least one course a year to train civilian scientists. We had as many as 40 civilians qualified at one time to do scientific diving at the Center. When I say scientific diving, it is about taking a piece of hardware—whether it be diving and salvage hardware, mine countermeasures hardware or torpedo countermeasures—

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down and evaluating it as an engineer, thoroughly investigating it, rather than just coming back up and saying it didn't work. The scientific diver came back with a report on why it didn't work or why it did work. Diving at Panama City has been very valuable to the Center, not only as a program for the Center in diving, but as a support to the other technical communities at the Center. A lot of good technical information has been received by the Center as the result of the trained engineer diver on the scene.

The next training I received was a four-week course in mixed gas diving at Key West. The course was intended primarily for EOD divers but included civilians and others. In the first week, we received an intense course in physiology as related to mixed gas diving along with plenty of physical training. The next week included the oxygen breathing systems, specifically the Clearance Diver's Breathing Apparatus (CDBA), the Emerson, the Perelli and the Draeger.

INTERVIEWER: Now, the CDBA was a British rig?

MR. ODUM: Yes. It was a British rig. It was used either as a closed circuit oxygen rig or a semi-closed circuit mixed gas rig.

But these four rigs worked very well. Each one had its own peculiarities, but once you learned the systems, they worked very well.

The course went from there on into gas mixing—mixing the gases and the charging of the bottles. Safety procedures were stressed throughout the four-week course. Next, we went into semi-closed mixed gas diving with pool diving and open sea diving. We made the final dive to 150 feet out in the Gulf Stream, which proved to be an

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interesting dive. We also made a nighttime limpet attack on the submarines stationed at Key West.

The school at Key West was very thorough in the training, in the set-up of the rigs, the diving of the rigs and in the maintenance of the rigs. So it was an excellent, intensive four-week program with a lot of physical training involved.

INTERVIEWER: Well, you certainly had a very interesting and fulfilling career, obviously.

MR. ODUM: For the past 11 years, I have been a consultant for Columbia Research Corporation (CRC) and a member of their Board of Directors. Presently, our primary effort is in support of the U. S. Navy and the Navy's Special Warfare Program. Under contract with a friendly foreign Navy, we recently delivered the SDVX, which is the next generation SDV with significant new approaches to design of both mechanical and electronic systems. I have enjoyed my work.

INTERVIEWER: And I've enjoyed talking with you.

MR. ODUM: I appreciate it, Lew. It has been my pleasure.

INTERVIEWER: We'd love to talk to you further if, in the future—if there are other programs you wanted to share.

MR. ODUM: There are a lot of programs I can think of that may be of interest, such as the Large Object Salvage System (LOSS); the EX 19 closed circuit mixed gas system; the MK 14 surface supported saturation diving system and many others.

Department of Naval Architecture and Ocean Engineering



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by
Lew Nuckols

For Naval Forces Under the Sea: The Rest of the Story

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UNDERSEA & HYPERBARIC MEDICAL SOCIETY

INTERVIEW OF WALLY JENKINS

By

LEW NUCKOLS

Panama City, Florida

June 26, 2003

PROCEEDINGS

INTERVIEWER: It's June 26, 2003. I'm with Wally Jenkins in Panama City, Florida, and I thank Wally for conducting this interview. I know a lot about your experiences. I've talked to you before about some of the things you've done, but I don't know anything about your background, about where you came from, how you actually got involved -- you could start out there.

MR. JENKINS: Well, I was born and raised in Tampa, and lived about a mile from Tampa Bay. And about 1948-49, I bought a face mask at Shell Filling Station, which used to sell them, and it's a "Superman" brand, a little blue thing with red letters which I really wish I still had, but I don't. And then we go explore the depths around Gandy Bridge and the seawalls, and things. And we messed around making snorkels out of garden hoses, and at first we tried to breathe with a garden hose, a 20-30' garden hose, and found out very quickly, you know, you can't do that. So we played around, didn't have fins, but we managed to get down to maybe 10 feet, in the little dark caverns and look for stone crabs and things. And then I went to Florida State University in Tallahassee in 1953, and I had my Superman mask still. And my roommate was Gary Salsman, who was a Navy veteran. He had four years in the Navy, and he had been to Silver Springs, and he was hooked on snorkeling. So he started messing around the sink holes and springs there in Tallahassee, the rivers and things, with his mask and snorkel, and one day I broke down and bought a \$4.95 face mask. I made 70 cents an hour at my job, so \$4.95 was a pretty decent investment. But I had the best face mask in the group, you know, and pretty soon a couple of guys bought masks. And in the summer of '54, Gary went back to Cape Cod. He lives

right by the canal -- Cape Cod Canal. And he bought a 70 cubic foot tank with a J valve, a two-hose regulator, and a set of fins. I think New England Divers Supply had a mail order business. There were no dive shops. I think the only dive shop in Florida was the Florida Frog Man in Marathon, certainly not in Tallahassee. So that summer of '54 Gary taught himself how to dive. They used to give out little books with the regulators, little white book, and it said, "How to Scuba Dive", and it told you all about holding your breath, and clearing your ears, and pressure, and stuff like that. And I still have a copy of that, matter of fact. It's pretty interesting.

INTERVIEWER: There were no courses at that time?

MR. JENKINS: There was no PADI or NAUI. All that came later in '54. Maybe YMCA started teaching. I'm not real sure. But I don't think quite yet. So he came back to Florida State in the fall of '54, and taught me how to dive. And we had one tank between the two of us. My first dive was the 18th of September, 1954. And the reason I remember it was because Gary kept a log. He'd logged about 45 dives up in Cape Cod. And he said, "Oh, I dove Hathaway's Pond." In Massachusetts they call a 10-mile across lake a pond. There's Hathaway's Pond, John's Pond, all these ponds -- Pocasset, Hyannis. I thought it was pretty neat to keep track of your dives, so I started keeping a log from my first dive and that's why I know it was September the 18th, '54. And then, he and I would go and we'd take turns. And I probably made 30-40 dives before I saw another diver underwater. Because one of us would be snorkeling around the top of the other one, and we'd be maybe 20 feet deep in the springs and rivers.

I made a major investment in the fall of '54. I bought a tank and a regulator, and we started diving in the caves. We kind of worried about making underwater lights, and we fooled around with getting batteries, and wrapping them up in inner tubes and sealing them, and we'd go into Natural Bridge sink, and Natural Bridge cave, and River Sink, and all those Blue holes, and all that stuff. And we'd go back in these caves with homemade lights, and they were very feeble. I mean, usually only good for one dive. And, you know, I was making 70 cents an hour down at the FSU food services, plus meal tickets, so my cash was real low -- very, very low. The dive gear was a major investment.

INTERVIEWER: Where would you get your bottles filled?

MR. JENKINS: Well, that's the next problem. The only air source was over here in Panama City, Johnny Reaver, Reaver's Air Service, and the airport was over there where Panama Christian is now, Balboa. That's where the airport used to be. And he had catalogs with these green fire bottles, and he could make you up a dive tank with that. And he also had an air compressor. So we'd come over here and fill our tanks, and then we'd go out and dive the jetties. We used to call it the "lead mine", before the State Park was there. There was one ranger out there, and a dirt road. There was no park. And there was one ranger, because they were going to make it a park. And all the fishermen's sinkers -- there had never been any divers there, obviously, and the bottom was littered with sinkers. And we had a market in Tallahassee to buy the lead for 25 cents a pound, which was big bucks. And then we'd dive the jetties, and go back to Johnny Reaver's and fill the tanks, and go to Tallahassee and dive a sink hole or a river, and then come back over and do it again.

Gary had a little bit of money. Of course, he was an old man. Gary was -- see, I was 19. Gary was 23, so he was really old and mature, and everything. So he had Johnny Reaver put together an air compressor for him, a '64 Ford engine with an Ingersoll Rand compressor, and we could fill a single 70 in, like, five minutes. So we had our own source of air on a trailer. We'd go to Natural Bridge and we'd pump that thing up, and you know, one guy's job was to pour water over the tank because it got so hot. And the other guy's job was to pour water over the compressor, because it got hot, too. And he kept a log, because Gary was very meticulous. And I think it cost, like, 8 or 9 cents to fill the tanks. We probably filled several thousand air fills.

We were exploring the caves, and we found out during the exploration that a regular old Sears and Roebuck flashlight, five cell, if you take out the little cardboard ring that goes around the lens, and take the glass out, and have a direct contact, they worked under water, in fresh water. They worked fine. And the batteries might last an hour. So pretty soon you'd go buy a flashlight, and it works fine in fresh water -- not in salt water, probably, but we didn't dive salt water, not yet. So we started exploring the caves, and we went back, maybe 200/300 feet. And at Natural Bridge, we went down a sink hole there by the road, and worked our way back, and pretty soon we came up in a little spring back in the woods. It was about a 300 foot transient. I think we got 60 feet deep, or something like that. So we made, maybe, 200/300 dives that first year. We really wanted to get into Wakulla Springs, because, you know, the story of Wakulla says they found extinct animal bones out there in the basin. Nobody had ever been into the cave; they'd been down to the bottom of the bowl with an air hose, but nobody had ever been down to the cave. We

thought, "Man, that place is going to be loaded." because we were already finding all kinds of artifacts in these springs. We were finding old moonshine jugs, and tools, and miniballs, and all kinds of junk -- bottles, really kind of neat bottles, because no one had ever dove the caves. We were the first ones. The caves were all cluttered up with limbs and things and we had to clean them out to get into them. It was kind of high adventure. One day a guy named Andy Harrold, with Florida Development Commission, was making a film called "Exploring Florida's Caves". This was in November of '55. By now we had a good solid year of cave diving experience. Andy had two guys, one of whom was a disc jockey, named Rick Hollister, another guy named Bob Dowse, neither one of whom were really into cave diving very much. And they were making this film at Wakulla Springs. They got their air down in Homestead, Florida at Lew Maxwell's *World's Florida Frogmen*. They had those 220 cubic foot bottles, but of course they ran out of air very quickly. Well, they found out about Gary Saltsman's compressor, and they thought they would just go ahead and get that college kid and buy air from him. Well, the first thing you know, Gary's diving with them, and giving them air. They thought it was wonderful. So we messed around with that movie for a while.

Then, I bought a depth gauge and the catalog number was Y-103, and that's where the "J" valve came from -- it was a catalog letter. That's all that means; in the U.S. Diver's Catalog there's the letter "J". It's a 300 pound deal, and the letter K is a different kind of deal. Anyway, Y-103 was a German depth gauge, and it went to 300 feet. At that time, the depth gauge was these little tubes -- air tubes, you know, you had a little rubber plug at

the end. You had to blow out all the air pockets, and then as you went down the little bubble would go in there. So they weren't probably too accurate.

The boat guides were telling everybody that off the ledge at Wakulla it was 185 feet deep. I went to test that gauge, and it went to 300. So we were making our film up in the shallows. One day Gary and I got our tanks on, and we swam down to the ledge. And the gauge, which I paid a lot of money for, said about 100 feet. And I thought, "Uh, the gauge doesn't work." But Gary's tube gauge also said about 100 feet. So, we messed around and started going down to the cave. We got down about a 180 feet, I guess it was, and found a mastodon bone laying there. We said, "Hoo, man!"

The movie pretty well died out, because it didn't have a plot in the first place. And then we started exploring the cave, so we all bought double tanks -- double 70's with J valves and the old DA regulator. If you're looking at an old DA regulator, the really originals, the hose is just one piece of rubber. You can take it off the regulator and look right through it; there's no non-return valves. The mouthpiece is hooked to the hose. This is one deal.

The first thing we would do was do some training going that deep, on how to clear a regulator. You roll over on your left and you flood your regulator. You roll over on your left side and grab your right hose and you blow, and that blows all the water out of the left side. And then you can breathe. Buddy-breathing's a chore -- a real chore. We trained. We practiced that, and that kind of thing. And we started exploring Wakulla Cave, and everywhere we looked we found bones, tusks, and teeth from those mammoth mastodons. The giant Sloth was a very impressive animal. It could weigh 3 1/2 tons, and be 15/20 feet

high. We found bone awls, projectile points from early man. But no modern stuff -- no Coke bottles, no bottle caps; all old stuff. Of course, the mastodons have been extinct about 10,000 years. And the awls come from about 8,000 years ago, according to the people that know that kind of stuff. We found some flint arrow projectile points, and things like that. We explored Wakulla Cave from November of '55 until we got out of college in June of '57, and we logged every dive.

Every dive in the cave was 200 feet. We got to 260 feet, and about 1,200 feet in, and I kept track of every dive, and we made close to 1,000 man dives. You know, like, I made 100, Gary made, like, 85, Andy Harold made 50, and right on down, you know. Henry Doll made so many. And we had Cole Phinizy from Sports Illustrated. He made three, or so, and he had a little story in Sports Illustrated years ago. Nobody got hurt, which is a pretty good record. I think the main reason nobody got hurt was that we were very careful. We used the old Navy decompression tables. And I don't remember most of the stops, but 15 minutes at 200 feet then 32 minutes of 10 foot decompression. Our tables were much more conservative than today.

INTERVIEWER: Or you were missing the 20 foot stop.

MR. JENKINS: Well, we were, but we never cut our decompression short. And we probably decompressed at 15 feet, because we had a couple of spots we liked. I didn't know exactly whether it was a tree that laid into the water -- a honeybee tree -- and then off the ledge at the tower. So we probably was lucky, too. We weren't really at 10 feet. We were at about 15. But we didn't have wet suits at first. Of course, nobody had wet suits. Wet suits were being developed in California by -- I think Dr. Hugh Bradner gets the credit

for it. The neoprene was being made for insulation, I believe for door seals and automobile running boards and stuff like that. And these California guys felt the properties might be good for thermal protection, and they got some sheets and they made wet suits. Some of the earliest suit manufacturers were EDCO, Engineering Development Corporation, was where I got my first suit. They were one eighth inch thick and came in small, medium, and large. So, it fit like a pair of sweat pants, but, you know, compared to not having anything, they were a godsend. But before we got wet suits, we'd decompress, and some of the decompression was for 250 feet. We'd decompress 17 minutes at 20 feet and 37 minutes at 10 feet, after making a 15 minute dive. So you'd be in the water over an hour.

INTERVIEWER: And were you staging in bottles?

MR. JENKINS: No, never did. Never had to. They weren't heavy work dives. Diving Wakulla is, like diving in a deep bathtub. There's no work involved. It's just going down, no current to speak of, no thermo climb, no surf and we used weights to get down so we didn't burn up any energy getting down. We had a piece of steel rail we'd grab, and jump off the ledge and, as we angled in let them go. Then, when we weren't making a cave dive we'd bring them back up with an air bag. So we didn't burn any energy at all. But, when we were decompressing without a wet suit, we'd go and hug the honey tree-- the log, which they said was a honeybee log, and you'd get a layer of water next to your body, which would be a little bit warmer. And you wouldn't move; there was no current. We got in places with no current. And if anybody swam by you, even 5 or 10 feet away, that motion would give you a chill. You know, we had our own isolated spots to decompress. And when we got wet suits; it was much better.

So we explored the Wakulla Springs and I went back and dove there off and on for years until, oh gosh, until 1985. I worked on that movie, "Airport '77", which was made in '76, and I was their technical advisor. They didn't want me -- Universal Studios didn't want me or need me, but the Spring manager wanted me there to keep them from destroying the place, you know, just to protect the spring. So, I just kind of liked to stay out of the way. They paid me a fair amount of money for doing it and I got the contract to salvage the plane and all the junk that went with it, which was a pretty good deal. So we dove Wakulla off and on for another 20 years.

Then after I got through with Wakulla, I went in the Navy, attended Officer Candidate School and got my commission in '58, and was stationed -- unbelievable, was stationed in La Jolla, California, Miramar Naval Air Station. And when I wasn't on a carrier, which was about half the time, we spent about two years on a carrier and about two years on the beach. We dove the kelp beds and we did a lot of diving in La Jolla canyon, in '58, '59, and '60. From '58 to '60 was a big transition in diving. Up until about 1960, you always drew a crowd, you know, and they would stare at you, and ask you all these silly questions and things...and that really Barthassed me. By 1960 scuba diving got to be popular, and it no longer drew a crowd, which was really a nice break. So, we dove in La Jolla canyon, and off the beach and tennis club by Scripps Institution of Oceanography, and we dove all the kelp beds. I went overseas, and of course dove Hawaii and Japan, and the Philippines. Southern Japan is surprising -- it's got really nice diving off Kyushu. There are greatt warm Japanese currents coming up there. It's really nice.

Then I got out of the Navy, and went back to school to get a little bit more education in oceanography. Puget Sound is a cold, cold place. Different. Very, very pretty. And had two job offers: I got my qualifications as oceanographer, and one was in Panama City, Florida. That was in 1964.

I met my first wife, Sandy, and married her. She's from Sedro-Woolley, which is 80 miles north of Seattle. After I left active duty with the Navy I Moved to Panama City, and went to work for a guy named Tom Odum, who has the Swimmer Diver Branch. And got a job as a GS-9, which paid \$7,020 a year, which was pretty good money. It's hard to believe, you know. That's hardly beer money any more. But that was really good money back then.

I got in the Swimmer Diver Branch and we were very active. Tom Odum and Bill Culpepper -- and they usually don't get much credit for this -- those are the guys that designed and built the first SeaLab. I'm giving credit out, because I wasn't involved. I know Tom was really involved, and Bill Culpepper was really involved. They got some old mine warfare floats, did some work on them, and made them into a habitat -- SeaLab I.

When I got there they were working on SeaLab I, and they trained off-shore. And of course, there was Bob Barth and three other guys from there. That's when I first got to know Barth. It was Barth, and Tiger Manning, and Lieutenant Johnson, and another guy, Lester Andy Anderson.

INTERVIEWER: Sheets?

MR. JENKINS: No, Sheets wasn't on SeaLab I ----. There was a Tiger Manning, Andy Anderson, Bob Barth, and Lieutenant Johnson. Okay, that's the four guys. And, of

course, they made their dive off Bermuda, clear, warm water, because Dr. Bond wanted less hassle to get nice and warm and nice and clear. And their dive was cut a little short because of a storm warning.

INTERVIEWER: And wasn't Scott Carpenter supposed to be on that?

MR. JENKINS: Yes. Yes. Carpenter -- I wasn't really involved, but I know the story. Carpenter was supposed to be involved in SeaLab I, but he had a scooter accident on Bermuda and got delayed on SeaLab I.

And then right after SeaLab I was diving for Odum, and we were working on things like the buoyancy compensated EOD filament wound fiberglass scuba, non-magnetic, and a new face mask, a PQS sonar, and boats for Vietnam that Bill Quigley headed up. We had some guys like Roger Johnson and Don Patterson, who just retired after 40-something years, who probably was as good with PQS Sonar as anybody ever in the Navy -- probably more experienced than anybody in the Navy. Anyway, we did all this diving stuff, and we were the Swimmer Diver Branch. That's all we did.

When they started making plans for SeaLab II. Well, I got on SeaLab II just, you know, the old typical "right place at the right time". I was new enough at the Lab that I wasn't controversial. I didn't have any enemies yet, really, and I hadn't made anybody mad. And I had a lot of diving experience. I had something like 1,300 dives when I went to work there. A lot of dives -- a lot of deep dives. But I hadn't made anybody mad yet, so Tom Odum was the first choice -- he was the branch head. We were going to have four civilians. Barry Cannon was going to be the second choice. And the first back-up was Bill Quigley, and the second back-up was myself. Then Bill Tolbert and George Dowling

went from the Oceanography Department. So we were going to have four civilians: two from Odum's branch and two from Oceanography Department. Well, Dr. Jasper, who was the Technical Director, said that Odum was not going to go make that stupid dive. He was too important, being that he was branch head. So poor old Tom got shot out of the saddle. And Bill Quigley, I'm not real sure why he decided not go. So pretty soon I was going. Barry Cannon and myself, and then Bill Tolbert and George Dowling. So we started training for SeaLab II in March of '65 -- did a lot of training here with the old Mark VI. In the meantime, I was going to scuba school here. And you know how the Navy is. I mean I made, like, 1,300 or 1,400 dives in all that deep stuff, but you still got to go to Navy Scuba School and learn how to clear your ears, which is fine. You know, it was fun for three weeks.

What I wasn't ready for was the PT. I wasn't ready for that, you know, because I hate running. Never have liked that. But it was a good school. I got a lot out of it. Then I went down to a mixed gas school in Key West with Don Patterson, and that's where I met Jimmy Stewart from Scripps, and Art Fleshing, from Scripps. We had a good time down in Key West using the Mark VI. In SeaLab II we used the Mark VI. We trained here, went up to DeSoto Canyon to make some deep dives, and then we trained off Stage 1 and Stage 2 before they were blown. We made just bunches of dives. Then, of course, Carpenter was back in the swing.

We left here July of '65, and I got to go with the trunks. I got to fly over in an old C-118 Box Car, and that was very fun. The rest of the guys were already gone, and for some reason I went later with all the trunks of stuff.

SeaLab II was in July/August of '65 and had three teams. There were 10 guys on each team, two of whom did two dives. Carpenter stayed down for Team One and Two as Team leader. And Sheets was Team Leader of Team Three. Dr. Sonneberg was the doctor of Team One and doctor of Team Three. So he made actually two dives. So we had 28 divers, and 10 of whom were civilians. We had civilians from Scripps: Art Fleshing, whom I have told you about; Ricky Gregg, who later, I think that next year, won the world surfing championship. Ricky went on to get his doctorate in oceanography and did a lot of deep diving for Red Coral with submersibles off Hawaii. We had Earl Murray, who dove the Andrea Dorea, lucky son of a gun; then there was Bill Bunton from Naval Electronics Lab; and George Dowling and Bill Tolbert; Barry Cannon and myself from the old Mine Defense Laboratory; and there was Morgan Wells -- 10 civilians -- each team had a few civilians.

Wilbur Eaton and Carpenter made the entry dive on SeaLab II. That dive it was 205 feet deep, give or take. They went down in a wet bell with a little air pocket on the top, you know, real crude. They went down about 150 feet, and then swam over to the habitat. It was dark and dirty and a miserable, miserable situation -- mud, scorpion fish that don't move out of your way, visibility about 15 feet, maybe 20, dark green, the water was cold. And, of course, our suits were permeated with helium, and we were breathing helium. I'm not sure what the doctors tell you about that, but it wasn't like being permeated with air and breathing air. So our biggest problem was cold -- pure, unadulterated cold.

We had EOD guys; we had hard hat guys. I wasn't on Cannon's team. He was on the First Team. We had Tuckfield, and Barth was on my team. Barth did most of the cooking. We did a lot of oceanography experiments, a lot of strength experiments. We did an excursion dive. We had a pneumo-fathometer we carried with us. And then Carpenter and I swam from the habitat to the ledge. The habitat was, like, 205 feet. We went down the ledge, which was dark and dreary, and you shine your light on a guy's shoulder, not in his face, of course. There were no sharks swimming around it was just dark. There were some Gregonian Corals like that, some little solitary corals. Anyway, it goes down like a straight down wall. And we went down about 250 feet, so about a 50 foot excursion, something like that. And then the last team, Sheets and Bill Bunton, went down to 300 feet, which is the old excursion type thing. That's about the nicest dive we had, because it seemed to be a little clearer than our habitat. And I think we did 15 days, or something like that. And we had 10 guys.

There was only one guy out of the 10 -- Bill Tolbert -- who was able to dive every day because we got earaches. That seemed to be one of our biggest problems -- ear infections. And in 15 days I got, like, 23 hours outside the habitat, which was the most. And I didn't do it to get numbers, but it just happened to be.

Tolbert and Dowling were the two oceanographers, and Tolbert had a bad leg, so it was really taxing for him to make these kind of dives. So I'd dive with one in the morning and the other in the afternoon. So I actually made two dives a day, and lost a lot of weight. But some of the guys didn't get out more than an hour or so, because it was miserable. We

didn't realize it was going to be that miserable -- I mean, it wasn't like the Bahamas -- it wasn't fun.

It was exciting and it was high adventure, but it was rough diving because the scorpion fish didn't move. Carpenter came up the ladder and put his hand on one. Very painful. They were all over the bottom. The bottom was kind of a muddy sand and you couldn't see very far, and the only way out, of course, was up that hatch, like diving in a cave. So, you know, if you don't make that, you're toast.

INTERVIEWER: Well, your cave diving experience would have helped --

MR. JENKINS: Oh, yes. Well, cave diving, I learned to have a line, and I didn't leave that habitat on SeaLab without a line. I mean, that would be a toughie. The porpoise is going to come and get you. That's just show biz. You know, that dolphin, he's not going to come and get you. He did his own thing. We had him down one day, and you know the story that he's going to deliver SeaLab mail, and all that, which is fine. But, we didn't depend on him for anything.

It was 15 days, and I guess it was very successful. I think what SeaLab taught me was that it wasn't worth the logistics. It's so logistically intense that you just spend all your time existing, you know. That's why now they have chambers on the ship and the guys go down in capsules.

INTERVIEWER: Now, was there a loss? It seems to me I remember there was a lost diver incident - - one in SeaLab II?

MR. JENKINS: Bill Tolbert and I were out one day, and we were wearing the electric suits. And electric suit had a 38 pound battery pack and we used that for a weight

belt. It was the first day of diving, or maybe the second, and the Mark VI had a purge valve hung down there where his battery pack was. The battery pack slipped off and caught the purge valve and inflated his bags. He started going up. He hooked his knees to hold the battery pack. And if he would have gone up, he would have been toast, of course, because he was already saturated. I managed to grab him and get upside down and squeeze his bags. And then in a vertical, foot up position, to swim over completely vertical to the habitat. We grabbed the habitat. Thank God we weren't very far from the habitat. Kenny Conda was out there and he helped us get inside. That was one close call.

One day a couple of the guys got turned around. One of them said "this way", and the other said "that way." The one that said "that way" was right, and that's the way they went. And that could have been bad. I think we were very fortunate we didn't lose somebody, because it was hairy diving, but everybody was very careful. So SeaLab, in my impression, was very successful.

INTERVIEWER: What was the typical routine, a daily routine?

MR. JENKINS: Okay. You got up about 6:30 AM or so, and you got something to eat. The environment inside was very pleasant. There was no humidity. It was warm. We would eat a lot of peanut butter and then get ready for the first dive.

Carpenter was a very good team leader. He wasn't a diver, you know. He got trained as an astronaut, and diving, he probably made, what, about 20 dives, or something like that. So you've got to give the man a lot of credit for going down there in the SeaLab habitat and making that dive with probably less than 100 dives under his belt. Good team leader, very understanding. If he had an idea and it was dumb, he'd say, "Commander,

that's not really the best way to do it." He'd say, "Oh, okay". So I told him that we needed to get two oceanography guys down one day, one with Tolbert and one with Dowling.

So after eating something, we would make a dive about eight, and stay out as long as the temperature would let us -- usually in about 45 minutes we would be just wasted from the cold. We would do experiments, a whole series of experiments. We did visibility tests, and we did strength tests, and we set up stations for checking water temperature, and guys did foam-in-place salvage tests, and bottom sampling, and things like that.

We did have hot water showers, which was really great. We would shower off then do our housekeeping or whatever, or just get our body heat back. Then we would make another dive in the afternoon. By six, or so, we were absolutely done. We were just absolutely wiped out.

We ate a lot of candy bars. We never sat down -- they had a table there, a dining room table, but we never sat down to a meal because it was just not practical. Because guys were out in the water diving, there were guys cooking, there were guys nibbling, you know. But we got a lot of dives in. I think we got all the tests done, all the experiments done that they wanted us to do. But there was a lot of diving just to get the transfer pots, going out there and getting the pot, bringing it in, and so we did a lot of diving just for logistics -- just maintaining our status. Then we all went home, and that was really exciting.

Then we got involved on SeaLab III, and Jack Tomsy was the team leader. Bond was still there -- I'm not sure who was what. But anyway, Tomsy was involved, and Walter Mazzone was the medical type, and Bond was a medical type.

Tomsy wanted us all to have umbilical training for SeaLab III so we all went to the Navy's Deep Sea Diving School in Washington, D.C. for 10 weeks to become Deep Sea HEO-2 Diving Officers. We did a lot of Mark V diving in the river and the mud. We learned how to burn and weld, do all kinds of stuff with the Mark V, which is another story completely.

The Deep Sea School in Washington was by the old Navy Yard, the old Marine area where they kept the President's yacht. Well, the Deep Sea School had the world's worst PT program. They had a different chief every morning out there on the grinder. One chief would be a "sit-up" freak, and we'd do sit-ups all morning. Another chief would be a "runner". Another chief, like, "8-count body builders". So your body was always wasted. You were always a wreck.

Anyway, we got through Deep Sea School, and then we started training for SeaLab III. There was all kind of gear for SeaLab III. We took all kinds of weird apparatuses and went to Point Loma on the submarine base. We used the old Kirby Morgan and a Mark VIII, which was a great big kluge, and these great big umbilicals, as big as your wrists, and we'd haul those things out, like, 75 or 100 feet and then we couldn't move. I mean, it was really big. They have a little one called the Mark IX. It had a little umbilical about like your thumb. And that was a neat little rig. We trained, and we trained, and we trained, and went to San Francisco and trained there in the docks. We actually had the habitat in a dry

dock on the bottom in about 10 or 15 feet of water. We swam out and did tricks and things like that. For many it was going to our home base for the dive. SeaLab III was, like, 600 feet or 610 feet or something like that -- pretty deep. We did a lot of PTC training with the old personnel transfer capsule.

Before that we had to do training in Washington, D.C. in chambers -- all kinds of physiological tests. And the old chambers that were not made for saturation dives, and we would go in the chamber, and we did a 100 foot, a 200 foot, a 400 foot, and a 600 foot dive. So you're in the chamber, like, a week. The first day or so the water got polluted in the wet tank, because the filter system didn't work. So we did a lot of things, like reading a lot of books and a lot of psychological and physiological tests. We did all those work-up dives, and Barry Cannon was always my partner on those dives. And we probably did four or five of them. Then we went to the west coast, got on San Clemente and did a lot of PTC training

They were having all kind of problems with the habitat. In SeaLab II the support gas lines and everything went down under, up into the habitat, so the air pressure kept it from leaking. There was a great big round flange that came through with no stuffing at all, because the air pressure kept it out. Well, in SeaLab III a lot of those things were in a bulkhead or overhead. So the air pressure was going to try and get out. Well, we were at San Francisco Bay Shipyard, we were putting this together -- you know, modifying the old SeaLab II for SeaLab III. They had a great big sign as you drove in that said, "The Midway -- our biggest challenge" -- a big flattop getting converted. Well, we all figured all the real priority went to Midway.

SeaLab III was kind of sloppily done. And they had put it on the bottom and it was leaking. Gas started coming out those ports. Barry Cannon, Bob Barth, John Reaves, and Blackburn, were the four guys on the entry team. They put them down under pressure pretty fast, because they had to get into the habitat and stop that leak. We learned on SeaLab II you don't go down fast because you get compression pains, and you ache for about half the day. But anyway, they put those guys down fast, and I was a safety diver that night. I did a 60 foot check of the PTC, and they were all in there. I looked through the port, and I could see them all in there, you know, getting ready to go down to the bottom.

INTERVIEWER: But you were in the water?

MR. JENKINS: I was in the water, yes. It was dusk so I went home, went back to the barracks, and they went down and tried to get in the habitat and couldn't. The hot water suits didn't work at all. They had a fan in there to circulate the gas in the PTC and they had a helium atmosphere. So, thermally, they were just absolutely wasted before they got in the water. Anyway, one thing led to another, and they had to come back up, got new rigs, and went back down, and Barry got killed. I think he got killed because he didn't have any absorbent in his canister. But anyway, he was killed and they say that's where the program was scrubbed.

Really, I don't think the habitat would have made it, because they never did get inside the habitat to try and patch those leaks. But what they did do, they had great big tanks on it that you open up and let the water come in, like a submarine, to make it stable on the bottom. So now the habitat was sitting on the bottom and was heavy. So this great big

crane -- I think they got it from Germany or someplace -- the thing was huge, and they barely got that habitat off the bottom in the next day or two. Bill Bunton went down for a check at about 30 feet and there was Barry Cannon's mask laying on the step platform. It came all the way up from the bottom where he lost his mask. Bunton gave me the mask and I kept it for years. So, SeaLab III was scrubbed. And that was the end of that.

Who do you blame? It was beyond our capability. 620 feet now is a piece of cake, but not back then. The hot water suits didn't work -- a lot of things didn't work. Maybe we should have gone to 400 feet first. But, you know, hindsight's always 20/20, and it was very disappointing. I think maybe the program just got away from them, with all the press, and the deadlines, and the funding.

I don't want to cast any blame on anybody, because the bottom line is Barry should have checked his canister, but, you know, I'm sure he was too fatigued and tired, cold, and didn't even think about it. That's part of the policy is check your canister. So after SeaLab wrapped up, I went back --

INTERVIEWER: Can I ask you a question?

MR. JENKINS: Sure.

INTERVIEWER: I've heard that a number of people have talked about even sabotage, potentially sabotage, the fact that there was a canister missing, and the person who was responsible for that was a very responsible person.

MR. JENKINS: Yes, the guy responsible for that, unfortunately, unfortunately to this day, feels responsible for Barry's death. And we all talked to him like a Dutch uncle, "You are not responsible for his death". Basically Barry is responsible for it -- he didn't

check his gear. And it's just an accident. I mean, accidents happen. But he still takes blame for it. It's a darn shame. I don't think sabotage. I think we were in a big rush, we were losing gas. It was probably either go now, or the whole thing is going to be aborted, and, you know, it's probably too much pressure on the leaders to make the dive, and kind of like NASA sending that space ship up in that cold weather. You know, it blew up. And now, looking back, you really shouldn't have done it. Well, you know, we were under all kind of pressure. You can't even imagine. All those admirals back in Washington asking why you can't do it, and guys on the scene, and it's hard to explain that you got a leak, you got hot water systems not working right, you've got a bunch of tired divers, all kind of things. But I don't think it was any sabotage. I think it was just a bad situation.

I think maybe 620, those umbilicals they had us programmed to take out, I think that was a little ambitious. Water was gin clear. Some of the guys went down in submersibles, and -- well, Bob Barth, I talked to him about it. He said he made the entry dive, of course, and he said it was like being in the middle of a great big baseball stadium - - you could see forever, using the lights, and everything. So it would have been a fantastic dive. No mud, hard sand bottom, none of that silt which we had on SeaLab II. So anyway, that was the end of the SeaLab program.

I kept going, working with the electrically heated suits and other kind of suits. Then in '69 we got the variable volume dry suits -- the UniSuit, which I think we got the first ones in the country. We started experimenting with them, and the variable volume dry suit's a godsend. Oh, my gosh, you know.

Then I got a call from Chester Bright in the Naval Oceanographic Lab in Washington, D.C. in Suitland. “You’re going to go to the Arctic.” And in 1970 he wanted to borrow my dry suits. I said, “Well, you know, you have to be really an expert to use these and you’ve really got to know what you’re doing, Chester. Why don’t you write my technical director and tell him you’ve just got to have me go along with you.” So he did, and we went to Point Barrow in November of 1970. We had a non-compressible wet suit, which Roger Johnson and I tested up in Lake Michigan in 44 degree water, which was another, really a fun trip. Beautiful place.

In the Arctic we had the SDV Seal Super Wet Suit with all those layers and layers of rubber. I had the variable volume dry suit. So we went and knocked a hole in the ice off Point Barrow at the Naval Arctic Research Lab. Ice is about a foot thick, and the water is about 20 feet deep. The water is 29 degrees. And we started diving. It was like cave diving -- you know, you have the line, and you dive under the ice, and you have lights, because usually it’s pretty dark. You swim all around, and we saw all those jelly fish, and the fish, and the trash -- you know, bread wrappers, and things. We dove at Point Barrow for a couple of days, four or five days, and then we caught a plane out of the Naval Arctic Research Lab.

The plane provides a shuttle service from Elmendorf to Point Barrow, to Naval Arctic Research Lab, up to Fletcher’s Ice Island, to T-3, and to the Air Force radar target number 3. It was is they call Tabular Iceberg. It’s a glacier that had broke off from Ward Hunt Island in the Arctic years before -- it’s about 7 miles by 4 miles, about 200 feet thick.

And it was drifting around the Arctic Ocean, and the Air Force picked it up on radar, and the U.S. put a experimental scientific station on it, right on the edge.

So I was sitting on the edge of a 200 foot thick glacier, but the ice next to me was not that thick. You know, it was like scum in a bathtub. The ice actually was 16 feet thick where we dove, but that's because it had built up over time next to the floating iceberg. The whole thing is drifting around in the Arctic Ocean about a mile a day. We were about 200 miles from the North Pole when we were there. It was in December so it was dark. We had this hydro-hut that the University of Washington has for oceanographic purposes out on the ice itself. The camp was on the iceberg and the only way you could tell the difference when you walked to the camp, there was a little ridge about maybe two inches high where they interface there. Other than that, you couldn't tell if you were on the iceberg or on the ice. They had two great big hot air blowers, to keep things from re-freezing. Then they did the oceanographic net drop, and things like that.

If the earth is a soft basketball and you put your thumb at the North Pole, and push in it will bulge out at the South Pole -- that's kind of how it is. You know, the North Pole is about a mile deep, and the South Pole is about a mile high, however it is. Anyway, the water's about a mile deep. So we went down a ladder with a line tied to us, and the other end tied very securely inside the hut. And then swam out, dropped through a hole, and swam over to the iceberg, we thought 50 feet away.

We did all kinds of things, looked for marine life, did tests, and mainly to see how our suits worked. The water was 29 degrees, the air outside was 40 below zero because it was December, which is no colder than Minnesota. That's not nearly the coldest place on

earth, not by a long shot. I mean, Fairbanks gets to 70 below, I understand. And Siberia, who knows what. But we got out over an hour a day, each of us got an hour a day, and for, like, two weeks. We very quickly found out that the variable volume dry suits were the way to go. Your face would get numb, your lips would get numb, but your body was okay. Your hands would get cold but you could go up under the ice and kind of wiggle your fingers and the hot air would go up in there. We got an hour a day apiece for about two weeks, I guess it was. Inside the hut, where there was no wind, of course, and it was about 40 degrees above zero. So it was nice enough -- it wasn't unpleasant at all. At that was in '70.

I went back in '72 with Dr. Joe McInnis from Canada on a project called "Sub-Igloo". And he put together this 10 foot acrylic sphere made out of two hemispheres, and you had to construct it underwater with no tools. That was a trick, you know. So I went up there to Resolute Bay NWT, there in the Canadian Arctic, right off the Northwest Passage. The ice there was maybe 4 feet thick and we had to dig a hole 10 foot square, 4 feet thick, to get that thing in the water. That took three days. I went back in '74 and did it again.

INTERVIEWER: Were these like saturation dives?

MR. JENKINS: No, these were very shallow. We'd go down, like, maybe 25 or 35 feet, and the water was real clear -- the clearest water in the world. Oceanographers will tell you that -- it's Polar water. It goes dead. And then when the plankton comes it can be really filthy. But when there's no plankton, there's no surf, there's no wave action, and there's no sunlight -- well, you get some sun, but then the plankton bloom might come

along. But before that it's just crystal clear. But we had the SPID, the old Ed Link Submerged Portable Inflatable Dwelling, a big canvas bag -- they were going to put that on the bottom in 30 feet of water. Phil Newton, who was the atmosphere suit guy, and another fellow -- spent 24 hours in that thing. It had to be miserable. They were in their variable volume suits, and they'd swim out -- they were only, like, 10 feet deep, because they were just under the ice. And they'd swim out and they'd do their excursions, and in 24 hours they'd probably spent, oh gosh, 8 or 9 hours outside -- pretty phenomenal. But Bill English, from Halifax, was probably as experienced in cold water diving as anybody that has ever been, I mean, you know, because he'd sometimes wade through the slush going out to his projects, you know. So he really knew what he was doing.

Then we went out on the ice in the northwest, about 10 miles from camp, to do some deep diving with mixed gas, in about 400 feet of water -- only Canadians did that. I was an American visitor, an American observer. I believe it was just the Canadian military who made that rule. But none of us got to do it. But what they did, they had a stage, and they had a flange, like maybe six holes and three bolts, and we were supposed to go down to 400-450 feet, and take them out and move them one hole over. And the guys would hold onto that thing, and they said they'd go down, be down for 15-20 minutes, and come up and never let go of that stage, much less try and move those darn bolts, because it was pitch black below you and no way you're going to take a chance of falling off that stage, Our hands were cold anyway.

McInnis and three of the guys went to the actual North Pole, and spent a week there, and took a bunch of shots and did a little diving, I guess. You can't tell if you're at

the North Pole or 200 miles from North Pole -- it all looks alike. We were up there for 60 days, and they made a film. I never did get to see a copy of it, matter of fact. We had a French-Canadian film crew, and an English-Canadian dive crew. There were two different components. They really weren't very compatible with each other, because they were having a lot of trouble then about French and English Canadians. I got along with all of them, because they equally dislike the Americans, or like the Americans, so that I was kind of in neutral territory.

That trip, the sun never set. We had daylight 24 hours a day. So the first two trips were black 24 hours a day, and the last trip was daylight 24 hours a day. I like the dark better, because you don't get eye burn. That bright sun is just hell on your eyes. That's why the Eskimos used to wear those little slit deals so they wouldn't get eye damage. The only thing that happened to me was I got frostbite. It was my fault. I was digging that big hole, 10 feet square and 6 feet deep, and you dig that with a chain saw. You saw the ice into blocks, and you get a big lever, and you pop them off, then put tongs on them, get truck and pull it out of the hole.

Further down in there, even though it's 20 degrees below zero and windy we'd be sweating at little bit. And we had these great big skidoo suits on -- you know, great big, heavy suits. So somebody wanted to talk to me, and I was in the hole. I climbed out and was talking to somebody. And somebody asked me a question behind me. I turned, and I was facing the wind and somebody said, "You got frostbite, right there. The next time I went out, that area would tingle. They said with frostbite, you're very susceptible to where you had frostbite before. Other than that, I didn't get in any trouble at all.

INTERVIEWER: Do you still have trouble with that?

MR. JENKINS: No. No, none at all. It was very minor, very quick. But, you know, 60 days was a long time. It's not a nice place to be. The diving is beautiful. It's crystal clear. The kelp, fish, and you've got icicles hanging down with super saline salt water gets trapped in the ice above and it gets more and more salty so it doesn't freeze. Then it breaks through. It's heavy. Instead of being 29 degrees, it might be 25 degrees. So all the water around it freezes, and it makes a crystalline icicle that hangs down. Some of them are, like, 8 or 9 feet high and they're very delicate type things. I finished up in the Arctic in '74, and went back to the lab and worked on suits and things.

Then I worked on the LOSS program (Large Object Salvage System) with Joe Brown and all these various programs. I woke up one day and my right shoulder hurt, so I went to see a doctor at the Navy base -- and he's some lieutenant. I don't remember if he looked up or not. I know he sure as heck didn't get up. He said, "Oh, you've got arthritis." I said, "Well, you know, doctor, my aunts, grandmothers, and all my family died from 94 years old down to 80 and only one person in my whole family, I had seven aunts, had arthritis. None of my brothers got it. Does that mean it kind of runs in the family?" He said, "Raagghh!" How dare you question him, you know.

So I went over and saw CAPT Bill Spaur -- Dr. Spaur. He went up and visited us in the Arctic, as a matter of fact, for a week. I got an X-ray, and he said, "You have aseptic bone necrosis". Bang -- like that. And so he knew right where it was, my right shoulder. So he got the old X-rays. We did what they call "long bone studies" for all the aquanauts up at Bethesda. They X-ray your whole body. They did it before SeaLab II and after

SeaLab II. They looked at the after SeaLab II films and there was the first sign that there was an injury there. Of course they did all those SAT dives in Washington after that. So, it disqualifies you, but you know, that's the way it goes for Navy diving.

Then it got worse and worse, and arthritis moved in. My range of motion got less and less till it got to the point that I couldn't reach up and turn on the car radio with my right hand. There's no surgery for it. It wasn't like hips or knees. There's no process -- well, there was a process, but my brother's a medical doctor and he checked on it, and he says they coat your bone with, like, a Teflon, and it might ripple in a couple of years. He said -- and the doctors here told me the same thing -- "Just stand it as long as you can."

Then I heard about Houston Sports Medicine Clinic in Columbus, Georgia, and they had a new procedure. I went up there two years ago this coming August. The doctor is very proficient, very proficient. Looked like a Philadelphia lawyer you know, pin-striped suit and his little entourage of nurses, PA's -- but very proficient. He said, "Got a big spur from arthritis that set in there. I can give you a choice: You can take pain killers the rest of your life, or I can give you a new shoulder." He said, "You get rid of all your pain, and get most of your range of motion back." And that's exactly what happened. Unbelievable.

INTERVIEWER: Do you have an artificial --?

MR. JENKINS: I've got a titanium hemisphere, bolted onto the top of what used to be my shoulder bone here, with a screw going down into the center of the bone, four little screws holding it, and a titanium cup that's rigged in. And I got through security at the airport and it didn't set off the machine, which is kind of weird. But no pain, and I can

raise my arm. I don't have complete range of motion, but he never told me I would have.

So it's just a godsend.

So anyway I still dive, sport-diving, all over here and there and of course my wife dives. But, you know, like everything else, I'm getting older, and I gave my wet suit away two years ago. I'm not going to make anymore cold water dives. You know, I just don't care to do that any more. I've got a skin, you know, a little body skin, and if it gets much colder than 75, I'm not going to do it. Maybe 70 degree at most, in one of these springs. But that would be it. None of that real cold stuff, because it gets cold out here and it gets 54 degrees around here in the wintertime. The last time I did that it was dirty, and I was rolling back and forth on the bottom, couldn't see 10 feet, and it was, like, 55/60 degrees, and I'm thinking, "Why am I here?" You know, "This isn't fun anymore." So --

INTERVIEWER: Now I know you wrote the ---- manual.

MR. JENKINS: "A Guide to Polar Diving", and another one, "Polar Operations Procedure", something like that, yes.

INTERVIEWER: I have students that are always pulling that --

MR. JENKINS: Are they, really?

INTERVIEWER: Yes.

MR. JENKINS: And my little figures.

INTERVIEWER: Yes. And they'll give presentations on diving in cold water.

MR. JENKINS: That's funny. That's funny. That was a fun project.

INTERVIEWER: Now, was that all a result of the experiences in the Arctic?

MR. JENKINS: Yes. Mr. Pauli from ONR, put together a proposal for writing a little operations procedure. So I did. The last two trips was mainly gathering material for that manual, and just doing as much different kind of diving as I possibly could. It was a fun thing.

My son's a SEAL and a matter of fact, they called him back on active duty last year to go to Iraq. He was talking to one the SEALs -- he's an officer now, four year's an officer -- and they were going to go up and dive in Greenland, or someplace and he was telling this SEAL CO that his dad had written this book. The guy didn't show a whole lot of interest. So, whatever. I'm not sure how much it's used. It's got some good little tips in there, but the variable volume dry suit -- I'm sure they've got them, they're better now. They're tricky, you know, if you get that air down in your feet, you could blow your fins right off, and you wind up under the ice and you can't move. We warned everybody. That was one of our jobs, to check the suits because we had all kinds of scientists from Canada coming up and diving for a week or two, or maybe just a couple of days. Most of them had never gone under the ice, and they had never used a variable volume dry suit. We would train them how we had ankle straps to keep the air from going in there and we told them to keep their feet down. We had one guy that lost it. He lost his fins, and he was up there just completely helpless under the ice. Other than that, it worked out pretty well.

INTERVIEWER: What about the electric suit? I've been reading Ellsberg's book, I guess. 1925, they had electric heated suits then.

MR. JENKINS: Yes. Well, they had the electrically heated suits from the bomber crews in World War II, the British did, and this suit that we used was a wire mesh inside of

a kind of spongy, rubber deal. Like I said, we had a 38 pound battery pack to heat it and it was certainly better than a wet suit, by far. But it wasn't comfortable, and the hands, of course, was a problem. It was very delicate, and it tore easily, and very expensive. I don't know if they even use electric suits any more. I think now they use hot water suits if they're covered, or dry suits -- variable volume dry suits, I think.

Probably most of the dives in the Arctic aren't saturation dives. If they are, they're going to be tethered, and they'll have hot water. The suits today are so much better than the old suits we had. You'll see the guys diving the Andrea Dorea, or any of that stuff, the wrecks off the Atlantic; they're all using dry suits, all of them.

INTERVIEWER: Well, you've been through a lot of experiences in the last several years. I wonder if you could consider the most significant achievement made in underwater field in the past 50 years. Is there any one thing that you think stands out?

MR. JENKINS: Well, the computers, of course, are just so far above anything we had just 10 years ago. Now they make it so much easier, and so much safer, and so much better than your old computers. The equipment -- the safety operating equipment like the buoyancy compensator is a big deal. I think the best thing they've come up with is the computer. Instead of carrying around repetitive dive tables and you get so much more diving in.

I'm not into mixed gas. A lot of my friends like to use nitrox (nitrogen/oxygen mixtures). And that's fine, but it's been around forever, so it's not any big achievement. t.

INTERVIEWER: Think back on your career in undersea, your experiences, if all barriers had been removed and you had been given absolute authority to do anything you wanted, what would you have changed?

MR. JENKINS: I don't think there is anything. The Navy, of course, by just requirement, they've got to go slow on everything, because, you know, they've got some slow people that are diving. They've got some fast people, or intelligent people, so they've got to go with the basics. They were very slow getting the buoyancy compensator; they were very slow getting the computers. But the civilian world, it seemed to move pretty well, you know.

I don't have any real gripes. Probably it's the kind of thing you need to walk instead of run, because there are a lot of things we did when we first started that we didn't even think about. Like, we used to make free dives and swim down to 90 feet or so, holding our breath. When we couldn't stand it anymore, we'd come up. And we didn't even know about partial pressure of O₂, you know. We didn't hear about going to sleep when we'd start to come up. We used to get down there and take our tanks off at 100 feet and give them to our buddy. Then we'd squat, and push off the bottom and blow like through a straw and, you know, that's perfectly safe. We didn't even know about the air sacs in your lungs constricting in your body. We didn't hear it. So I think it's best in sport-like diving to maybe not crawl as slowly as the Navy crawled, but to certainly take it easy and not jump at anything too quickly because there's a lot to be learned, and the body does funny things under great pressure.

INTERVIEWER: For the first half of the century, the Navy appeared to be the world's leader in diving. Since that time, many of the Navy divers have gone on to be leaders in commercial diving field. Currently, neither of these facts seem to be prevalent.

MR. JENKINS: Well, it was an interesting period. The Navy did all the research in diving because they needed it for, like, the Squalus, and hull tending. Sixty feet was their average dive to go down and repair things. The oil people weren't diving -- didn't have oil rigs offshore yet, you know, so they really needed to develop diving. I mean, your toughest divers around are your harbor people up in, like, New York City, places like that. They dive all year long in the winter time. Once the oil rigs got going, I guess it was a money thing -- It was a profit motive and that certainly makes things move faster than the Navy did.

So the Navy guys were well trained, and then they take their training and go into the oil industry. They take more risks, and you probably add that together and, like, a guy named Ken Wallace just really made a very success out of it. They had good training -- what do you want to call it -- they did things very systematically. Then they get a little more free reign and say, "Hey, look, we going to make this dive because, you know, there's a lot of bucks to be made, and we can take this training and just dive and put it together." Now, they're going about as deep as they can go as far as humans are concerned. I guess now it's mostly submersibles, and remote, like the salvage of the City of Central America last year was all remote -- 6,000 feet.

INTERVIEWER: But the Navy has very limited saturation capabilities.

MR. JENKINS: They don't need it. They can go hire it out, like, they can get -- well, like the Kursk, you know. Who'd they hire? The Swedes, the Norwegians, or somebody? I mean, they had a SAT system. When they hauled the USS Cole back to this country from Yemen, they rented a ship. They don't have those great big ships around to haul. They rent them. I mean, same way with mobilizing the civilian merchant marine fleet in time of war. We don't need a SAT system.

What's the Navy going to do? You know, all these little old ladies in Kansas with boys sunk 100 feet down off Miami in a submarine. What's the Navy going to do, make all the admirals look bad? They can't get them out of there. But the only time you can get to those subs is when they're just coming to and from port, because most of the ocean's too deep. Everybody knows that. Everybody knows it.

INTERVIEWER: What do you think the Navy should be looking towards in the future? You know, where should the Navy go, in diving and --

MR. JENKINS: Well, I guess some of your special warfare, to a certain extent, a little bit. Of course, that's limited, too. And hull tending.

What reason do they have to go deep? I mean, there's no repairs in deep water. I think 60 feet was the average Navy dive when I was working that stuff. They could go down and work on the bottom of an aircraft carrier and they're not going to do any treasure hunting; they're not going to do any oil exploration. The Kursk was, what -- 450 feet? I guess if we had a sub thing in 450 feet of water, the Navy would go and hire some civilian outfit to try and get it up. But why have 300 or 400 men full time just waiting for that to happen -- every 10 or 20 years?

INTERVIEWER: I know that in the last week there was actually a meeting in Washington, the Navy looking towards having their own SAT system.

MR. JENKINS: Again?

INTERVIEWER: Again.

MR. JENKINS: Well, this is kind of like the, you know, the Haley's Comet. It comes around periodically. I remember the guy that salvaged the Edinburgh. You know, he's a British guy, and they got \$75 million off the Edinburgh in 850 feet of water. Phenomenal feat, and a great book on that. And the Brits -- he was talking about the bureaucracy of the British Navy and the British diving Navy. They talked about that SAT system. They were coming up with it periodically and then it'd die, and then it would come up again. I'm not sure what the status is now. But what do they need it for? I don't know -- I'm not in the business.

So, you know, I don't know what's going on in the Navy. But, what for? For that one sub that goes down every 20 years? I mean -- one argument says, "Well, if you were in that sub, you'd want them to come get it." Another says, "Well, that's true, but" -- and you remember the old torpedo bombers, the Marlin during World War II when that enlisted man rode as the belly gunner there. You know darn well he didn't have a parachute on. And if that thing creamed in, you know he was toast. So some things are just risky

INTERVIEWER: I think even in Tom Eadie's book, the last paragraph. Basically the gist is that diving is dangerous.

MR. JENKINS: Yes, it's a little dangerous. It's -- like out here, people -- it's not as bad as it used to be. It's not as much macho as it used to be. That's why a lot of guys

lost interest, I believe. Because they can't strut around now with their dive knives on and impress the girls, because little old ladies do it. And this trip we just made, little old ladies my age and older -- they sit there and they compare their diving in the Red Sea to Fiji, or Palau, or Papua New Guinea, or any other. So it's not as macho, and anybody can do it, and that's why it's drawing so many more women and not as many men as it used to. But right out here, what's your biggest danger? You know, sharks, and all that nonsense? The biggest thing I worry about diving off Panama City is coming up and having my boat broken free and just drifted off. That's why we always leave somebody in the boat. Always. Always. Always. Never leave that boat empty.

And, maybe after that, sunburn or jellyfish. But that's not very dramatic. I mean, you know. And what is the big worry? I mean, you get down current from your boat, and that's always a sad situation. But Laura runs that boat as well as I can. As a matter of fact, starting years ago we'd go down to the dock and I'd put it in the water, and unhook the cables, and she'd be in there getting it ready. She would crank it up and run it. So if I ever do get in trouble, I don't have to explain to her how to hit the choke, and everything, while I'm drifting away.

INTERVIEWER: Is there anybody that you consider a mentor in your career or in your life?

MR. JENKINS: Oh, boy. Well, I used to really be impressed by Cousteau, who was at the right place at the right time, and certainly did a lot for the deal. And I like, as a person, I like old Lloyd Bridges. I think he's just neat. Well, Gary, my roommate, he was the one that taught me. He was a lot more mature than the rest of us. He was four years

older, and he was very mature for 24. I kind of used him for a guide for a while. I didn't pass him necessarily, but I didn't really consider him a mentor anymore. But I meet guys like Bill English, from Halifax, and Bill Bunton, from California, and the guys are just real, real knowledgeable, and real good. And I kind of always try and glean something from those guys a little bit.

You can tell pretty quickly if a guy's got some good habits that you might want to pick up, and techniques, and things like that, and you try and learn. And you can tell real quickly if a guy is full of bull. And you try to get away -- avoid them. And there are a lot of them around. But it's just individual. That's why I had maybe a dozen like Bev Morgan of Kirby & Morgan. Bev is a pioneer, down to earth, knowledgeable as he can possibly be, hands on, one of the old boys that worked on his helmet and dove outside his office on a pier there and tried it out, you know. A real pioneer in the business. Guys like that, you know. And there are guys like Carpenter, who's, of course, well known, I admire his guts. Anybody who sits on top of a missile and gets fired into space has got guts. But, I admire his guts for doing that with this really very little bit of experience. I mean, you know, for guys like him, a good leader. But as far as diving, he's certainly no mentor, for he didn't have the background.

INTERVIEWER: Well, you've certainly had an exciting career, and a lot of things to reflect on in your later years.

MR. JENKINS: It's been fun. It's been fun. Well, you know, Lew, I give talks occasionally. I talk to the archeology department at Florida State every year on the Wakulla and about the Arctic. I also give talks in those Scientist-in-the-Sea (SITS)

courses. I remember one of the young guys in there talking about, you know, "What does it take to dive under the ice like that?" I guess he wanted a couple of spoonfuls of macho. I said, "Well, the last trip we had a bunch of young girls from Seneca College in Toronto, Canada -- they were doing a pollution study. They dumped a bunch of oil under the ice with a barrier around it, to see what the penetration was, whether it would go back up through the ice." They were all, like, 18 or 19 years old, using mixed gas, closed circuit. So, what can you say?

But the big thing, we were there when it started. Wakulla, anybody could have done that. But we were there; we had an air compressor, we were there at the right exact time to get in there. I've always counted my blessings on that, you know, very, very fortunate to get that experience. That's probably the best experience in diving I ever had. To go in that virgin room, and see the bottom covered with mastodons and mammoths.

INTERVIEWER: No one had ever been there?

MR. JENKINS: No one had ever been there, no. No human being had ever seen that before. To be able to do that was a thrill. I guess the biggest disappointment of my life was not getting on the *Andrea Dorea*. We spent the summer of '57 looking for it. It went down in '56. And we made a movie called "Gulfstream Captain", off Fort Pierce, Florida, and in the Keys. Gary and I were the models. We came up from a dive one day at Fort Pierce, and George Archer, the Captain, says, "Hey, there's a new wreck for you guys to dive on. They had a big ship sink off New England yesterday." That was in June of '56. So in '57, Gary and I lived up there, of course, and John Light was going to dive it. He hired us to dive it with him. Light had the Samuel Jameson 65 foot dive boat out of

Hyannis and he had a guy named Edgerton on his boat in Nantucket -- he drowned. He was in closed circuit in about 10 feet of water in Nantucket Harbor.

Edgerton's father was "Papa Flash", Dr. Edgerton, and he was with Cousteau diving in Romanche Trench in the Atlantic, in 25,000 feet of water. This is with National Geographic, you know, this big long deal. So Cousteau and Edgerton, Frederic Duma, and Tailliet flew over for the funeral and Cousteau, you know, talk about a golden spoon, the *Dorea* sunk while he was there. Can you believe that? So, Light took Duma and Tailliet out there. The *Dorea* had beach chairs popping up in oil, and bubbles and things, so it was easy to find and they dove it. They got a bottom trace of it, but that was the old Loran A. You know, the peak on the pedestal, and all that mess.

So Light hired us, and we went out there, and we could never find it. While we were there, Peter Gimble came out. You know, Gimbles and Macys. Well, Gimble was the first who dove on the *Dorea*. He hit it the day after it sunk with a guy named Fox and had it photographed for Life magazine. The *Dorea* became Gimble's obsession. He got the safe with Italian money, and did a lot of diving on the *Dorea*. He died young, unfortunately, you know, in his fifties. Gimble was out there with a guy named Ramsey Parks, and they had the *Carl Henry*, a fishing trawler. We hailed them back and forth, but Light said he had Loran bearings. Gimble said, "Well, why don't we get together?" Light flopped him off, you know.

We had electronic problems, and went back to Nantucket. Nantucket's shaped like a crescent in the harbor -- it was a 14 hour trip. While we were gone, Gimble found it, and dove it, and cut his buoys free. We found his buoy a couple days later. But, you know, we

were all disappointed. It had been my 21st birthday, I think it was, or 22nd. But in retrospect, the *Dorea* is a deep, hairy, dive. It's 240 feet to the bottom, 187 feet to the flying bridge, which is all gone now. We made a lot of dives to that depth, but, like I said, it was like diving in a bathtub. You had to dive it in currents and cold water. Our suits couldn't have handled that water -- no way on earth. So maybe it's best we didn't find it, you know.

I've seen a lot of divers, and seen a lot of wreck divers from the Atlantic, too, which are a lot more trained in that kind of diving than we were. Because, see, our suits could not have handled the *Dorea* temperature -- no way on God's earth. So Light bought suits called "Polar", and they were huge, thick kluges. We had no experience diving with them at all. None. He had them in boxes up there on the boat, so we had no training in them. We didn't have any idea how much weight to put on, or compensators, you know. So really, it's probably best we didn't find it.

We started sinking one day. We were 50 miles offshore, right in the *Dorea* area. The shaft whip-lashed, the stuffing gland came out, and the boat started sinking. So we called the Coast Guard. They sent an 84 footer out to tow us in. It had twin screws on it. Threw us a big Hauser, we wrapped it around the Sampson post up front. He backed up on it, and wrapped it around his port screw. So there we were.

INTERVIEWER: Oh, God.

MR. JENKINS: Now we were sinking, and we just said, "Well, we're going to pull you down with us." So we grabbed one of those polar suits out of the box that had never been used and put it on -- it ripped all the way up the side. I said, "Oh, my God." Can you

imagine that thing coming apart on the bottom, down there? It took us a couple of hours to get that rope out of that screw.

But Light, you know, he was interesting -- been around forever. Old hard hat diver in New England, and he was the first American, and one of the first few to dive the Lusitania. Charlie Quadro dove it, you know, about the early '60s. Of course, now it's been dove a lot. But he dove it, and he died a few years ago. Of course, Gimble's dead, and Mike's dead, Cousteau's dead. That kind of makes me scary, though. I guess Lloyd Bridges is still around. And Glen Egstrom is still around. Glen Egstrom is certainly a colorful guy. Well, he's got a lot of background. It might be a more narrow background, strictly sport diving. He's certainly colorful.

But -- yeah, I've been very fortunate. I had a couple of close calls. I've been very lucky. I got lost in that cave one day. You know, I was 19. I thought I was the world's best cave diver. I had a mastodon tusk back there, about six feet long, way back in the cave. It was on the left side of the wall and our line went down more to the right. I figured, well, I'll just go back to this rock and I'll swim over to the wall to the tusk and then swim right back, you know. Well, Gary stayed on the line. We were in a place we called Grand Canyon. The water was a little deeper, so the tusk was, like, 220 feet and the bottom of Grand Canyon was, like, 240 feet. Anyway, I wound up on the bottom and got narked. Just drunk as the lord, you know, lost. I had no idea which way was up. That was hairy. The first thing I said was, "Well, this can't be happening to me." you know. We had an emergency signal, which was rapid tapping on the tank with a knife and Gary heard

it. He held his flashlights up like a beacon and I saw them over there. Pheeww. So, I never left the line again.

Then one of the guys ran out of air one day at 200 feet. I never have figured that one out. Then we had Gordon Whitney -- the Whitneys, wealthy people -- he dove with us a couple of times. He used to have the blow out plugs in tanks. For a while they came out, like, 22 bullets right in your back -- little plugs of lead. One of his tanks blew when we were in about 20 or 30 feet of water, but he had another tank. He kept fooling around and it started filling with water, which was kind of interesting. One day he left a wet suit laying out on a pier there at Wakulla Springs in the winter time. We had the run of the place for years, you know. Went to eat lunch. We found out that buzzards loved neoprene, and Gordon's suit had 200 or 300 silver dollar size holes in it. It couldn't happen to a richer kid, you know. He had everything. It would have devastated us, because we had no money. But, that was a good experience. That was about the best and most fun we ever had, because every day was high adventure. We would go out and do a decompression dive after decompression dive, or on a day we weren't making a deep dive, we'd go fan the bottom. You know, it slopes down. It's kind of like a hard clay. It has cracks in it. Well, those cracks collect stuff that sits in and settles and that's as far they go. I got over 200 of those bone awls, and spear points, and flint arrowheads, and things I just found at the bottom. And thousands of coins.

INTERVIEWER: Well, these are Indian artifacts?

MR. JENKINS: Uh-huh. Indian artifacts. They'd been there forever. Those bone things are about 8,000 years old, according to this Dr. Faulk over at Florida State. But -- yeah, it was a lot of fun.

It's kind of like my brother. He's a pilot, and he just had his 50th wedding anniversary last week and he doesn't miss flying. And I don't care to go explore Wakulla Cave anymore. I go over there now and it's kind of depressing, because it's black from the rain, you know. It has been dark for over a year. There'd be a bunch of young college kids going down there and finding stuff, you know. Lots of times I would decompress off that tower and while I would decompress I'd stand at the bottom and I'd find gold class rings, and a beautiful gold ring. My wife's favorite ring. And quarters by the hundreds. You know, because people drop off that tower, they drop the coins. They're lost forever because they go into those cracks.

INTERVIEWER: This is at Wakulla?

MR. JENKINS: Yeah. So we had a lot of fun there. I bet it was the right place at the right time, you know. It was just perfect timing. Same way with SeaLab. I just happened to come to work, and happened not to be controversial. I think mainly nobody knew me so I didn't have any enemies yet.

INTERVIEWER: Now, this lab didn't have anything really to do with the design of SeaLab II, was it?

MR. JENKINS: Well, I don't know. Culpepper could tell you more about that. And Bernie Deleman worked on it. Yeah, I think it had a little bit of some of the life support. Yeah, I believe they did.

INTERVIEWER: Yeah, I'm going to talk to Bill (Culpepper).

MR. JENKINS: Okay. He'd know all about that. But get him to tell you about designing SeaLab I. I mean, because he and Odum maybe, it was a lot of people were really big into that. It's kind of a shame, you know. We had the SeaLab reunions, and Barth doesn't like Odum, for whatever reason. And Odum doesn't get invited to SeaLab reunions. And he was a pioneer in the business. I mean, him and Culpepper both. So now there's very few SeaLab people left to go to those reunions. Because, you know, they live all over the country. Carpenter didn't come to the last one. He normally makes them. But Carpenter is -- he turned 40 in '65 -- he's about 77 years old. So he's no spring chicken anymore. But he has always kept himself in good shape. But you don't get to be an astronaut by being sloppy.

INTERVIEWER: Thank you, Wally.

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MY LIFE UNDERWATER
AND
IN OTHER WONDERFUL PLACES

Walter R. BERGMAN

LCDR USN (ret)

October

2003

UNDERSEA & HYPERBARIC MEDICAL SOCIETY

INTERVIEW WITH WALTER R. MR. BERGMAN
of Roanoke, Virginia.
Friday, 30 May 2003

Interviewer is Captain Robert C. Bornmann, MC, USN (ret)

INTERVIEWER: What was your father like?

MR. BERGMAN: He was one of five and had three brothers and two sisters. Their mother went mental. Today, I think it would be called a 'nervous breakdown.' The oldest child was 17. Can you imagine that? There were no social workers. There was none of that nonsense in those days, and she kept the family together. When the first kid married, the next one took over, keeping the family together. My father was born in 1906, and he went to work in Jordan Marsh in Boston as a busboy when he was 13 years of age. Every Wednesday, the store had mandatory schooling for their employees who were still minors. My father got his eighth grade diploma from that instruction. That family stayed together. The greatest attribute that I can think of is that they visited their mother every Sunday. If you think the postman has stern rules about rain, snow, sleet or whatever, this family was out with their mother on Sunday. They would rotate around it, and if for some reason one of them couldn't make it, the other one did. I went there many times, Bob, starting when I was probably about four years old, with Dad. It was a big adventure to me because we would ride trolleys and what have you. I got quite accustomed to the mental hospital. It was Mattapan State Hospital, which is closed now. In any event, it was just great. It's hard for me to believe, but many years later, my grandmother had a fall. She was in the hospital on the complex. Mental hospitals do leave a lot to be desired. Of course, Janet had never been out there. She had met my grandmother many times in my home because they would bring her home for visits to eat dinner with us and what have you. But when Janet was there at the hospital, a

woman died in the adjoining bed. The staff came in with that basket to put her in. I looked over at Janet and she was as white as a sheet. I had her put her head down between her legs, and then I whisked her out of there. I forgot that I was very familiar with the situation but she was not. But Janet loved my grandmother very much. We had gotten engaged, and in the Swedish family, the oldest member is supposed to bless the marriage. Whether that was a Swedish tradition or one that they had developed, I'm not sure. Janet was a little nervous and went into the side room with my grandmother. Nothing was manifested when grandmother was home, or nothing that you'd see, you know. You just thought she was a quiet, lovely person. Janet and my grandmother had a great conversation out there. Then my grandmother called me out and she said, "Walter, she isn't Swedish, but I think she's a lovely girl and she'll do fine."

INTERVIEWER: Janet's maiden name was 'Burgess.' She was not Swedish?

MR. BERGMAN: No. She was not Swedish. Her father was English and her mother was Irish. In fact, her father was from England, born in Liverpool.

INTERVIEWER: Your grandfather came from Sweden?

MR. BERGMAN: He came from Sweden, as did my grandmother.

INTERVIEWER: I think it's important to record that the people of our generation are very close to immigrants. They're third and second generation immigrants.

MR. BERGMAN: I used to have Swedish flags and a blue and gold sweatshirt, and I can remember one Christmas dinner when my grandmother spoke to me and said, "Walter, I know you're very proud of your Swedish heritage. But consider this. If Sweden was the greatest country in the world, why would your grandfather and I have come to America?" She really put me in my place in a very sweet way.

INTERVIEWER: You grew up in Quincy?

MR. BERGMAN: I was born in 1929, but I lived in Quincy from the age of four, until I joined the Navy.

INTERVIEWER: What was the name of the old department store in Quincy, the famous one?

MR. BERGMAN: Its name was Remick's. Lee Remick's father owned it.

INTERVIEWER: Was she in your high school?

MR. BERGMAN: No, she wasn't. She was a little older than I was, and I think she went to, you know, private school. Remick's was a very prestigious store. Janet's father ended up working there for a good while.

INTERVIEWER: Did you ever meet Lee Remick?

MR. BERGMAN: No. I never met Lee Remick.

INTERVIEWER: Well, I'll continue to tell people that you did.

MR. BERGMAN: I saw her in the store, but I never met her. My cousin was a secretary/accountant for Mr. Remick. She walked in and out, but she didn't work there.

INTERVIEWER: Tell me about growing up in Quincy and going to school. You met Janet in high school. Is that right?

MR. BERGMAN: I met Janet in high school. I grew up in the poorer section of Quincy, which is called 'Houghes Neck.' The only famous thing about Houghes Neck was that it was a summer resort for kind of well-to-do people who bought little beach houses. In addition to that, when John Quincy Adams set off for France, he departed from the shores of Houghes Neck. It was a very quiet community. There was no industry at all in Houghes Neck itself, other than clam digging. They used to dig with the tides, two times a day. I was in the same school system for the entire time, and though we were poor, we really thought we were rich. We would go out in a rowboat any time we wanted. You could row a boat shortly after you could walk. You were just

brought up on the water, and it was a good life. I can tell you the name of every one of the teachers in my grammar school, grades one through six. They all made an impression on me. The women could not teach if they got married. I thought that strange.

INTERVIEWER: Your family migrated from Sweden, but you were not Lutheran at that time?

MR. BERGMAN: No, I was not, not at all. My mother and father were Episcopalians. In the community we lived in, in Houghes Neck, there were two churches, the congregational church and the Catholic church. As a commentary on that time, it was the era of great bitterness between the Protestants and the Catholics. It was really very sad and bitter. A priest would come over during a Bingo game and tell one of his parishioners sitting beside a Protestant, "I'd like you to change your seat." That's pretty severe stuff. But I had a great education through the sixth grade.

In the fourth grade, I ended up in juvenile court. It was really kind of crazy. I chummed with a couple of older fellows. That's no excuse for what I did because I knew it was wrong. We were down at the beach in the off-season and broke into a couple of houses. They took tools and some other things. I took a Bible and a deck of cards. In those days, there was no messing around. If you fouled up, you went to juvenile court. I can remember that my minister and my mother went with me. I looked up at the big bench on which judge was. He looked mean, and he just waved his finger at me and said, "One more offense, son, and you're going to reform school. You have one year's probation." Now, I was nine years old.

INTERVIEWER: Well, you started earlier than your son did.

MR. BERGMAN: Yeah! Probation, in those days, was a very serious matter because the probation officer would come by your house, knock on the door, meet your mother, of course, and ask, "Where is your son?" She would tell him and he'd say, "Let's get in the car and go see him." Every time, when I was running around with the guys doing kid activities, and they were

going to go someplace else, I had to run home like sixty miles per hour and tell my mother where I was going, so that if he ever came, that was it.

INTERVIEWER: That sounds like a good system to me.

MR. BERGMAN: Oh, yes. They'd laugh at that system today. Of course, when I joined the Navy, sure enough, everything was fine, but my juvenile record was going to be reviewed. They weren't protected in those days. They saw my juvenile record and said, "I'm sorry, son. You're not going to be able to go." But the captain knew me from lifting weights and exercising and he said, "I'll sign for him."

INTERVIEWER: That was the captain of the recruiting station?

MR. BERGMAN: Yes. Walter was very grateful for that. Not to belabor this point, but it comes up again, later in my life, when I had an appointment to the Naval Academy. I don't mean to jump, but it all ties together. I had an appointment to the Naval Academy. I was in Memphis, Tennessee, on active duty, studying electronics and got called before the officer candidate board. A fat lieutenant commander, and I'll never forget him, looked at me and said, "I'm interested, son. What did you turn into?" I said, "I beg your pardon?" because I didn't understand his question. "I'm very, very interested. Did you become a gambler or a preacher?" I said, "Sir, I just don't understand your question." He said, "Well, I see you stole a deck of cards." The next thing that happened was the other guy said, "I see you took Spanish. I'd like you to go through the conjugation of the verb, 'to have.'" I stumbled through that, and the lieutenant commander spoke up. "You know, he's going to play football at the Naval Academy. Let's knock it off." Lo and behold, it was in the year of the great Army football scandal, 1947 or 1948. I had an appointment from a congressman in Pennsylvania. Can you imagine that? Some kid in Pennsylvania lost out and I had an appointment. All of a sudden, I start to think, "Is this a good move?" and I said,

"No. I'm going to get married." I was very much in love with Janet, so I turned it down. I graduated from high school in 1947. Junior high was a great time for me. I was an excellent student, but I didn't work at it. I could have been so much better, and our junior high school system was tiered for ten grades of each class. There were ten seventh grade groups, ten eighth grade groups and ten ninth grade groups.

INTERVIEWER: Wow. They all had 25 students?

MR. BERGMAN: Yes. Then when you were in grades 7-10, they said that you weren't any smarter than anybody else was but worked faster. Naturally, you covered more material. You were accustomed to working quickly. That proved of great benefit in the Navy. You would take an exam be through with it, put your pencil down, and look around. Everybody else would just be going like mad. That was why I scored quite highly on my battery of tests as an enlisted man. I had no trouble with the tests at officer candidate school (OCS).

INTERVIEWER: Back up. You played football in high school? I always thought you were a basketball player.

MR. BERGMAN: I played football and track. I loved playing football and I enjoyed track. Track, for me, was high jumping and shotputting. I could place first or second, most of the time. In high jumping, we didn't have the conventional jumping. It was western roll. In western roll, you went up and punched with your hand to get over and then you were supposed to hop on your foot. Well, I punched so hard that I'd always land on my butt. But I was jumping five-five and would take third place and get some points. In football, I played tackle and loved it. When I graduated from high school, my assistant football coach had arranged for Albion College in Michigan to give me a scholarship. Then Boston University offered me a scholarship and so did Massachusetts State Teacher's College. I really wanted to play football, with my ignorance and,

at that age, I had no familiarity with other vocations. Realize that I grew up in a community with probably two cars, at the most. There was probably one college graduate in the whole community. You just didn't have any broad horizons. I'll never forget this. Janet and I were playing tennis. I was hanging around because I didn't have a job or anything. It was right after graduation and my mother had undergone a hysterectomy. I was kind of minding the store at home. A young kid came up and said, "Hey, Walt, I want to say goodbye. Remember those old days when I said we'd go off and join the Navy?" We used to like to go out on the bay in the fog and spin the boat around in circles and then start rowing. We'd just go by the sounds to know where we were headed. I said, "Bobby, that sounds great. If I can go with you, I'm going to go." Janet almost fainted. That was how I joined the Navy. It was absolutely spontaneous.

INTERVIEWER: Well, let me ask you something. Was it only the Naval Academy that said you couldn't get married? Did Albion say that you couldn't get married?

MR. BERGMAN: Oh, no. In fact, I got the paperwork from Albion and it was kind of interesting. At that time, it was an extremely biased, religious school. It was some religious thing because boy, you had to declare this, this and this. At that time, Boston had the reputation of 'if you got hurt, that was the end.' I selected Massachusetts State Teacher's College, and I remember the interview. A science teacher in my high school took me up there.

INTERVIEWER: Where was that located?

MR. BERGMAN: It was in Springfield, Massachusetts, wasn't it? No, it was in Amherst. He came, talked to my parents and asked me if he could take me out there. I was talking to the dean of admissions, and he asked me the classic questions. I had no preparation. He asked, "What can you do for the school?" I was good, old, brash Walter, you know. I said, "I'm terribly sorry, sir. I'm coming here for an education. What can you do for me?" He said, "You are a very brash

young man. We'd like to know what you're going to contribute." I was going to get some silly little job of raising the flag or something like that. I don't know why I didn't do it. I really don't, but bingo, I was off and running.

INTERVIEWER: Did you get married first?

MR. BERGMAN: Oh, no. I went right into the Navy. I became a very, very homesick kid. I had no brothers and sisters. I came from a tightly knit family. I loved my girlfriend very much. I was just absolutely at a loss at boot camp in Great Lakes, Illinois. After I was there for two weeks, I went to see Chaplain Alley. I said, "Chaplain, I can't take it. This is not for me. This is for idiots. We treat people like animals. We put them in trashcans and scrub them with these brushes. The kids are out of the hills. They don't know what to do. For crying out loud, it's brutality." They made me a platoon leader, and I absolutely refused to hit them with my guard belt on their rear ends. I said, "This is animal life." He said, "I want you to go back. Try this for two weeks more. Then if you still feel the same way, I'll send you home." I said, "You're wasting your time." This is a true part. It sounds kind of foolish for a kid who's 18, but I thought, "One day, I'm going to have children and I'm going to have to tell them not to quit. Here I am, ready to quit." That was that. I had to tough it out. Without belaboring that point anymore, it was many years later in Key West, and I was the executive officer of the USS *Penguin*. They were dedicating new wherry housing and who was there but Commander Alley, the chaplain.

INTERVIEWER: He was a fine man.

MR. BERGMAN: He was a fine man. At that point, I was a Lieutenant. After the ceremony, I went up to him and I said, "Chaplain Alley, there's absolutely no way you can remember me, but this is what happened and this is what you did. I want you to know I decided to stick it out." Well, he just laughed and shook my hand with heart. He said, "I'm awfully glad you did." I said,

"Hey, I'd love to invite you down to have lunch or dinner on the ship." He said, "No, thank you very much, but I'm glad you stayed." It was really kind of fun to meet him after all those years.

INTERVIEWER: That's great. You finished boot camp.

MR. BERGMAN: Yes, and on the basis of my marks, they assigned me to electronics. The aviation electronics school was in Corpus Christi, Texas. I said, "Gee whiz. I'm really going to see something." Well, they then decided to move that school, and they put all the schools in Memphis, Tennessee. During that transition, they had a program, mostly for undesignated sailors, fellows with whom they hadn't decided what they were going to do. At Aviation Preparatory School in Jacksonville, Florida, they gave you a taste of each one of the ratings in the aviation branch. Fellows like myself, who already were designated to go into electronics, had no choice. The school was a breeze. There was nothing academic about it. From there, I went to Memphis. The school still hadn't fully completed the transfer. I was mess cooking, and mess cooking was quite a horrible thing. But I went along with it because school was going to start. I still wasn't in love with the Navy. I hated it. But, hey, it did the job, and that was what it was at that time. In fact, that was why I went to the officer candidate review dressed as I was, as a mess cook. You can imagine what I looked like because everything was late.

INTERVIEWER: Why did you go to Memphis if the school was in Corpus Christi?

MR. BERGMAN: Well, the school was moving. All aviation schools were moving to Memphis then. It was a great program. In 28 weeks, if you were in the upper third of your class, you made third class. At the end of 40 weeks, and it was a 44 week school, you could make second class. Well, that was great for me because I was going to get married. I said, "Boy, at least I'll be a second class petty officer." You had to be second class or above for the Navy to recognize your marriage in those days, and to get housing allowance and the rest. Well, they moved all the

schools to Memphis. In my 26th week of school, I was in the top three, maybe in the top two, and they decided it was a waste of money. They were educating guys who would soon go off to IBM. They said, "We're going to have an 'A' school just like everybody else." They rammed us through the rest of the course, for two weeks. All of a sudden, I was graduating early. I was still a Seaman. I hadn't even made third class. I thought, "Well, all right." I wanted to get married so badly, but economically, it was stupid. When it came time to pick duty stations, and I'll never forget it, I picked VP-7 in Argentia, Newfoundland.

INTERVIEWER: Did you miss Janet?

MR. BERGMAN: What I thought was that I could get married and then go off to Argentia, Newfoundland, save money and go up in rank. Then I would rejoin her, you know.

INTERVIEWER: You were still 18?

MR. BERGMAN: Well, yes. I was approaching 19.

INTERVIEWER: That was a little poor in logic.

MR. BERGMAN: That's right. It was absolutely absurd. I knew I couldn't afford it. I had already scheduled that we were going to get married and I was going to be second class and all that stuff. Of course, Janet had an ugly home life, and I wanted to get her out of that.

INTERVIEWER: How were you going to get her out of that if you were in Argentia?

MR. BERGMAN: Well, I had the idea that once she was married, she could move out of the house. She was contributing to the support there at the house, and to the rest of her family. Well, in any event, I had to report into Quonset Point, Rhode Island for transportation. Sure enough, we had an early Christmas because we were married December 5th, and I had to report, but I forget when. It's still a struggle. I haven't thought or talked about this in ages. Christmas was a sad day. I had my gear all packed in my father's car and we drove down to Quonset Point in a

snowstorm. I reported in to Fleet Airwing 3 and said, "Checking in for Argentina, Newfoundland." He said, "What are you talking about? You're in VP-7." I said yes. He said, "VP-7 is just down the street there in Seaplane Hangar 3." I said, "what?" He said, "Yes. They go to Argentina, but they go there maybe for a month or two and then they're back. You're going to be home based here in Rhode Island." Having had a taste of marriage, I thought that was it and I said, "Oh, I've got to do something about this."

INTERVIEWER: You were still only an E3?

MR. BERGMAN: You wanted to believe it. I hadn't had my first test for third class petty officer. Janet's father could be abusive, and we had an incident at home. I went home and said, "This is it, Janet. We're going to set up housekeeping." I borrowed my buddy's car to move. We took a third floor, rear apartment at \$10.35 a week and set up housekeeping. Janet took a job with the insurance company in Providence, and bing, bing, I was third class, second class and then we were off to the races. Well, the squadron VP-7 had gotten a trip to Cuba in 1948. I thought Cuba was paradise. I thought, "Boy, this is great." You had the anthology filled out on your next duty station, and Walter went ahead and picked a duty station in Cuba. But no one was getting transferred. Everybody was broke in those days, and nobody was getting promoted to chief because chiefs were two-blocked. But they were great days.

INTERVIEWER: Were you second class at that point? You could have taken Janet to Guantanamo Bay, right?

MR. BERGMAN: Well, I did, but I couldn't take her then because it was just a deployment of the squadron for a week or two. But once I knew about Cuba, I put it on my wish list. Lo and behold, that ultimately came up. But in that third floor, rear apartment, when an apartment would vacate on that floor, I'd make sure I got somebody from the squadron in there. We had a real

clique on the third floor of that thing in Providence.

INTERVIEWER: The apartment was in the city of Providence?

MR. BERGMAN: Yes, it was in North Providence. Warwick and East Greenwich weren't the paradise, high-rent districts they are today, but they were still out of my reach. I had to be in a carpool, too. But you had to rent something you could afford. We did that. We'd been married three years when we lost our first child. That was one ugly experience. Janet and I would go down to the garage, park and see somebody with a baby carriage. It would just tear her up. I was extremely wretched also. "I cannot believe that God would do this to me," I thought. To me, God was what was going on in the world. There was one guy in the squadron, a first class named Red Merrill. He had an absolutely lovely wife and two beautiful little boys. For some reason I became intolerably angry with him. One day, I said something unbelievably hostile just to make him angry. At that time, I was lifting weights and was in great physical shape. I was six foot two and weighed 193 pounds, and there wasn't one ounce of fat on me. I wanted to provoke Merrill. I wanted to make him hit me. I thought I could beat him up. I was so angry. I was just looking for a fight. Of course, Red had the good sense to walk away. I got home that night and realized that I was more miserable than before. I thought, "What have I done? How sick can I be?" I went right to the Chaplain. The Chaplain listened to this story and said, "Walter, I'll tell you what." He stood up from behind his desk said, "You are a bum. You are worthless. You are a pig." He dressed me down like you would not believe. Then he said, "And you know why, Walter? It's because I'm comparing you to Jesus Christ." He said, "Never ever compare yourself to another human being. That's not what it's all about. If you compare yourself to Christ, then you tell me. You've got to get yourself straight with God. You can't be angry with him. He didn't single you out," and he gave me a very meaningful time. It impacted me for the rest of my life. That was it.

I did go to Cuba and loved it there. Down there, we had half of a furnished Quonset hut. We thought we were in heaven after our third floor walk-up in Rhode Island. Instead of having me working on aviation electronics, they said, "Hey, I think you've got as much training as anybody, or more, for that matter," and they put me in charge of all the navigational aids, which was really an ET's job, not an AT's job.

INTERVIEWER: What was an AT?

MR. BERGMAN: An AT was an aviation electronics technician and ET was a general service, shipboard electronics technician. I would fix all the navigational aids and the ranges, and it was over my head. Since we're rambling, I'll go the full route. I had the Adcock Range, which was a four-sector grid of towers, transmitting so that an incoming pilot could discern his relative position. Its radio signal, steady if the pilot was on course, became a broken Morse code 'N' if he strayed to the right and an 'A' if he strayed to the left. Over a tower, he was in the 'cone of silence' and there would be no signal at all. We called it the 'A&N range.' Hearing its signal, the approaching pilot could tell in what quadrant he was. The towers were huge, hundreds of feet high and had very complicated electronic equipment to run them. What did Walter do? I shined up the equipment. It wasn't called the Federal Aviation Administration, and I forget what it was called then but somebody did come down from that department to check me out every once in a while. I made a lovely mahogany racks for all the huge electronic tools I had. I painted the compartment. I ended up putting rubber mats in front of the equipment. I put 'Danger - High Voltage' signs around it. Then I borrowed a lawnmower from public works and mowed the grass around that. Commander Vanderhoff came out for a look one day and said, "MR. BERGMAN, you are going to go a long way," and I was very, very pleased. He was being very folksy. I said, "Oh, I'll tell you, Commander, I haven't done anything to the equipment. The equipment works

now, but if it fails, I'm going to have a devil of a time. But I'll try." He said, "Walter, you are taking care of all those things that the Navy looks at first. You just keep that up," and I did, and it was great.

One great thing happened during the Korean War, some time around 1951 or 1952, in Guantanamo Bay, Cuba. We had a Dumbo flight for the Queen of England. I'll never forget it. I flew in the last commissioned PBY. Coming from a P2V squadron to that, my lands, I could not believe it. You climbed up on the wing and had a crank, and you cranked the starter. What a difference it was. The radar was an APS-9 and you figure that by then they were generally APS-31s and 33s. I was in one of the first airborne radars. It was hilarious. We went down to do a Dumbo flight for the Queen, the 'Dumbo' being just an escort around the Queen of England, in case something happened. She was visiting Jamaica. We finally landed, and everything is just Jake. The Queen of England, if you could see her, because they held things up a long time because we had landed, by the way that was not in the water -- we landed on the ground. We quickly got out and watched her come down. She had on a lovely, pretty sheer dress and her hat, and in those days, they had those long steps going up. I'm here to tell you, Bob, she floated down those stairs. It was most impressive.

INTERVIEWER: People don't realize how beautiful she was. You had to see her in person, and her photographs never captured that.

MR. BERGMAN: No. She was going to meet our crew the next day. Well, that night, the pilot got absolutely hammered. I remember it was right around Thanksgiving. He got absolutely hammered, and so the meeting was off. Walter, at that time, did not overindulge in anything. But, boy, we got these Cuba Libres, rum and cokes with a little lime, and I drank too many of them. I wasn't feeling too red hot myself. We flew back to Guantanamo and Janet had a lovely

Thanksgiving dinner ready and a short time thereafter, I was barfing up my Thanksgiving dinner. I said, "It must have been the mincemeat." She said, "There was no rum in that mincemeat, Walter, and you sure smelled of rum."

INTERVIEWER: How did you get to be on a plane crew with your assignment for the A&N equipment?

MR. BERGMAN: How do I say this modestly? I was good at anything I did, Bob. I really was. I still had my AT rating, and I had logged over 3,000 flying hours.

INTERVIEWER: You were on flight skins?

MR. BERGMAN: Oh Lord, yes. We were in the P2V squadron. I was a natural to be the backup navigator with the PBY. That was it. We'd fly to Miami and buy various things for our families and some friends. I can remember buying hollow Easter bunnies that were non-pressurized. You can imagine what happened, pop, pop, pop. All those Easter bunnies were in little pieces. I'll never forget. It was just terrible. How did you hand somebody's kid bits and pieces? But those were great days and you learned to pick out clothes for your wife and the rest. But Cuba was a very pleasant place and one day, in Cuba, who showed up but Ted Williams. He flew in, saw my buddy, Charlie Swisher, and said, "Hey, where's the fishing around here?" Charlie replied, "I happen to have a boat and am happy to take you there."

INTERVIEWER: Was Williams on active duty, at that time?

MR. BERGMAN: Yes, he was on active duty. He was a flying Marine. He did a flight up and had his fishing rod in the plane. He wouldn't fish with any other rod. Lo and behold, Charlie walked right through my yard with Ted Williams and didn't tell me. He knew we were home but didn't say a word. He proceeded to go right through my yard, down to the dock and down to the boat. What kind of a neighbor was that? I told him later, "Charles, never mind." I never got to

meet Ted Williams there. But the two of them caught some fish. When Charles brought Ted Williams home with their fish, that wonderful man said to Charles' wife, "Let me cook them for you, Maryanne, if you don't mind." Ted Williams cooked those fish. Ted Williams entered our life again, many, many years later when I was a civilian on vacation on the Florida Keys with my wife. She went into Manny and Isis. Was that the name of the place? I forget. But, in any event, she went in, alone, to see what time they started serving dinner, and who did she run into but Ted Williams, who immediately said to her, "What's a pretty Irish lass like you doing in here?" He hit on my wife. Janet said, very quickly, "Well, my husband and kids are out in the car. We were just trying to see what time the restaurant was open." He said, "Oh," and that was the end of that.

INTERVIEWER: She didn't introduce you?

MR. BERGMAN: No. I was out in the car with the kids. I screamed at her afterward, "Hhy didn't you say, 'hey, we'll be right in. Let's have dinner together?'" But that was it.

I got orders to B School in Memphis, Tennessee. I was in Memphis and number one in my class there, because I had had enough experience by then. I was acing it and all of a sudden, Charles Swisher, now that Guantanamo had changed from a PBY to one of the Gull Wing things, a lovely plane, convinced the pilot to fly to Memphis, Tennessee, from Guantanamo Bay, Cuba. This is a true story. He found me and said, "Walter, there's an officer's candidate program that you are made for." Now, Charles was a first class petty officer. He hadn't made Chief then. I was a first class petty officer. The pilot bought into it. He showed me the program and said, "Apply for it." It was the Seaman to Admiral Program. It was not an aptitude exam. It was an academic exam. I said, "Ah, Charles, I'm on it." He said, "Pick either line or supply corps." I went ahead and applied for the exam and studied. I wanted to read that stuff because I was weak in chemistry and didn't know what was going to happen on the test. I studied pretty hard for that exam but

even as number one in my B School class, I flunked the course for a two-week period. I had to go before a review board. They used to get guys who had three or four flunks because they wanted to keep them going. I'll never forget it. The commander looked at me and he said, "MR. BERGMAN, you are number one in your class and you flunked? Why?" I said, "Well, I was getting prepared for the OCS exam." He said, "Mr Bergman, you're a first class petty officer who is studying electronics. Knock it off. If you flunk one more time, you're going right back to the fleet. No ands, ifs or buts." I got back on the stick. I did not get selected. That wasn't it. I thought, "Well, I want to make chief." I put on my wish card to be an instructor at Memphis. As an instructor at Memphis, I figured I could really nail the exam for chief. Well, there was one piece of paper missing, so sure enough, I got orders to VS-26, a tail hook outfit home ported in Norfolk. It was kind of a surprise. I flew off aircraft carriers as a combat air crewman.

INTERVIEWER: What kind aircraft were they?

MR. BERGMAN: They were S2Fs. You guessed it. Man, I reported in there. At that time, I had two kids. What was I going to do, you know? I reported in because they were ready to go to the Mediterranean, and that was it. I got Janet settled in Quincy with my parents in a little bitsy house. Can you imagine that with two kids? God bless my parents. Boy, they were generous. Off I went to the Mediterranean for three months. I came back and we immediately moved to Norfolk.

INTERVIEWER: Was that in 1950?

MR. BERGMAN: It was about 1955. The next thing I knew, they were based out of Norfolk and flying off the land, not off carriers, and we had little deployments off of the USS *Kearsarge* and I forget the name of the other one. In any event, we were deployed and going on a carrier to the Panama Canal. This is the story I told you about the footlocker on wheels. Well, I liked my

uniforms starched and the stencils just right, you know. Seabags didn't seem conducive to that, so I had a big suitcase, almost like a footlocker, and I put four wheels on it. I remember going through South Boston Station with red caps and everything. Of course, I was the only one in that station with any package with wheels on it. But Walter didn't do anything with that idea in mind and, of course, you well know! It was steady. It was very broad. I can remember coming up on that carrier. There was a second class boatswain's mate (BM2) from ship's company who was in charge of the compartment. He asked, "What is that?" There was a seabag locker for peacoats and other stuff that wouldn't fit in our tiny personal lockers. He said, "That's such a darned good idea. I can't let you throw that away. I'll put it in the seabag locker." We were in the Panama Canal and I went ashore with a buddy. When I came back to the ship, the BM2 who was in charge of my compartment said, "Hey, you've just been selected for officer candidate school." I had taken the test again. I didn't believe him at first. He said, "Yes. You've been selected for OCS. It's here in the *Naval Reserve Magazine*," and he showed it to me. It was in the *Naval Reserve Magazine*. Can you imagine that? I took the magazine up to my personnel officer. I said, "This is crazy. Could it be true?" He said, "I don't have any orders for you. This is crazy. Don't pay attention. That's a Reserve thing." Then he said, "I'll tell you what. Why don't you go back to Norfolk. Your orders might be sitting at the squadron headquarters in Norfolk." Well, that was fine with me. I asked, "What would you suggest?" He said, "You're going to be an officer, so you better think for yourself. You get back to Norfolk." We were in the Panama Canal.

It was quite a thrill for me. I went over to a guy who had been to B School with me and was stationed there, at Coco Solo, and Barnes got me a ride on a PBM to Jacksonville. Then I went ahead with a R4D (DC3) to Norfolk and went to the squadron. For some reason I didn't understand, the skipper of the squadron was still in Norfolk. Obviously, it was for something

serious that he was there. I told him and he was very, very nice. He said, "Good. We're going right over to sickbay and getting you a physical because you're going to be a pilot." I said, "I'm not sure I want to be a pilot." But he said, "Well, you're going to have your physical." When they put those drops in my eyes and asked me to read the charts, it was a disaster. Then they had me do those string things to show depth perception, a disaster again. He said, "Oh, boy. That's too bad. Well, why don't you be an aviation observer?" I said, "No, no. I just want to go to OCS, for now." He said, "Well, I don't have any orders here. You should probably better get up to Washington." Once again, I had a figure up and landed at Anacostia. I went over to the Bureau of Personnel (BUPERS). They were shocked that I hadn't heard. They were very, very upset about it, since I had to be at OCS the next week. I went to Newport and checked in. I found it to be a piece of cake to work. But I think I shared with you that odd experience of having to pick out five guys who were the best naval officers for the future and five guys who were the worst. I had the discretion to name the company commander, who was a lieutenant. He would have made one of the worst. I just can't understand my being that stupid.

INTERVIEWER: That was a repetitive trait in your career?

MR. BERGMAN: Yes. I had always been really brash. I hope I'm toning that down now. Janet was in Norfolk with a brand new baby, our third. I was at OCS and had to bring her up to Quincy, Massachusetts, so that she wasn't alone. She'd have support from my family. I went to the company commander, who I said was a jerk, and I had to ask him for extra time off. It was tough. I had minimum time to get down, so I went to the airport to fly. When we landed in Washington, we were fogged in and couldn't go. My wife had packed up everything. She was waiting there with three kids, and I was in D.C. We got a car and it was so foggy. Man, I'm telling you, we couldn't get out of Washington. I pitched in with the other guys and we caught a

cab from Washington, D.C. to Norfolk. I was still a first-class AT. I had a real problem. When you got commissioned, it was like the old New England 400 Club. You bought your own uniform.

INTERVIEWER: Back up one more time. You were a first-class AT in an OCS course. If you graduated from college and went to ACS, you were a seaman until you graduated?

MR. BERGMAN: That was true. I was senior to them. But that usually didn't mean anything, other than people from the enlisted ranks were made platoon leaders, and blah, blah, blah, at the beginning. Then they rotated everything, so everybody had experience. OCS was, I found, a shock. College kids, especially people with B.A.s, just didn't know how to study. That's a sweeping generalization, but they would jam on one and then flunk. If they flunked, they were out to the fleet. The uniform thing was a big problem for me. I had scraped up money to buy an officer's cap so that I could keep my focus on where I was headed. But I really wanted a good pair of shoes, and I couldn't afford them. The cheap Navy ones were only \$5.25, and with a lot of effort, you could keep them spit shined and presentable. I wanted a more expensive pair of shoes. My buddy said, "Go ship over," and I did. They said at first, "Who do you think you're kidding? You're not going to get any bonus for signing up for six." But I did get the bonus, which was \$1200. I immediately gave ten percent to the church and had the rest for my uniforms. My problem was solved. I went ahead and graduated from OCS. I think I shared with you that I was in the Hotel Viking, in Newport, for the big party. Lionel Hampton was going to have the big band, the whole bit, and I was just so thrilled, in my officer's whites, and I didn't have my shoes. I had white socks on and went right down to the lobby as confident as could be. I walked out to my car to go get my shoes at the barracks. That was fine. I had a nice graduation. Afterward, we were out at the breakers in Newport. I'll never forget. Janet said, "Walter, you've been around all

these years with no ring on your finger. Now, I have seen you in officer's whites and you are going to wear a wedding ring." She put a ring on my finger there at the breakers. She had been living in Quincy and I had been living in the barracks. It was really a great thing for me because my dad and mother were just so proud. Dad was so disappointed when I didn't accept my appointment to the Naval Academy, and I finally got commissioned. He said, "I couldn't be more proud of you if you were the president." The course was approximately three months. But the ridiculous thing about it was that you only had to remember something for two weeks. The only final exam that really took place was a drill in navigation. Everything else was a piece of cake. We were competing for numbers for seniority. We were supposed to rank with and be integrated with the Academy. But it ended up that we ranked just after them, just as the Medical Corps ranks after line officers of the same seniority. That was a disappointment. I had done everything just fine until the last week when, lo and behold, at study hall I got caught reading *Newsweek*. I got sixty demerits, as I recall, and I forget how many numbers that cost me. Who caught me? I was caught by the wonderful company commander whom I said wasn't going to be a good naval officer. Then they told me to go home, and I didn't understand that because they didn't explain anything. But officers didn't have to worry. They said, "We'll call you when we're ready to send you somewhere." I went home, knowing I was going to the USS *Randolph*, but they didn't know where she was. I finally got a call after about seven or eight days, maybe even ten days, to go to McGuire Air Force Base in New Jersey, and fly over to find the *Randolph*.

INTERVIEWER: When you were enlisted, you were in the United States Navy? When you went to OCS and graduated, your commission was in the regular Navy?

MR. BERGMAN: It was the regular Navy, 1100.

INTERVIEWER: When you were told to go home, you weren't sent on leave?

MR. BERGMAN: No. I just went home. They said, "We'll call you." We flew off from New Jersey, and I had a grand tour of Europe, really. We landed in France and in England. You have to understand that it was the pre-computer age. Why didn't they know where the *Randolph* was? I had a wonderful time. For two weeks, I think, I was in Port Lyautey, Africa. Finally, they figured out where the *Randolph* was. I made a circuitous route by plane with one other fellow with whom I chummed up, a guy by the name of Bill Lakin, and we picked up the ship in Palermo, Sicily. I think I shared with you that when we got in, of course, we were put into the ensign's bunkroom. There were probably about twenty or twenty-two Ensigns in there. Two of them were from the Naval Academy. It was kind of rugged. Bill Lakin said, "Hey, I'm not going to live in this pigpen." He was not a large man. He said, "Hey, I want your attention. We've got to clean up this stuff. I'm not going to live like this," and he added, "And if you don't like it, see Walter. He'll kick the crap out of you." He gave me no warning. You can imagine that both of us were kind of in trouble, and nothing changed. He went to his gun boss, a full commander, Commander Mason, and said, "We can't square them away. You've got to help me." The CDR came up there and raised Holy Cain. Then we were really popular. After we had the bunkroom all squared away, the next thing Lakin and I wanted was to be qualified OD, underway and in port. We were going to compete like you'd never seen anybody compete, and we were really working on that. About then I opened my mouth in the wardroom because I got very upset. I was just having a cup of coffee and listening to the guys talk about hanging seamen for some infraction. I said, "Hey, you haven't even found them guilty yet." All of a sudden, Lieutenant Harms called me out. He was the administrative officer. He said, "Hey, in the wardroom, you were talking to senior officers when you jumped in there with your opinion. You've got to mind your Ps and Qs." Then he said, "But right now, you're an assistant defense counsel." I said, "I

don't know anything about that." He says, "Then you will learn." The next thing I knew, I was a full-fledged defense counsel and ended up having 21 special court martials under my belt.

INTERVIEWER: Your date of rank was based on your graduation from OCS?

MR. BERGMAN: It was Year Group 56, summer. Being put after the Naval Academy made a difference to ensigns. If I had graduated in the fall, it would not have been that noticeable. The only time that it got sticky, in those days, was when you were going on a flight and there were only so many seats. That's when your lineal number counted. Whether you were a junior officer or a senior, they went right by the numbers in those days. Not only that, but all of a sudden, I was a security officer and carried top secret material, and I had that thing strapped to my wrist. You guessed it. The lowest lineal number was the guy that got the job. If you never had a briefcase on a chain and stood up to a urinal, you ought to try it.

INTERVIEWER: But didn't you get to be last on and first off if you were carrying that?

MR. BERGMAN: No. I never got any special privileges. I just remember the annoyance of trying to use the urinal and keeping the briefcase out of the way. Anyway, I had a great tour after qualifying as OD underway. That was the day before the command duty officers and I had a wonderful time. I think I shared the little pylon story of when Captain Smith got me aside to let me know it was his ship, and you just didn't stick pylons out in front of his ship.

INTERVIEWER: Go ahead and tell that. Get it on the tape.

MR. BERGMAN: Well, any time we would have an aircraft launch, you would be hunting for the wind because you wanted maximum wind across the bow for takeoff. I said, "This is crazy. Every airport has a wind-sock." On my own, without discussing it with anybody, I went down to the parachute rigger and had a sock made up. I went to the sheet metal shop and had them make a frame. After hours, at night, we went up and tack welded it up there in front of the bridge.

INTERVIEWER: That was a SHIPALT!

MR. BERGMAN: That was fine, you know. I didn't come on watch until late the next day. When I did, the old man said, "Well, would you like to sit in my chair, Walter?" Of course, as you well know, that was the captain's chair. No one sits in it except the captain. I said, "No, thank you, sir." He said, "Well, is there anything I can do to make your tour easier?" He really played it up well. He finally told me, "What are you doing? This is my ship, Walter. Why didn't you ask me?" I said, "I just thought it was a good idea and went ahead and did it." Well, bingo!

INTERVIEWER: How old were you then?

MR. BERGMAN: Oh, God. How old was I? I was twenty-seven. The windsock stayed. He actually liked it. My other achievement on that ship as one of the defense counsels had to do with somebody turning on the sprinkler systems. That was a disaster. You had the hangar bay loaded with planes in various states of repair. The sprinkler system went off at night and you had a disaster. They finally said they were going to catch the guy or there would be a repeat. They put dye on the valves. Sure enough, it was done again. Lo and behold, they found the one guy. They had quarters for everybody, supposedly, and they held their hands out to be inspected and he had dye on his hands. Can you imagine that, on an aircraft carrier? They found the guy with dye on his hands and they gave the case to me to defend. Why he didn't get a general court martial instead of a special, I don't know, but he got a special. I started hunting around the ship, asking questions, and I found a snipe who didn't go to the inspection. If I found one guy who didn't go, there could have been others. My position to the legal officer was, "Hey, I can't get a fair trial on board here. Everybody was up at quarters. This just means that the guy is condemned. We won't get a fair trial and I need to have it at another place." He asked, "How is the old man going to ask Sixth Fleet to convene a special court martial on another ship, when we got a aircraft carrier with

over 300 officers?" I said, "Well, we're going to do it or I'm going right to Washington." We went to the USS *Mississinewa*, AO-144, and had the court martial. I got him off.

After that, the captain said, "Well," and they sent me on to justice school. I asked for it. I probably already had 15 or 16 court martials under my belt. I went there and you'd be pleased to know that, at that time, the justice school was pretty well manned by Harvard Law School. I wanted to be first in my class. I wanted to beat all the other lawyers and I wasn't even a lawyer, just for my own ego, which I still have, but I have mellowed. I went ahead and I just really worked at it and did fine. For instance, we had to write trial briefs. I wrote a trial brief and wrote in it, "Go ahead and ask him if he did, in fact, make a homosexual advance toward you?" I wrote that right in my trial brief. I wrote, "This will immediately be objected to, but you will have made your point with the board." I got called in to see the commanding officer and he really raked me over the coals. He said, "This isn't a game. This is justice. You know it's illegal. Where are your ethics in doing it? That's a smutty, cheap trick. As a Naval officer, you should not even think about it." It was a real morality lecture. It really was. He said, "It's grounds for dismissal and if not, disciplinary action." Finally, he calmed down.

INTERVIEWER: That was fifty years ago, right?

MR. BERGMAN: Oh, yes. They were really strict. I had another incident in which I went home one weekend, out of that whole time in the school, to see Janet, and the car broke down and I was late getting back. I phoned in ahead, but it was classified as unauthorized absence, and I had to go before the same captain for that. I used to be rather youthful looking. When you had khakis on, you didn't wear all the other stuff. He called me and started lecturing me about unauthorized absence and missing movement and finally, he asked, "Have you ever had any dealings with anything like this?" I said, "With nine years in the Navy, yes sir. I'm ex-enlisted,

sir." He said, "Oh, never mind. Get out of here." That was the end of that. But I think the story you liked the most from the *Randolph* was the gun shoot. We were having an operational readiness inspection and still had enough influence in straight 1100s that the Airedales couldn't build a carrier without a cannon. We had the five-inch guns and all the other stuff, and it was time to shoot. The target went down the port side and they missed that sleeve entirely. Then they started down the starboard side and the forward mounts missed that. I was boat division officer, at that time, and my men were on Mount 57. You have to realize that the aiming was completely controlled by fire control equipment. But my men were the ones loading the guns and shooting. I had a captain standing there. I was kind of overseeing things up from aft and watching as a safety watch. All of a sudden, over the IMC came and said, "That will be all for fire runs today." I piped up and said, "You didn't see the best mount we've got shoot. Mount 57 can blow that out of the sky." All of a sudden, that captain got on the phone and called up the bridge and arranged everything. He said, "There will be another firing run on the starboard side. Mount 57 will fly." They hit the bloody thing. Well, I was excited. I was happy. You know, I didn't think too much about it until we all went down to the wardroom for a critique. You had some very senior officers on a carrier, and lieutenants, and there I was, a young ensign, maybe even junior grade at that time. I don't know. All of a sudden, the inspecting admiral said, "And the spirit of Ensign MR. BERGMAN, for the competence of the men on his mount is to be commended." Well, I'm telling you, you were not too popular with the rest of the crew when you got singled out. It was an aircraft carrier. Launches and recoveries were important. To single out someone by name was probably inappropriate. Commander Black Jack McNeiler was really mad. He was angry and let me know it. That was fine. The gun boss finally came to my stateroom and said, "Could we talk, Walter? I'm so proud of you. You did a great job. But I'm just interested. What on earth would

you have done if it totally missed?" Without any hesitation, I said, "There's absolutely no way Mount 57 could have missed." He said, "Oh, boy. That's it. That's it. You're going to get in trouble one day. You'd better be careful." But he said, "Good spirits," and that was it. It was a great victory for me. Of course, I was very happy with the crew and really told them, because it gave me a feather in my cap.

I also was COD, or carrier onboard delivery, flight coordinator. Besides my other jobs, that was my assigned political job. This is one you will appreciate. What happened when there was a death in a family? You were going to send somebody home, right? But he had no precedent over anything, nor does an officer with orders. It was strictly rank and seniority for who got on the plane. Even with a death in the family of a sailor, an officer was going to get on first. You had to go up to the officer and say, "Hey, he's really going home to a death in his family. Could you wait another day?" You had to kind of sell that. I never could sell it to an Airedale. With any warrant officer, it was automatic. They'd say, "Sure. Go right ahead." That is an interesting observation. You were bouncing around for six to nine months, and you got pretty anxious to get off once you got an opportunity. But it bothered me that I could always convince the warrants, but never the officers. When this became interesting was later in BUPERS. Remember how, in the old days, you used to go over there to read your fitness reports? I guess that maybe you still do. It was a very quiet place. I went over there and was finally interested to see how I made out with my fitness reports on the carrier. Everybody was sitting around whisper quiet. All of a sudden, I went into convulsive laughter. A little old lady in tennis shoes came over and said, "You have to be quiet." I said, "This is so funny that I can't help it." I was absolutely blown away. I had great marks and everything, but it read, "As COD Flight Coordinator, he can do anything with people. He's a diplomat of the first order. Recommended for embassy, attaché

duty." I said, "There's something wrong here," because I was kind of brash. He had to write that about my COD Flight Coordinator duties. He did write down the other things, like "Ready for accelerated promotion and definitely on the path to command" and so forth. But it wasn't really that important.

INTERVIEWER: Well, maybe the guy before you had screwed up somehow.

MR. BERGMAN: You looked good, you know. I got back on the carrier. I passed my two-year college level test. I was also taking about twenty Navy correspondence courses and bingo. I said, "I've got to get more credits because I want to go on a five-term program." I went to the catalog to look for Navy schools that had a long time, and I thought I'd pick up a few hours worth of credit. I went to look and found the language school and the diving school. I had read Ellsberg and other books in junior high school and said, "That sounds like a winner." Just like you and I shared before, when I finally got to diving school, all I wanted to do at the end of the day was rest. I didn't want to take college courses to get credit.

INTERVIEWER: Had you any thought of being a diver before you looked up the catalog?

MR. BERGMAN: I had absolutely not had any thoughts. At that time, what I wanted to do was to get through the five-term program, get commissioned, have my college degree, ask for a leave of absence, go to seminary, become a minister and go back in the Navy. That was what I wanted to do. This is out of sequence, but when I was on *Penguin*, Bob Kutzleb really took it on himself to show me how rotten people could be. He could draw that out pretty quickly. I kind of got sour and said to myself, "I don't know if I could stand being a chaplain, having to deal with this type of stuff." I made the decision, which was very cognitive, Bob. I said no. One week later, I got a letter from the University of Missouri that read that I no longer had sixty hours worth of credits with them. I would need an additional nine. Then I got a call from the detail officer and he said,

"Don't worry about it. We're going to send you to Monterey instead." and that sounded good to me. But I ended up not going. I was a 1100 line officer with early advancement to exec. Then I got stuck because the submarine desk had me and didn't want to let me go. I had George Enright, Bob Kutzleb and Al Carry as skippers. I did 42 months on the *Penguin*. That was a long tour. I was out of step with my class. It was time to go to Monterey, but Monterey became only a postgraduate school. I lost my chance.

INTERVIEWER: What would you have studied at Monterey?

MR. BERGMAN: I would have studied for a B.A. or a B.S. degree. But the program was discontinued because Monterey was going to be just postgraduate. My running mate, Lincoln, the guy from the *Randolph*, had gone to San Diego State University with the rest of them. Then he went to Monterey for his postgraduate work. I got out of step. I went off to the *Randolph* and then to diving school.

INTERVIEWER: You went from the *Randolph* as a student to the diving school? Then you went to the *Penguin*. Then you went back to the diving school as assistant officer in charge?

MR. BERGMAN: That's correct. What else can I tell you, sir? I think the ship in the Panama Canal was the USS *Valley Forge*, a CVS, because we were flying S2Fs.

Near the end of my *Randolph* tour, I decided to go to 26 weeks of diving school. I was interviewed by an EOD diver on the carrier and got his blessing. Then I had to take an indoctrination dive on the ASR USS *Kittiwake*. I did that on a Saturday morning in typical hardheaded diver fashion. To put this officer in the water, they gave me a size two suit, which was too small and had numerous leaks. I made my indoctrination dive on the pier side in Norfolk. I flooded down and adjusted my air so that I could breathe, and I didn't get excited. As they brought me back up one of the officers, either the CO or the executive officer came on

board. When he saw my suit, full of water, he was pretty upset. But I had completed the task and got my orders to diving school, at which I arrived in 1958. Bill Wise was the assistant officer in charge. Nickerson was the OIC of both the Experimental Diving Unit (EDU) and the diving school. I was there a little early, before classes started, and Wise said, "Why don't you look around?" That suited me. I took a walk around, and out on the barge I saw 'Bull' Thurman in action. He was doing something under the auspices of the EDU. Pete Prickett was the diver. I think they were testing the new suit or something. Pete Prickett obviously did not do something that Bull Thurman wanted, so Bull Thurman proceeded to belt him right in the arm as soon as the diver's helmet came off. I could not believe that a naval officer would strike an enlisted man like that. He was just screaming at the guy. As I walked off that barge, I could only think, "This is certainly different from the carrier. What kind of pirate Navy is this?" I then went back inside where there were these 'open tanks,' as they called them, on the lower level. There was a deep tank, flooded with water, in which they trained the divers. All of a sudden, all kinds of alarms went off. There had been a blow up. A diver had used too much air in his suit and blown up to the surface. I saw a real panic situation and said, "Gee, what have I gotten myself into here?"

Bill Wise then said to me, "Your extra pay will start when classes start." I asked, "What extra pay?" For the first time, I found out that they paid divers extra money, and that was quite exciting. Herb Scranton was the other officer in my class. He was an ex-snipe, and we became buddies. We ended up being partners during the diving. In diving school, we always paired off in teams of two. The academic portion of the course, the questions and tests, were easy for a naval officer, but we were in class with a bunch of enlisted people. Teaming up on the various dives, we did okay. Bud Nuquist was also in that class, as an enlisted man. Of course, as an officer in an enlisted class, you had better be first or second or you hung your head in shame. With my

competitive nature, I said to Herb, "I don't care whether you're first or I'm first, but we have to be first and second on any exam. He didn't exactly share that philosophy, but we did fine. It was a relatively easy course. I was always surprised with some of the best in the group, like Jack Lahm, who was a first class petty officer and acting master diver many times. He was very, very good. There was a Chief Timmons who really, really impressed me. He was good. But the diving school itself was a pirate Navy, and I had a lot of trouble with warrant officers. In diving school, the high point, or the sad point, for me, was parking. I had an older car and asked for a parking space. That became interesting later on. No parking spaces were available for students. I was on permanent change of station orders, but that apparently made no difference. They didn't recognize that I was permanent, and not there TAD. Petty officers had parking spaces if they were staff at the school. But there I was, an officer, come up through the ranks, just off a capital ship that was very formal in the recognition of the hierarchy, and I had no parking space. That didn't sit too well with me. I had to park outside the gate, in a field, and pay some token amount for that privilege. That really annoyed me. Other officer students were passive on that. They just accepted the situation. That was the prevalent attitude. I was going up a very narrow stairway and Robinson, a first class petty officer, was coming down. I can't remember how long I had been in school. But I started up those stairs from the wet pot, going to the igloo. I went up that ladder, and he kept coming down. I grabbed him by his shirt and slammed him against the igloo. I said, "Listen, when you see an officer on a ladder, you gangway. I don't know what the rest of you pirates do around here, but I'm concerned that we don't adhere to some kind of discipline." I was an arrogant jerk. I was a junior grade. At about the same time, I met a warrant officer coming out, a very well known diver by the name of 'Chips' Thomas. Thomas walks right past me. I said, "Mr. Thomas, please stand fast. I don't understand what's going on around here, but

I'm a fellow naval officer. We're supposed to be shipmates. Plus, you're junior to me. If you see me with my hat on, you salute me. If you see me in the morning without my hat, you say, 'good morning, sir.' Do I make myself clear?" He looked at me like I was an alien, but he said yes and stormed out to the barge. Later on that afternoon, he came up to me and said, "I was so embarrassed that you had to talk to me like that. What have I come to, acting like that? I am truly sorry." I said, "Gee, that's great. I'm glad we're going to be friends." That was an episode I always remembered. Because of that, I'm sure the word got around to be careful of MR. BERGMAN, the jerk. But I just couldn't understand that attitude. It wasn't that I thought I was better than somebody else was, but I wanted to be treated as an equal.

INTERVIEWER: Actually, you were observing, as a naval officer, a significant drop in Navy discipline to a slipshod level. But it was a command problem. I've seen it on other bases. You were perfectly correct. You mentioned diving pay in 1958. I'm trying to remember when they changed the law and the regulation for diving pay. Were you paid footage in 1958, or did you get a monthly amount?

MR. BERGMAN: The changes in diving pay procedures transpired while I was on the *Penguin*. At the diving school in 1958, I think I got about sixty dollars. The footage thing was in effect when I arrived on *Penguin*. When SEC-NAVNOTE 7220 came out in August 1961, diving pay was changed so that everybody got \$110. The next most significant thing that happened at diving school was the incident at Wilson's Cove at Selby Bay. We used to go there for salvage projects. It is on the Maryland side of the Potomac River, just beyond the Woodrow Wilson Bridge. The river was very polluted, but on the salvage projects, we were somewhat protected by hardhats or Jack Browns. That day, we had an underwater swimming exercise, and our prior swims had been really rugged. In the SCUBA phase of our training, we went down to swim in Wilson's Cove. It

was also a day on which Bill Wise decided to take the craft down, and he was the senior officer present. He was a lieutenant at the time. I respected Bill Wise. He was a fine fellow. But I would have been the senior officer present if he hadn't come. We ended up on the longest swim across the cove and back, in partnership. Since there was a limited amount of equipment at school, some of us had aqualungs and other ones had swim masks. One fellow had a mask on. I've forgotten his name now. I just remember that his buddy's name was Merritt. We had to complete a swim, which was probably a quarter of a mile over and a quarter of a mile back, at the most. The instructors were skimming around in a boat on the surface, watching bubbles. All of a sudden, they were making all kinds of noises by banging on things, trying to get the swimmers to come up. But, focused on completing our swims, none of us paid any attention to that. When we did come up, we found out that there was one diver missing. Merritt had lost his buddy. Bill Wise alerted the school and Dr. Paul Linaweaver, among others, got on the presidential escape boat, which was really clean, I thought. You could never do that today. They raced down to the cove. The body had been recovered, by that time. The instructors were doing CPR of some type and the students were kind of just watching. As the presidential escape boat came up, I remember that Paul Linaweaver, in almost one motion, dove off the boat and onto this man, trying to save him. Of course, Paul couldn't and the guy died. I think it was attributed to vomiting. We swam in polluted waters. We were all feeling kind of sick. We were certainly given the option as to whether we made the swim or not, but we all naturally agreed to make the swim. That poor fellow got sick and vomited in his facemask. I think he choked on his vomit rather than purely drowning. That's just an opinion, or a memory. Our SCUBA training stopped because they didn't know how they were going to resolve it. We went on to the next phase. We did the salvage project, which was very, very interesting. It really made us feel like we were getting to be divers.

Billie Delanoy was there, one of the famous names in diving from that era. He was a young officer and just full of vim and vinegar. The officer in charge of the school at that time was Nickerson, but he was going to be relieved by George Mahoney. We were still in the days when we had little silver trays in our homes. When you made calls, you left cards. Nickerson surprised me. He lived in a duplex near Marlow Heights. I arranged for a call on him, but when we arrived, he wasn't home. He was quite embarrassed and quickly made a return call to my house. I said I was surprised that he wasn't home when I made my call. I didn't mean to rub his nose in it. It was just conversation, but it was stupid. Janet chewed me out for mentioning it.

Well, I'll go back to the salvage diving now. We had trouble raising our project. There was a free surface effect that Billie Delanoy hadn't taken into account. We learned quite a few lessons there. I really liked Billie. He might not have been completely knowledgeable, but he sure tried. Then I sold my old car and bought a brand new Plymouth station wagon. I went in to see the assistant officer in charge. I said to Billie that I was not going to park that new car outside the gate. I had had it. I had my orders and was ultimately going to the *Penguin*. I wanted a parking space. "I can't give it to you," he said. I went up and saw the officer in charge. Nickerson had been relieved and the new guy's name was George Mahoney. I talked to the new skipper and he said, "MR. BERGMAN, you have a couple of options. You can accept the situation or you can leave diving school!" I said, "Gee, sir, you have forgotten the third option. I can endeavor to relieve you at some time in the future and make this place run like it's supposed to be run, in terms of parking spaces." Can you imagine talking to a commanding officer like that? I must have had my brains in my feet. Bingo. Man, I was just angry. Remember the submarine? Well, there were parking spaces over by the USS *Drum*. I drove my car onto that base, right after I talked to Mahoney at lunchtime. I went out and brought my car in onto the base and parked it at

the *Drum* deliberately. I got a ticket. Then boy, I was mad. I took that ticket and walked up to the base headquarters to see the security officer, I guess. He was a heavy lieutenant commander. I came storming in there with fire in my eyes. He said, "Hi, there. My name is such and such. What seems to be the problem?" I just started. But he said, "Wait a minute. Would you like a cigar?" That really threw me off base. I said, "No, thank you." He said, "Why don't you sit and calm down, because you are very angry." He was so patient. He said, "You know, that is a heck of a note, isn't it? Let me look at it. Here. You got a parking space, my friend." It was down there by the *Drum*. The next day, I came in and parked my car there. My buddy, Herb Scranton, had a Thunderbird, but he said, "I don't dare do what you do. I'll just give up." Now, I don't want to jump, but I think it's prudent, and we won't bring it up later. After my tour in the *Penguin*, I came back to be the assistant officer in charge of the diving school. At that time, the whole area where the SR bell was kept was just a slophouse. We cleaned that out and I put in parking spots instead. I don't know how many parking spaces we put in, but we cleared out that area. I went to the base and got public works to pave it and put the lines in, and that was it. Anyone who came to diving school had parking spaces, officers and enlisted. I was true to my own conviction. It took me a while to get it approved, though.

INTERVIEWER: You were in a six-month course?

MR. MR. BERGMAN: Yes, it was twenty-six weeks. I think it probably ended in late fall because we did a cold-water dive and had to break up the ice with the Mike Boat. One of the funniest things that happened to me involved the underwater building project. All the separate pieces of a wooden box were tied up with line. They would stick that package underneath the ladder in the open tank to hold it until you got there. You had to make a box out of this wood, pounding nails in underwater and all that. It meant planning it out in your mind and being able to

put it together. You were working against the clock. If you let go of a piece of wood and it floated to the surface, that was a mark against you. You would have to blow yourself up to the surface, get your wood, dump the air and go back down. They didn't allow anyone to pull you up. You had to have a controlled blow-up. I'll always remember that. At that time, I was number one in my class, and we had a Reserve lieutenant who was doing his two-week cruise at the diving school. He was already a diving officer, but he wanted to do this project. He said to me, "Let's you and me make a bet, hot shot. I'll bet I can do it faster than you." I said, "For a buck, you're on." I was the one who went first. I was trying to go as fast as I could. It was a great success. Then he went down. I was looking through the port into the open tanks, and the poor sucker was having one difficult time. The sailors in my group nailed all his boards together, so he didn't have them loose. He had to work to pry each board off. They made it so difficult that I was naturally going to beat him. God bless him, he was a real sport about it. He came up and was just smiling. I said, "I'll give you the dollar, friend. You had a bum deal." The whole class laughed and thought it was funny. But he said to me afterwards, "Gee, you know, you ought to be pretty pleased. You're just with these guys a short while and obviously, you've gotten some kind of loyalty with them that they would do that to make sure you won." I said, "Well, thanks." Bud Newquist was one of the enlisted divers in my class at that time, and he went on to get commissioned. He was a good diver. Jack Tomsy and one other officer were there for a short course. Tomsy had been an enlisted diver and was going from there to be an ASR exec. The shell natron used in helium divers' helmets was looked on with great fear because it could burn your lungs and skin. Open water dives were made down near Dahlgren, Virginia because that was the deepest spot in the Potomac River, right by the highway 301 bridge. Jack Tomsy was down there to make helium dives and the divers were shackled onto the stage. I think it was Jack

Lahm who was acting master diver, although he was first class. The master said, "Okay. Unshackle the stage." The divers had to stoop over to unshackle the stage, so they replied, "We don't want to unshackle the stage." He said, "Unshackle the stage." They refused. They absolutely refused to bend over in the helium rig because they didn't want to tip shell natron solution into the helmet. Tomsy kind of got a little bit of a bad reputation for that. But you know Jack. If you thought I was arrogant, just go out with Jack Tomsy and he'll let you know. The general concern about burns from the caustic sodium hydroxide in shell natron was based on fleet experience. The EDU was working on a substitute. Actually, while I was AOIC at the Diving School, we were asked by the EDU to do an operational test of baralyme. Our divers made hundreds of helium dives using this new carbon dioxide absorbent. It worked so well that, just as I left for command of the USS *Florikan*, shell natron was removed from Navy diving and granular baralyme was used instead.

There was one other thing from diving school. We were down at Indianhead, where the EOD school was. We were with the craft and doing explosive stuff in the water. Chips Thomas was the officer in charge on the craft and was up in the bunk having a rest while we were doing things. The base fire alarm went off. I immediately went and woke Chips Thomas and said, "I'd recommend that you get on the phone and call the base to see if they need any manpower. We're ready and available to help in any fire on the base." He said, "Are you kidding?" I said, "No. That's good procedure." He did call. Later, someone at the base called the school's CO and said, "I want to commend Warrant Officer Thomas for being ready to respond in our emergency." It all worked out. That kind of was the end of my diving school experience. It was graduation time, and I went from there to the *Penguin*. It was my first time in Key West. Housing was a critical issue, and my family was still in Washington. We lived over in Capitol Heights, of all places. I

drove my brand new Plymouth station wagon all the way to Key West and reported aboard ship. George Enright was the skipper and Reserve Lieutenant Dan Callahan was the executive officer. The submarine desk at BUPERS had officers with dolphins under their control, and naturally, they were trying to grow, as all bureaucratic things do. They wanted to have more people. Walter was an 1100 non-submariner, but the original deal was for me to come aboard in the submarine group. They were overjoyed with that because it gave them another body to play with. They really thought that was great. But my 1100 desk had said in its turn, "The only way you're going to get MR. BERGMAN is if you give him an executive officer's billet," so I went to relieve Dan Callahan as executive officer on the *Penguin*. Transfers were just going slowly, and George Enright was supposed to be promoted and leave. That was the name of the game. I looked over the ship and it was unbelievable. I thought diving school was a pirate Navy, but on the *Penguin*, they were running around with straw hats and cutoff shirts or none at all. When they started requal diving, they simply put the diver in a helium outfit and put him the water over the side. They were moored to the pier. They were using pier-side diving to re-qualify divers for deep sea helium-oxygen diving! I thought that was despicable. I just said, "This is going to end." But Sam Kutzleb was coming in to relieve George Enright. All of a sudden, we got notice to go on a cruise and took off for the Yucatan Peninsula. I was really learning. I was on a small ship, and things were a lot different there, as opposed to an aircraft carrier, which was my first duty as a line officer. Everything was all tied up. I wasn't the executive, and I was just kind of sitting there, wondering. I was really just drifting and standing watches until the wardroom lineup got settled. God bless old George Enright. We got down to Mexico and I said to him, "Captain, I'll tell you what we ought to do. Why don't we buy a good wreath of flowers, find some memorial that they have here, march the troops over and lay the wreath there?" He asked, "Do what?" I

told him, "It's good for the ship. It's good public relations. You want to do this type of thing. We can talk to the attaché, but they're usually useless." He was still puzzled and asked, "You're going to march sailors?" But I answered, "I was an ex-Marine as a kid. I don't think I'll have any trouble marching sailors." Sure enough, we got a group of sailors together, marched them partway through town. The wreath was behind us in our pickup truck, and we lay it on their memorial. Did that go over big! That made a huge hit and got all the way up to the White House. George Enright got a commendation. He was now a hero with the Navy, and fooled absolutely everybody. He was on the list for promotion to lieutenant commander. That just botched everything up. It really shocked the world because George had a drinking problem, a very serious drinking problem.

There is one fascinating story that I must tell you. When we were in Mexico, the consul, who was a nice guy, and I still have, right out in my garden, a piece of wood that came from his swimming pool, came over to the ship to visit George. George was big on banana splits. When I say 'big,' I mean humongous. The poor guy was there and George said, "Won't you have a banana split?" Well, bingo, the steward made a huge one for each of them, and put them in soup bowls. Can you imagine that? You could see the green color come into the consul's face, but he was going to be a Trojan. George finished his and ordered another. Our guest was still tinkering, and it was almost turning into soup. But George was gracious and asked, "Would you like more?" I thought the poor guy was going to die. Callahan went away after I relieved him, and I was then the real executive officer. I started to work in my fashion, to make the *Penguin* crew look a little more like sailors. Helium dives were conducted pier-side, but until George Enright left, I couldn't change that, and that was bad. We really needed to do the actual diving. It was a pirate Navy. I did finally get that squared away and much more uniform. Ultimately, we won all

five Es, and it was a good tour. I think the interesting thing was that we were still, in those days, taking a Jack Brown mask and putting a deep-sea hose on it. At any time, we would go down and dive off coral to get langouste or just look. In Key West, Jack Brown with a deep-sea hose on it was pretty standard fare until it was totally outlawed. We did have coral shoes. It was a good tour. I enjoyed it and got a lot of training because Al Carry was one of the best people with whom you could possibly be. He was a great skipper, God rest his soul.

The next thing I knew, Bob Kutzleb came aboard as prospective skipper. We were then in port in Fort Lauderdale, Florida, as part of ASROC missile recovery. It was a standard thing. George Enright did have a liquor problem. It was really tough because Kutzleb was then standing in the background. Spratt was our deck chief, although he was only first class. Vic Thomas was the warrant boatswain. By the way, Vic Thomas died May 13th of this year. I made a signal with Spratt: if the Captain yelled down, be careful. If you didn't see my head nod, don't move the line. That was all arranged. We were getting underway. George was absolutely hammered. I remember it like it was yesterday. My cousin and her husband happened to come down to the pier to say goodbye. I was excited because they made the effort to come down and I forgot to nod my head. Oh, boy. All of a sudden, I saw that line getting taut. Then I looked like one of the nodding heads with the dog, with my ears going up and down. Of course, Bob Kutzleb was watching all this. We started down the channel out of Fort Lauderdale. It was a great run. But George was absolutely stoned, and he must have thought to show off in front of Bob Kutzleb. He said, "Well, I'm going to show you, Bob." The captain said, "Steering casualty, steering casualty." I don't know if you ever looked at the setup for doing the steering casualty drill. You took twenty nuts off as many bolts to get a huge plate off the deck. Then two capstans had to be hooked up port and starboard. It was a one-hour evolution at its quickest, while your command

was drifting helplessly. In a major ship channel, it was a real ordeal. But George was determined to do it. I said, "I recommend you drop the hook, Captain." He said, "I'm not dropping the hook." What were we going to do? Were we going to run aground? What was going to happen? Bob Kutzleb said to me, "I think you better relieve him for cause. Take command." I said to Bob Kutzleb, "If you think I'm going to do that, you're crazy. You are the next senior line officer, the prospective commanding officer. If anybody is going to relieve him, it's going to be you." He said, "Well." Then George said, "Belay my last. Let's get going." We finally proceeded on out of the channel.

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MR. BERGMAN: George Enright did have problems, but he also had a lot of abilities that people didn't know about. George could make it on his own merit. But when he got promoted to lieutenant commander, it surprised everybody. After he retired, he went with a civilian company, and I forget which one. They were going to try to find the *Lusitania* off the coast of Ireland. George was in the midst of that when there was some serious family problem that he had to leave and go home to, and that was the last I ever heard of George Enright. Here's one thing I liked about George: he had had a very rough childhood, and there was a large Negro girl in his brownstone, and George was kind of small. If anybody ever picked on him, this big black girl would intervene, and no one messed with her. Because of that, when we had a black diver,

Davis, on board the ship, some of the rebels were not exactly too happy with having him there, but George Enright made sure that guy was well taken care of. Davis was a fine young man anyway, a first class diver. I thought that George always felt indebted to black people because of what happened to him growing up. I want to say he grew up in the Chicago area. I think it was an interesting thing that he remembered that, and it had an impact on his life.

Do you know what a rook was, at the wardroom table? It was the thing that went from place to place to indicate who was going to get served first. Some ships called it a 'buck.' We called it a 'rook.' I still have the one off the *Penguin*, and it's a brass penguin. After Kutzleb came aboard, he said, "I don't know what that democratic crap is. I'm the commanding officer. I will always be served first," and that was that. But what else could I tell you about the *Penguin*? I can think of a few other things that happened on the *Penguin* during my tour. Sometime in 1959 or 1960, a Soviet submarine had trouble and became grounded off the coast of the Florida Keys. The destroyer group there in Key West was circling the spot. The submarine had bottomed, and they were trying to communicate and tell him, "We want you to surface, blah, blah," and all that stuff. Then they brought a submarine skipper out. In the meantime, they told us, "Get out of Fort Lauderdale and come down there. Get on that submarine." We came rolling in, doing all of our 17 knots. The ASR was there. She was going to dive on this submarine. I'll never forget it. We had Dr. Aquadro with us in Fort Lauderdale because we were doing some deep helium dives. I will not tell you stories of Charlie Aquadro in Fort Lauderdale because that would really drive you crazy. There was a very senior squadron commander there on a destroyer. He sent a boat for us and we went over and talked. The next morning, we were supposed to start diving on this submarine. Very, very early the next morning was when Charlie broke out his favorite monkey mask. He was wearing this funny monkey mask out on deck when the senior

officer came out to board us. I told Charlie, "Sorry, but you can't do this. We just can't allow it." He said, "Why not? You ought to have a little spirit." I replied, "Charlie, please don't." Charlie was a lieutenant commander then. He wasn't a lieutenant but did have some very willful ways about him. He got in a real argument with George Enright because he and I were going to go SCUBA diving. George said, "That isn't diving and you're not going to do it." He hated SCUBA diving. Anyway, all of a sudden, all the destroyers disappeared. The submarine officer came aboard our ship and said, "It's a wasted effort. Don't do it. In the middle of last night, that guy took off at over thirty knots. We all heard him." I remember that and it shocked me. That was a monumental speed to us because we were from Key West, and we hadn't been in the nuclear fleet. We were still in the diesel Navy. There were some tests done on submarines when Rickover came down to Key West. They had a low water casualty and he fired the chief engineer, just like that. I remember it was very, very impressive.

INTERVIEWER: Was the Soviet submarine a nuclear submarine?

MR. BERGMAN: I have no idea, but a submariner was saying, "He left here at thirty knots." I thought that was impossible and left it at that. They never found them again, and that was the end of it. The incident wasn't classified. I don't know whether it was reported in the newspapers, but no one ever told us not to talk about it.

Another thing happened on *Penguin*, later on. Bob Kutzleb was the skipper. They had made a big, huge pressure hull and were going to run shock tests on it. The X Map. We were towing that thing out through the main channel and it ran aground. We were heading out to the west of Key West towing it. It was not high tide and we just had too long a tow. The channel was pretty narrow and it happened. Davis, the first class diver, and I got in SCUBA gear and swam around it and did a survey. It was my opinion, and he agreed, that if and when high tide came,

we'd be all set. There was no real problem. But I guess that when it hit, a crack developed along one of the fins. It slowly flooded and then sank. We were supposed to sink it deliberately at another location. Then we were going to blow it dry after the shock test. But we never got to that point. Ted Bacheler was SUPSALV and he came down to inspect the problem.

INTERVIEWER: That was when I first met you. I remember that Bacheler was there when I came out to the *Penguin*. I said something to him that I had heard from Ken Ploof, which I should not have said to the SUPSALV because it was critical of him. I didn't know who he was. That was when you and I first met, in the fall of 1961.

MR. BERGMAN: I didn't realize it was at that point. In any event, I went looking for help from Bacheler as to what we should do. I was relatively new to the game. He said, "Well, you'll just have to sit down and figure this out, young man. If you're pressurizing, how soon is it going to surface?" I was in so far over my head I just couldn't believe it. But we were not successful in raising the X Map. A number of years later, an ARS went in for the job and did raise it.

We were going out for an operational readiness inspection and the SUBLANT medical officer, Captain Faucett, was the medical representative on the inspection team. We had done first aid training and the other things. Sam and I worked very hard on the *Penguin*. Warner Dewey was the squadron medical officer and we took him with us. That was after Aquadro. But, in any event, it was then the ORI and we were on the small ASR. We were not on the big ASR, but we had trained and knew what we were doing. I'll never forget it. We had the administrative inspection just before, and it was a classic thing. The administrative officer of SubRon 12 started to give me accolades in the review for what he had done in the *Penguin* office. Bob Kutzleb, God love him, interrupted the officer as he was talking. The officer was citing me by name and Kutzleb said, "Walter is certainly a reflection of my leadership. What's the next item?" Honest to

God, that's a true story. I figured out the medical inspection. I didn't know much about Faucett, but I said, "Hey, if he's any kind of examiner, he's going to look for the cloddy looking sailor and ask him first aid questions." This is terrible to say, but I went ahead and asked myself, "Who in the deck force looks like kind of a clod?" I picked out three of them and had our corpsman work for a week on them with first aid. I was right. He picked one of them. He was asking him hard questions. You know it yourself, but with the sea, you can have bad times and good times. We just had a great day. We had a clean sweep. We were number one. We were awarded the communication E, the engineering E, the overall E, the whole thing for the Atlantic Fleet Submarine Force ASR. I'm telling you, we were on cloud nine. It really was great. Sam and I had developed a nice rapport.

I remember one story. We were in Fort Lauderdale on ASROC recovery. That was not an easy job for the diver because he had to wash them out. They would enter the water at high speed and penetrate to the bottom. Then we were called to come to Florida's western coast to assist in the recovery of aircraft remains. The search for something on the bottom with sonar was a big chore, but we gave it a shot. We picked up John Light, whom George Enright absolutely detested. It was during Enright's tour. He just disliked the man. It was earlier, probably in 1959. An FBI agent also came on board, and he was just a very pleasant man. Let me tell you, we were so impressed with him. At the end of a two-week period, he knew the names of everybody on the ship. He called them by name on the scene, which really impressed me, because as the executive officer, I had struggled to know them all. He pulled it off in two weeks. Light was always on Enright's back, making recommendations and suggestions, and he was a pain. But it was an unsuccessful search. It was called off. I don't know what the ultimate disposition was, but it was alleged that somebody had a bomb in a suitcase and was collecting insurance on either his

wife or her husband.

There was another time. Kutzleb was the skipper and we were in the Gulf of Mexico standing by a nuclear submarine,. They were doing their test and everything went fine. We were following the submarine. Bob Gaucher was its skipper. The next thing I knew, the captain called me to the bridge and said, "Walter, something is wrong here. I think we're losing power. Will you look into it?" All of a sudden, there was a scream on the 1-MC. The screw had fallen off the shaft on our ship. We were a single screw ship, double wound armature, single propeller. I'll be a son of a gun, but the screw came off the ship and it was in the skeg. The submarine was accompanying us and we had to ask them to give us a tow. Bob Gaucher never took advantage of that. He was truly an officer and a gentleman. I mean, there really could have been quite a story. Consider the newspaper headline "Submarine Rescues Submarine Rescue Ship." He towed us in and we had to go into dry dock. Those commercial people were mucks about things. Bob and I were having an early breakfast and all of a sudden, Bob looked out the window and they were moving our ship into the dry dock. We hadn't gotten the screw on the ship. We couldn't go anywhere. We were in Alabama, in the same place that the *Pigeon* was built. Bob just absolutely went out of his gourd because they moved his ship without asking him. He was the commanding officer. But they just pulled us with little lines. In their dry dock, they put our screw back in.

I told you about my going to the officer's pool every weekend. A couple of months later, I was at the pool in Key West. Who came walking over but Bob Gaucher. I greeted him, "What a pleasure to meet you, Captain." I presented my wife and my family. He wanted to ask a favor of me. He said, "We set the sea detail coming into the ship's channel and lost our anchor at the head of it." I said, "I'll take care of it right away." I called in a couple of divers and they went out with a small boat and recovered his anchor. I think they used a 26-foot motor whaleboat, which they

were able to get from the tender. He was very appreciative. I told Bob Kutzleb, and he wanted to write it up, but I objected. Bob stopped and thought, "This is what they did for us." It was a good deal. We hadn't done anything foolish and it was all very quiet. Nobody ever knew about his losing his anchor.

The Cuban Missile Crisis took place while I was on the *Penguin*. Bob Kutzleb was the CO in the fall of 1962. The Navy had winter maneuvers and summer maneuvers, for which you had Op Orders. You had to follow them. We had just finished going through them. They were all communication plans and everything was fairly organized. All of a sudden, we had this emergency deployment because of the Cuban Missile Crisis. There's some stuff I can't talk about, but we ended up in the Carolinas and in Charleston to stand by, just in case. Julio Rivera was with us as squadron medical officer. What a fine gentleman he was, and a wonderful friend. He really helped me with my kids. We were in Charleston. Busby was the repair officer on the tender and I lined up to get a couple of things done. The whole world was changing and I remember we invited girls over from the nunnery. Bob was big on that stuff. We had them over for dinner. Al Carry was relieving Bob during that period, and Bob had orders to become the CO of the USS *Kittiwake*, which was very interesting because it was a back to back command for him, and that was not normally done. Al Carry is a giant, in my mind. He took over as skipper and at last, everything subsided back to normal. Al Carry was an interesting guy and also a very capable mechanic. We headed back to the Keys and back to home port and he didn't like the way the steering handled on the ship. He said, "Hey, Walter, make believe I'm not on board," and he rolled up his sleeves and got with the men, not just supervising them, but with the grease and muck like everybody else. He kind of overhauled the steering mechanism back in the after steering. He did it and I'm still amazed.

Then we were sent out on a helicopter recovery in the Gulf of Mexico. I think it was well off the coast of Biloxi, but I'm just not sure. The minesweepers had been up there and with their better sonar located the Navy helicopter. The minesweepers left and of course, we couldn't see where the wreck was. They came back, but in the meantime, Al Carry said, "We're going to drag for this." He took one of the ship's ladders and hooked grapples up to it to make a broader sweep, and we were towing that thing back and forth to try to find the helicopter, without success. The minesweepers came out again and they found it. They wanted us to come aboard for a conference. Al and I were wearing flight jackets and khakis, so I said, "I'll go change into my uniform, sir." He said, "What do you mean Walter? This is the way we are. We're working." Minesweepers were, I knew, a little more formal. They were little ships, but the skippers were straight 1100 guys. They were determined to go up the ladder. He said, "No. We're not changing." We went over and those guys had blues on with jackets, the whole bit. The captain was a little aghast, and he was certainly senior to us. But we talked it over and then went ahead to the operation. We started the body recovery and that was a miserable job. I looked up and there on the upper deck were all our sailors with cameras. I said, "Put your cameras away. No one's taking pictures of this." When it was time to put the body in the body bag, the public health doctor who had been sent out started vomiting. I told him, "Why don't you go up and have a cup of coffee? We'll take care of this." We got him in the body bag and that was it. I was surprised when we pulled the helicopter up. It looked like it had been shot full of bullets. There was a lot of magnesium in helicopter structures at that time, and the holes were the result of salt water action on the magnesium. As I remember, we only recovered one body, but I can still smell it. I don't know why a public health service officer was there. Maybe it was because he was closer to the activity than the submarine medical officer, whoever he was. That wasn't helium diving. It

was on air. Any time we were doing the submarine rescue drill with the false seat and everything, we really wanted the doctor out. It was not so much for the diving, because we thought we knew it all. It was for the accidents that could happen when you were doing it. You needed the doctor on hand.

INTERVIEWER: As I recall, regulations said SCUBA could not be used deeper than 130 feet and the dive had to remain within no-decompression limits. For dives deeper than 130 feet, you needed hard hat dress. If it was deeper than 170 feet on air, you needed a recompression chamber on the scene and a medical officer. Also, if you were diving with artificial breathing mixtures, meaning helium, you needed a doctor. You didn't need a doctor if you were diving with air and it was shallower than 170 feet.

MR. BERGMAN: Those rules might have been there. I don't think we paid attention to them, though. I really don't think so, because I can think of numerous occasions on which it was deeper. Let me digress with the *Penguin*. I've got a little sea story. The division commander would jump from our ship to the submarine with his flag and of course, he'd gone over to the submarine and sent a message over by flashing light, "I forgot my cheese in the refrigerator." Then with a question mark, he sent, "What do you propose to do?" Sam Kutzleb was the skipper. Before we could answer him, he came back, "I have the solution. Put Walter in the water and have him swim over." This is honest to God. This is a true story. You can imagine one of my divers or a line officer jumping in the bloody water with a thing of cheese and swimming over to the submarine. I don't know if you, in your diving experience, ever tried climbing up the side of a submarine. It's no easy chore. Instead, we went over there and really heaved for them to get it, and we successfully transferred the cheese. I'll never forget Commander Cooper. He was crazy. He was a very brilliant man. He went on to make captain. He was sent to the Naval Academy.

When he was selected as head of the language department, he knew that he was going to make captain. He had a fetish for shining belt buckles. He would go around taking belt buckles and shining them for people. Who was the other crazy guy down there who was division commander? It was Tex Procter.

That's kind of it for the *Penguin*. I then got orders to go back to the diving school to relieve Bob Pescott. Pescott was going over to the other side to be assistant officer in charge at the EDU. At that time, the EDU and the diving school had only one common wardroom. Officers from both activities used the same one. Once again, I was obsessed with all the ugly coffee cups. We purchased a standardized coffee mug. I still have one with an officer's insignia on one side, not a diving emblem but a Navy Officer's insignia, and the officer's name on the other. Everybody's coffee cup was the same. The officers' pictures on the board in the entrance showed some in khakis and some in blues. We all got new photos, all wearing the same uniform. The school was running fine, so I had time to fuss with those things. We had a hodgepodge of desks and chairs, which I replaced with new fiberglass chairs with armrests. Then I had some of the boatswain mates do some Irish wraparounds on the railings. We got rubber mats around the wet pot of the complexes where the topside divers stood watch. We painted up the place. I got a Medal of Honor to put into a cabinet display honoring all the divers who had received that award. People didn't realize that we had six divers who were awarded the Congressional Medal. As a matter of fact, that display is now a feature at the Diving Training Center in Panama City. The diving school was really functioning. There were some very good guys there. Joe Baimbridge was the training officer when I arrived. But then Vic Evans came and he was senior to Baimbridge, so I had to make Vic the training officer. Joe was a little disappointed when that happened. Next, I took a look at the naval architecture course. That was a circus. It was naval

architecture as it pertained to ship salvage. I decided to rewrite the curriculum for it myself, and I did. Naturally, no one else wanted to teach it, so I taught the course. It was basic stuff. You had to do some math and you had to use your slide rule, but that was fine. It was for salvage officers and all the diving officers, but only for officers. They all needed this information. It was a one-week course. I took the material home and ran it past Janet. God bless her, she was so patient. She said, "I don't understand it, but I can follow what you're telling me." I jumped in. I will never forget that first class because it was comprised of five EDs from the Massachusetts Institute of Technology (MIT) and Webb, not OCS. I would write 'Naval Architecture' on one side of the blackboard and 'Walt MR. BERGMAN, etc.' on the other. Then I went through my course. When I got through, they all came up and greeted me and told me that was the best review they had ever had. It was a review because they had all studied it at MIT and Webb. That gave me great confidence, so I continued teaching it. Bill Searle came down because he took a personal interest in improving the ED-salvage officer course. That was where he and I first met. I was talking to the graduating class of regular officers and gave my speech, a kind of a 'duty, honor, country' thing. Many years later, when I was working at Ocean Systems as a civilian, Bill called me up to talk to me. He said that he really wanted me to work for him because he was doing a reorganization of the OOC. I told him that I couldn't come and that I didn't want to be a 'sand crab,' or in the civil service. It wouldn't work. He said that he really needed me, and he quoted my speech from those many years before. That's Bill with his file cabinet and his great memory. He'd say, "Does that sound familiar?" It was basically the duty, honor, country thing that I gave those officers. He said, "The Navy needs you and I need you." I said that I would talk to Ed Wardwell. He really humbled me when he said that.

The diving school was fine and we just had a good time. I remember another humorous

thing that happened there. Sailors always lost their foul weather jackets. I wanted to solve that problem. I said that any sailor who lost a foul weather jacket would pay \$15 for a replacement. I told them I would get a foul weather jacket from the Army-Navy store to replace it. I wasn't going to go through the Navy supply system. We didn't lose any more foul weather jackets. It was that simple.

We had a big Mosler safe at the diving school, and I kept the money in there along with a couple of other things, but we just didn't go into that bloody thing that often. It was a separate little cubbyhole room off the space where the wet pots were. Then I forgot the combination to the Mosler safe. I couldn't remember it, and I never wrote it down. I couldn't get into the huge Mosler safe. They had to call somebody to come in to open it. Then Vic Evans told me that the mechanic was in there and taking care of it. I went into what was a very small, tight room, and there was this voluptuous woman in the shortest of skirts with the headiest of perfume. I mean to tell you, it knocked you over. Vic, of course, was standing outside just laughing his tail off. I was overwhelmed with what I was greeted with. She had one drill and made one hole. In five minutes, she was in that safe. But it was a heady experience for Walter.

When Bob Pescott got his orders from the EDU to take command of *Penguin*, I told him what a great little ship it was, and how beautiful the waters were in Key West. But Bob was prone to motion sickness. He didn't have a good time on the *Penguin*. He thought the seas were too rough and a few other things. He was a character, but he just didn't put it all together. He was quite a colorful guy, a big fellow who liked to look at the ladies. When he had the EDU and I was in diving school, he'd come over and say, "Let's go," and we would. He would say, "Let's go over to the BUPERS. We'll just walk in and look at the ladies." The BUPERS was over in the Arlington annex then. It wasn't really my style, but we would go. In those days, if you were in

uniform, you could sit and observe Congress as long as you wanted. There was no time limit. We seemed to have unlimited time and could go in there and sit in the visitor's gallery and listen to guys like Douglas and Dirksen. Those guys really had it.

This is my last sea story from the diving school. We weren't as smart as the UDT-SEAL people were in getting Naval Academy graduates into diving. The key to success in any Navy branch is having a ring knocker. UDT did, but we didn't. But there was a phase when people from the Naval Academy came down as a group, a class. There were probably about twenty or thirty of them in each group. A couple would be given indoctrination dives and the rest would watch. They were all gathered around the open tanks on both levels when Vic came running to me and said that they were reading 'crotch classics.' They had paperbacks stuffed in their pockets. I went out there and waltzed up to a midshipman with a question. Of course, he struck a brace immediately. I asked, "What is that protruding from your back pocket?" He said, "My Bible, sir," and he broke it out and showed me. The class was studying the Bible as an exercise in literature. I could have killed Vic Evans, but I asked him how many books were in the Old Testament and how many in the New. That stumped him, so I gave him the answers and charged him never to forget those numbers. That time, Vic was not trying to pull a joke on me. He really had thought the midshipmen were carrying dirty books into the school. But I called Vic in and said that I ought to make him read the Bible from cover to cover so that he could recognize it in the future. I thought that was a great sea story. When I left the diving school, they presented me with a beautiful blue Bible. I was very, very impressed and still have that Bible. That's the end of the diving school stories.

I went out to San Diego in 1964 or 1965 to relieve Clarence Smitter as the commanding officer of the *Florikan*, another ASR. Ed Whittaker was the executive officer. When I made my

inspection of the ship, I just thought it was a good ship and in good shape. When the commodore called me up prior to the change of command ceremony, I told him, "He's turning over an excellent ship to me. The only problem I see is with the forward hold, but I will strip the forward hold and make it the way I think it should be. The rest of it is outstanding and I'll be in great shape." He replied, "Walter, that's not what you should tell me. No commanding officer comes in and tells me he's receiving a fine ship. Usually, he says that it has quite a few problems but he should be able to fix them. That's the normal answer." But I told him, "That's window dressing, Commodore. You know it and I know it, and you should see through it a mile away." He finished, "I can see that you and I are going to get along." He was very nice. In any event, I relieved Clarence Smitter. The day after that, we set off for San Francisco to be standby for the submarines going out from the shipyard at Mare Island. It was post-*Thresher*. You had to stand by out there. There was an ex-chief petty officer diver who had made his way in San Francisco and had a successful Oldsmobile dealership. As soon as we pulled in, he would go ahead and put a car at the disposal of the wardroom, free of charge. It was very nice. Herman Kunz was at Hunter's Point at that time, as sort of a jack of all trades, I guess, and the program manager for one little thing or another. Herman was one of those guys who kind of had a reputation. His reputation was such that he never wanted to go to sea. He always talked about how he never went to sea. He did have kind of a black mark on him. But I had had a casualty with my anchor, which was very unusual, in that a Jew's harp had gone bad on it. That was the little shackle on top of the anchor, the loop that went on the top where the chain bends on. You were supposed to send broken ones to the anchor farm and that meant a long, long wait. Herman said, "I can take care of that for you, Walter. Just let me take care of it." I'll be a son of a gun, but in a matter of a couple of weeks, he flew down to San Diego carrying this Jew's harp for the anchor for me. He

had one fabricated for me in the shipyard under strict specifications. I put it on and was back in full commission. He did that, and from that moment on, Herman was okay in my book. I would do anything for him.

The next time we went up to San Francisco, there was dense fog and it was really difficult to get in. The pilot came aboard and he first said, "What are you doing, coming in through this fog? Where's the captain?" When I told him that I was the captain, he grinned and said, "Now, I know why." I guess I looked very youthful. He was pretty disgusted, but we got in. Fog could be really great. I didn't get the Clark Gable experience of going under the bridge when you couldn't even see the bloody thing. You used radar, but you just couldn't see anything. I thought it was quite fascinating because they had a terrific pilot boat there. You went by and saw Alcatraz and the rest. We had routine operations all the time. We never had any problems on the *Florikan*. It was just a great tour of duty. We had a serious bends case. I can't recall whether it was in San Diego or Okinawa. We had been diving pretty steadily when it happened to Lynn, one of my divers. I jumped into the chamber because somebody had to ride down with the patient. I noted that he had rattles in his chest and just sounded terrible. But the pain was relieved. I didn't want to ride out a table three or table four, so I was quite concerned. I ordered Ed Whittaker into the chamber. I came out when he went in. Ed told me that he had no trouble with nitrogen narcosis at 165 feet, but he became absolutely stoned. It was terrible. I was yelling at him, "Ed get hold of yourself!" and he finally did. But did I feel good when the doctor showed up. I had learned that lesson from Dr. Workman. The doctor was going to get me out of the woods. In my day, when you made helium dives and qualification dives, you went to a minimum of 180 feet. We did routine things, but Lynn had pains in multiple joints. It just scared us badly. Then when I put that stethoscope on his chest and heard him rattle, I realized I didn't really know

what to do next. But the doctor came and said that Lynn was going to be okay. The *Florikan* was a good tour for me. I just enjoyed it.

The interesting thing with the *Florikan* was the gimmick of the 'keep smiling' flag and the red, white and blue bell. Allen May was the master diver and I asked him to paint the three bands of the SRCs red, white and blue. He said, "I'm a master diver. I don't want to be the laughing stock of the fleet." Those were the days when the Japanese ASRs would paint their spuds international orange if they saw that ours were painted international orange. If they saw ours yellow, they would paint theirs yellow. I wondered if they would copy a red, white and blue motif. After that, I kept mine that color. I'm sure it wasn't regulation. It was actually different, but I liked that. I also had my 'keep smiling' flag, which I told you about. I don't remember doing any monumental diving. It was an easy thing. You called up SUBPAC and said, "What are some of the ports you'd like us to visit?" They liked that. The *Florikan* was home ported in San Diego. I had very little contact with our commodore and seemed to conduct most of my business with the division commander.

INTERVIEWER: Tell me about the qualification dives, the diving jobs and the availability of diving medical officers on the *Florikan*.

MR. BERGMAN: With the *Florikan*, when we were going to do deep dives or a four-point moor, I really wanted to have a doctor on board. The squadron was very cooperative and did send one out anytime we were in the San Diego area. When we deployed to Mare Island to stand by submarines, you never knew what was going to happen during that period. We would not have a doctor on board. But if a casualty had occurred, they would have flown one to us. When we did re-qualification dives on *Florikan* while I was there, I insisted that we actually do re-qualification dives. By that, I mean that we would dive in excess of two hundred feet on helium.

The air re-qualification dives were 130 feet or less. We worked, pretty much, in straight rotation. In the past, you would have had one or two diving officers, but at that point, there were as many as five diving officers on a ship at one time. We didn't follow the British tradition that the officer always made the first dive, but to gain the respect of the crew, we followed a normal rotation for every diver, officer and enlisted. When we deployed to the WestPac, no doctor was readily available and of course, we were over there for six months. We did do deep re-qualifications and four point moors there, and we did them without a doctor. Hopefully, one had no trouble. When we did have one case, they flew a doctor out. I don't know whether he came from Okinawa or the Philippines or somewhere else. I was in the Okinawa area at the time and it worked well. We had great support, medically. I don't remember any lack of that.

INTERVIEWER: Did you ever have to cancel a planned diving session because you couldn't get a doctor?

MR. BERGMAN: No. My command position was that a doctor was a very valuable asset to us. A simple little thing could happen suddenly. You could send the quartermaster out to shoot a pistol and he might mishandle it and burn his hand, or sea conditions could change. One time, I remember our 26 foot motor whaleboat came back in really rough seas, and he got hung right up under our stern, jammed in there, and we had to get him out. If you had broken bones or broken hands, what a joy it was to have a doctor on board to handle that. ASRs had independent duty corpsmen and they did a wonderful job, but if you had a doctor on hand, that was great.

During my two-year tour, I think the biggest job we had out in WestPac was changing a screw on a nuclear submarine. It was a pretty heavy chore because it wasn't some small diesel sub. There was nothing else that dramatic. Later, the *Florikan* was used in a movie in which it was called the USS *Bustard*. They went out and did great dives to recover a lovely Buddha on

the bottom of the ocean. But I didn't have that good fortune. We had a lot of independent duty and could do man-overboard drills, diving and ship handling for the newest of our officers. We had a great tour.

INTERVIEWER: What type of equipment did you use when you changed the screw on the submarine?

MR. BERGMAN: At that time, it would have been a Jack Brown, right from the pier itself. Later, when I was a civilian in NAVSEA, because of that experience, we designed a ROPER card, or Routine On Pier Emergency Repair something. The acronym was 'ROPER' because CDR Jim Roper was SUP-DIVE and I knew that if I put that in there, he'd approve it. We could go right on the pier and jump off with anything and have plenty of air.

INTERVIEWER: What I was also alluding to was that although ASRs were equipped for the deepest diving in the Navy, as the ships called out for emergency diving, they were also most often used as a utility or work boat for various squadron errands and tasks. I heard complaints that they didn't get to do much diving and had difficulties doing re-qualification diving.

MR. BERGMAN: You had to make time for it and just do it. In those days, our squadron Commodore was very, very helpful. Earlier divers used to go around looking for work and volunteering for work. They'd go to destroyers and say, "Hey, would you like us to inspect you? I'll do this," because they were paid footage, or diving pay. When the pay regulations changed, that was taken away, so divers didn't go looking for work. That was a change. In the WestPac, if there were any destroyers nearby, I would automatically send divers over to ask, "Would you like us to check your moorings before you guys get underway?" When ships moored stern-to-the-pier, anchors could be crossed. They could easily be fouled, and it was nice to know that they were in good shape. There was one other job we had out by San Clemente, off the coast of

California. One of our ARSs was mooring a submerged hull floating below the surface at a certain depth. They were having one tough time. We were called out to go help them. Those guys had been running straightaway hard, battling sea conditions and a string of problems. It was a struggle and they had been going at it for 36 straight hours. When you're in such a fatigued state, you don't think clearly. I was no genius at anything having to do with the Navy. I was just an average guy, other than my energy level. But we came fresh on the scene and saw the problem. I told the skipper and said that I'd be glad to help him. We were happy to come in with a solution and take care of it. That was an interesting observation to me. I don't remember anything else that was monumental.

At that time, the USS *Chanticleer* was also home ported in San Diego and I think we were competitors. We had two tenders and many submarines there. Much of our time was spent at the B Street pier, right down by the Star of India. That was a great place to train officers for landings. I liked a quiet bridge. I just didn't like noise. I liked to give commands in a normal voice unless there was some trouble. That was a contrast on the *Chanticleer* with Jack Tomsky, who was a pistol. He could be very loud when he wanted to be, and occasionally a little bombastic. Once, we had to tie up to buoys, and he went in first and did a fine job with the operation. He didn't have any trouble, but you could hear him all over the bay. When we came in behind him, it was by comparison kind of whisper quiet. I remember the quartermaster said, "A little bit of difference there, Captain, a little bit of difference." I didn't acknowledge the remark in any way. Jack and I were both competitive, and we were two ASRs at the same base. The Navy sometimes asked ships going to the WestPac to do special intelligence assignments and Jack had one of those and did a good job with it. That worked to his great advantage. *Chanticleer* once flooded its forward hold, which was not something one liked to have happen, but nothing came

of it. Jack was a very capable and able guy. He was really good. We were in competition, and I really felt that we had beaten him pretty handily on the operational readiness inspection. But his excellent work on the intelligence gathering in the WestPac made up for that and he ended up winning the E that year.

We made many trips to San Francisco to stand by submarines after the loss of *Thresher*. Those submarines did not want to hear us set off a hand grenade in the water to tell them to surface. That was the signal for 'I'm about to lose you.' We only had old, antiquated sonar to track them. When the sub began its high-speed sea trial, it would give you its course, but you almost always would lose contact with it. At our pre-trial scheduling conference, I would always bring that up. I told the sub's commander that if we didn't adhere to the planned schedule, then I would be in trouble. But I was a young Mustang lieutenant commander and he was a successful senior officer. That was 1966.

INTERVIEWER: I thought they upgraded your underwater communication and recording after the loss of the *Thresher*.

MR. BERGMAN: That's a negative. It was still 1943 stuff. But we would pre-arrange that at the meetings. I would say, "I'm not going to lose you. When the time comes, you'd better surface. If you don't come, I will drop the grenade. The commodore will hear it and know that you failed to keep in touch with us." They were usually very good, and we'd be in reasonable proximity at the end. But there was no Mickey Mouse about it. It was very, very strict. On a good day, they would complete the high-speed run, surface and say, "Thank you very much for your escort. You stand relieved," and that was it. We went back to port.

There were no memorable diving jobs. We did change that screw on the nuclear submarine in Subic Bay. That was quite a job. Once, I had a call out for an emergency on a

Russian ship. A Russian ship was in trouble, not a submarine but a surface ship. There was a little confusion as to whether it was a minesweeper or what it was. But I was told, "Please go to their assistance," and they gave us a position. We zoomed there as best we could and found nothing. I searched for about five hours. I finally sent a message back, "Unable to locate. I have no amplifying information. Unless otherwise directed (UNODIR), I am proceeding to port." The Navy was wonderful to include the beautiful phrase 'UNODIR' in the signal book. It gave the captain so much latitude. I sent it to Yokosuka. Lo and behold, nothing ever came of it. It emphasized the responsibility and the authority of the senior officer on scene. It made you feel good.

We had a joint maneuver with the Thai navy and a couple of American destroyers. For that, our ship was assigned the role of a destroyer. I was the only line officer on board who had been on a capital ship and really understood signal flags. ASRs were a very specialized group. All of a sudden, we had the school of the boat, getting qualified and what have you. We performed admirably, so much so that when I came back to port, Commodore Huey and the skipper of the destroyer were there and made me an honorary destroyer captain. That was kind of nice. I still have the plaque hanging in my office.

INTERVIEWER: Now, when you went to the WestPac, did you go to Yokosuka or to the Philippines? To go to Thailand is a long way. You covered a lot of ocean.

MR. BERGMAN: We went to Yokosuka. We did cover a lot of ocean. We really, really got around. We had some nice trips. We were scheduled to go to Singapore, which was going to be an interesting experience for me because I had never crossed the line. The WestPac cruises were typically six months in length. The *Penguin* trip to the Mediterranean was three or four months.

Let's go back to the *Florikan*. We were out in the WestPac with a group of other ships.

There was a kite flying off of one of those ships. It was a large ship, but I can't remember what type it was. I can't even remember the name. In any event, they flashed a light over to our ship that read, "Hey, the kite just fell in the water. Could you recover it?" Our 26-foot motor whaleboat went down in the water and we sent them over to pick up the kite and take it back. As they did that, the other ship interrogated them, "What ship are you from?" Our sailors yelled, "*Florikan*, the number one ship in the entire United States Navy." Oh, boy. The Admiral was flying the kite and really appreciated the spirit of those kids. Once again, it was dumb luck.

INTERVIEWER: What kind of a flagship was it? Was it a destroyer or a cruiser?

MR. BERGMAN: I just don't remember, Bob. In Pearl Harbor, on our way home, I gave a brief of my tour to Admiral Fluckey. He was a great guy. When you talked to him he knew who you were. He'd ask, "How's Janet? What about Chris, now? How old is he?" and right down the line. Because of my capital ship experience, I loved to use flip charts in my briefings. In Japan, I purchased poster board for that type of thing. I made them up myself. They were a condensation of our trip. I included the part about the kite. Well, he already knew about it because the admiral had sent him a message. A radioman in San Diego had missed the departure of his sub to Japan. I was asked to take him along with us and deliver him to Yokusuka. The poor guy was seasick the whole trip. He wrote a letter. Can you imagine that? A second class radioman wrote a letter to the admiral that read, "You do not pay these ASR sailors enough money. Our submarine duty isn't anything compared to what they endure." Admiral Fluckey got such a kick out of that, talking about the submarine pay and an ASR. Anyway, my flip chart thing went over big. The day after I arrived in San Diego, my division commander told me, "You really made a hit." That was why he was really trying to bug me to go to a destroyer. But we didn't do anything monumental on the *Florikan*. Still, it was a wonderful time for me. At the tail end of that time, I

was going into the shipyard. It was after the sea trials. Coming into the harbor to moor, we didn't get a pilot or ask for tugs because we could handle everything. Then I had an electrical casualty. We were coming into port and lost electrical control. We had to drop the anchor but still couldn't stop. We plowed into the bow of a pier-side LST and put a nice little hole in it. That was pretty serious stuff in the Navy. I wrote my letter report. My division commander came back with an endorsement. The commodore came back with his endorsement. That didn't burn me in any way, shape or form. It was very unusual. I was very fortunate. If I had it to do over again, I'd be more conservative. Maybe it would have been a good idea to have one tug stand by, just in case. But we had been out to sea trials. Everything went fine. If I had had any trouble out at sea, I'd have done that.

Out of the whole time, I think the greatest port that we visited was Okinawa. That was a wonderful time. We went to the Naha Civilian Club for the Civil Service. There was entertainment. A woman came out and sang some songs and of course, she wandered around with her microphone. It was party night for the *Florikan* wardroom and all the officers were there with me. We had a submarine officer standing duty on our ship. The singer came over and cuddled up to Walter, singing, and did I turn scarlet. I don't have composure. I really don't. It really threw me off, Bob. My officers were just eating it up. They thought it was hilarious. The Old Man was really embarrassed. That was fine. I got through that and we were still having a good time. The next thing that happened was another gal came out and she was going to sing at the piano. I could feel it coming. She said, "I need some audience participation." I just knew it, because you could picture the other gal saying, "Hey, there's a turkey over there, the tall, blonde, fellow sitting at the end of the table. He is something. Grab him." She came out. You guessed it. She came up and grabbed me. At that point, I could reestablish myself with my officers. We

went up there, and I'll bet I belted out songs with her for about 15 minutes. I had the time of my life. I could write home to my wife, "Janet, I have finally, finally made it. I have overcome being close to women. I put my arm around this woman and sang right with her. I'm not afraid of being close to women, other than you." That's just what a wife wants to receive. How could I think that? Oh, well.

INTERVIEWER: Did you ever suspect that your wardroom officers bribed these ladies to do that?

MR. BERGMAN: I'm not sure. I wouldn't put it past Ed Whittaker. I'll tell you, I wouldn't put it past him. What those guys would do, though, was call up the O Club in Yokusuka and reserve a good table. Yokusuka had great floor shows, you know. Whittaker was behind it, along with Al Strong. They would call up and ask for a table for General so and so from the Marine Corps. He was passing through. We would go in there in civilian clothes and they'd just say, "Reservation for General so and so," and we would get a great table. It was hilarious. I didn't know that until much later. There were a lot of funny things that happened, when I just think back. Those were great days. I enjoyed that command very, very much.

At the same time, I was having some personal problems at home with my oldest boy. I really wanted to finish my command tour. I really did. It was also the point in my career at which I had to consider where I wanted to go. My division commander wanted me to go to a destroyer because he thought I had a future. If I was going to climb the ranks, I could not do it in diving. I could go to command of the underwater swim school, but I didn't want to do that. I wasn't sure if that was a career path. Janet wanted me to. She wanted to get back to Key West because she loved it there. When I got orders to Washington, D.C., she was not too happy. I thought it best to go back to D.C. to the Experimental Diving Unit. From there, it would be another ASR

command and then SUBLANT or SUBPAC staff. I thought I would retire from the Navy as a captain, or at least a commander. Captain might have been difficult. Al Carry was the only ASR skipper who made it, as I recall.

I had my orders back to the Navy Yard and the EDU. That was my choice. I wanted to go to the EDU and really was as happy as a clam there. Pescott had gone to be the CO of the *Penguin*. Ken Wallace was the senior master diver. You remember the rest. As I think back, the only thing I was rattled about there, at the EDU, was that there was no accountability for anybody. You just assumed they were there. Having a senior officer like Bob Workman and a GS-15, Dick Murdoch, coming to quarters every morning bothered me, but they tolerated it. At quarters, everyone got the word about everything we were doing. Bill Leibold was the skipper at the EDU, and he was a legend among ASR skippers as being very, very rigid. I found him to be very pleasant, very easy-going, but he didn't understand compromise at all. He disliked Bill Searle intensely. I used to be at meetings with Searle. He'd start in his usual style and I'd let him know that I was the senior, unrestricted line officer present. That would always rattle him. He was an engineer, a restricted line officer. Searle was going to have a gallstone removed. He was in Bethesda. I went out to visit Bill in the hospital. We'd had a few clashes and it was a hot Sunday afternoon. He came in and asked, "What do you want?" I told him that I just came out to visit him in the hospital. I wondered how things were going and how he was doing. We sat down and had a delightful conversation. It was great. As I left, I went out the door and started down the ladder, and I heard, "Walter." I came back and although Bill was not usually vulgar, he let out a few cuss words and admitted, "I am really surprised. You really did come only to visit. You didn't want anything. You didn't need anything. You weren't pushing anything. Thank you very much. If I can return the favor, ask me to and I'll do it." I said, "You don't need to return favors

of hospital visits.” But that was not the end. Do you remember the jury-rigged air conditioning we had at the EDU? I got to thinking about the air conditioning problem, and resolved to get the money to fix it. I didn't tell Bill Leibold. I went up to SUPSALV and told them what we needed and why. I said that we were doing important diving development with multi-day diving and the conditions in that building were intolerable for the divers. Bill Searle gave us the money. Now that I had it, I went to Leibold and told him about my plans to put in some air conditioning. When I told him that the Bureau of Ships (BUSHIPS) had agreed to fund the cost, Leibold worried about using BUSHIPS money in a facility under BUPERS control. It was BUPERS that gave us assignments. I was permitted to go ahead, but the dispute foreshadowed the division that came later. With Bill Searle's money, we got some air conditioning that really worked. That was great.

I did go back to the EDU in 1966 but then retired in 1967. The Experimental Diving Unit, in 1966, was a place where a lot of activity and a lot of changes were going on. It was in the middle of a profound alteration in Navy diving. When I arrived, Bill Leibold was officer in charge of both the EDU and the diving school, but I was working on the EDU side at that time.

After the incident in which Chief Charlie Taylor lost all hearing in both ears during the emergency ascent from a deep long dive, something really different took place. It was interesting. I was scheduled to be on the watch for that dive but had to go up and do some work at BUSHIPS. John Harter relieved me as the diving officer. There was an equipment failure in the atmosphere control system and they had to bring the divers up as rapidly as safely possible. During that ascent, Taylor reported that he had gone deaf. Trying to figure out what had happened and what had caused it was very difficult. The medical staff was on watch outside and the diver was on the inside. They weren't going to lock somebody down into a saturation dive to

take a quick look. Besides, the push was to abort the initial dive and get the divers to the surface. The doctor thought it might abate if we went down another atmosphere and stayed there awhile. Pressure was increased immediately, but there was no change in his condition. The situation of the chamber was such that we had to get the divers out, so the ascent was cautiously resumed. Taylor surfaced from this very, very deep dive and was sent to Bethesda to the ENT people. But nothing they did in treatment worked. Taylor was profoundly deaf for the remainder of his life. The divers had a strong faith in Dr. Workman's oxygen treatment tables and they wanted to try it on Taylor and did it on their own. Without permission or supervision, the divers came in at night and given Taylor hyperbaric oxygen to see if it would relieve his deafness. He was a favorite, a great guy. In the EDU fire that killed two divers inside the chamber, Taylor was one of the two who attempted a rescue. He was awarded the Navy and Marine Corps Medal for Lifesaving. Ken Wallace was the master diver on the saturation dive on which that fire occurred. There were some very, very strong feelings between them. Taylor was a close friend of Ken Wallace until Taylor's death, last year. Ken was absolutely distraught that one of his divers was hurt and executed that clandestine treatment on his own. However, I understood later that there was a strong possibility that he had called Dr. Workman before he did it. I never validated that. It was an absolute no-no.

MR. BERGMAN: Afterward, I remember Kenny Wallace coming in to tell me that. Wallace had a very limited vocabulary, and I normally didn't allow swearing or taking the Lord's name in vain. I would correct any sailor or officer who did it. Wallace was trying to talk to me and was almost stuttering. I had to say to him, "Knock it off. You are allowed to use any words that come to your mind. Tell me what happened." I then had to go up and tell Bill Leibold about it. I mean, it was just such a breach. But I realized it was an emotional thing. Wallace thought he was acting

in the best interest of the diver. Fortunately, what he did didn't compound the problem. I said, "Okay, Chief. Thank you for coming to me and telling me that you did it. You could have hidden it and I never would have known. You get an ace for that, at least." I really had a lifelong respect for him.

At the time I arrived, there was still one officer in charge of both the diving school and the EDU, and it was Bill Leibold. Bob Workman was medical officer for both commands, but he soon was transferred to the Navy Medical Research Institute (NMRI) in Bethesda. Leibold and Workman had their offices side by side on the second deck of Building 214. That was just before the shift. Wally Kurz was the very competent, capable AOIC of the diving school. He was a lieutenant commander who had come from an interesting intelligence job. He had been 'sheep-dipped,' or disguised as a fisherman running up and down the coast of Cuba in a civilian fishing boat. He was a very, very pleasant fellow. Well, when the decree came down that it was going to change, that the diving school and the EDU were going to be completely separated, Bill Leibold was some kind of upset. When Bill was angry, he was a tough customer. He and Wally Kurz pulled down an iron curtain. It was really tough because we were fellow naval officers. We had both been commanding officers. But we couldn't talk. We had been officially separated. The wall was in place. That was how it was going to be. The second deck door that went from the EDU into the offices of the diving school's CO and medical officer was almost never used afterward. That arose principally from just a lot of animosity toward Bill Searle and some others. I don't know how orders to the medical officers were written, but the doctors had their desks in one large office on the EDU side and continued to work informally on both sides and used the sick bay in the school spaces.

Gene Mitchell was coming in as the officer in charge of the EDU and there was no office

for him. Chief Wallace and I sat down to reconfigure the space we had. We laid out a new office for the officer in charge, in the northwest corner of Building 214. We put up a partition in what had been the administrative office. His new office was beyond that, behind the space for the AOIC and a secretary. I told Chief Wallace to go get me the biggest desk he could find. He returned with the most beautiful wooden desk you'd ever seen. It was a real executive's desk, not the standard Navy issue. Gene Mitchell fell in love with that desk, so much so that when he went up to OOC he took it with him. We had no wardroom, so I designated one space as a staff room. Then I upgraded the furniture in what had been the divers' lounge. What could we do with the furniture in the old lounge? Wallace said that nobody could use it or wanted it, so the divers loaded it on a truck and took it to my house. It ended up in my recreation room. I always felt funny about that, but Wallace wasn't the type to kiss up to anybody. It was just that nobody wanted it. We did away with the wardroom and had a coffee mess in the administrative office. My office was in front of the officer in charge's office, and between that and the medical office were a locker room and a head. It was an uncomfortable period for us in many ways, but it was an interesting time in diving. We had plenty of great work to do. We were really developing deep diving and saturation diving. Bob Workman was working with us and so were George Bond and Walt Mazzone. They really worked hard on those saturation dives. Bob Workman, at the EDU, became professionally recognized as one of the creative leaders in extending decompression capabilities in diving. He was prominent internationally. He was interested in intervention dives, like the half-hour dives to 600 feet. Then the Bureau of Medicine and Surgery transferred him out to NMRI and he decided to retire. He went to work with Ken Wallace, for Taylor Diving in New Orleans, so that he could continue his interest in the area. Bob was very quiet and dedicated. If he came out of his office, smoking a cigar or his pipe outside the decompression

chamber, the divers got worried. I can still see him, to this day, making yogurt over in his little office topside. He was something else.

I told you about the air conditioning at the EDU. I also thought it was interesting, and I get confused as to whether it was while I was at the diving school or the EDU, when a Japanese medical officer came in for cross-training. Bill Liebold recognized him as one of the gentlemen who had been in the prisoner of war camp. Bill Leibold, being the officer and gentleman that he was, handled that well. That must have been a supreme effort on his part. Bill was really quite a guy. He was a very competent fellow and very prissy. He was very, very right down the line. He didn't mess around and I never served with him at sea, but I imagine he was a most capable commanding officer. John Harter was a young buck and the project officer. Later on, John had some personal problems and decided to retire. In any event, I later joined John when I was a civilian because we were both in the Azores after the *USS Scorpion* was lost. John was the engineer and I was SUPSALV representative and Ocean Systems whiz kid in that search. But that's a civilian story. My time at the EDU was, I think, well-spent time. I remember one diving experiment that was kind of interesting. I think it was a test from the young psychologist Tom Berghage. We blocked off the ports in the wet pot. We wanted to see how the divers would do in absolute pitch-black darkness. All of them started hallucinating, which could have probably been predicted just as well in a dark tank room. In any event, they are very much at unrest. We knocked off the experiment. It was just a little frightening. Then we had another tough one. We were measuring core temperatures. Do you remember that one? It was frightening when the numbers suddenly started to fall. I think we had it in our minds, or the doctors told us, that once you saw it drop too much, it was difficult to reverse. A plummeting core temperature was a very dangerous thing and scary to us. We kind of backed off a little bit on that testing. That was the

era and period of time during which we couldn't get the medical department to decide whether AC or DC electrical was a hazard to the heart. We couldn't get them to pick one, so we ended up with hot water. When my EDU tour ended, I decided to retire from the Navy. I had one of those beautiful little cannon desk sets given to me. A doctor friend of mine, Dr. Bornmann, with his wife, Karin, took me out to lunch with my wife. He gave me two Brooks Brothers ties with which to enter into civilian life. I always did remember that.

INTERVIEWER: What happened to the ties?

MR. BERGMAN: I kept those ties for years, Bob. I really did. They meant a lot to me. We would go up and down in the size of ties, but I always kept those two. I retired from the Navy with twenty years and two months and went over to Ocean Systems. Charlie Hedgepeth was already there in 1967. I was very fortunate because I had been spot promoted. I didn't have to do any additional time. My Marine Corps time in high school counted, too. Ocean Systems had acquired a chamber complex in Tonawanda, New York, from Union Carbide and Heinz Schreiner and Bill Hamilton ran it. But it really wasn't adequate for what they were planning, so Hedgepeth said they should plan a new facility and get it going. That was also when he asked me to come and work for him. I had interviewed at some other places. I went up to see Jack Tomsky about going to the Deep Submergence Systems Project (DSSP). Jack said there wasn't an opening at that time. I went to an interview that I'll never forget. It was with Bendix in New York someplace. When we got through, the guy said to me, "Let's talk about salary. Since you're a retired Navy officer with a pension, you should be pretty well off with that." I replied, "Not only do I have that, but I have a stock portfolio that anybody would envy. I really don't even need to work." He said, "Really? Tell me what's in it." I said, "I only own two stocks, sir." I had to explain that I was being sarcastic, but it was important to me. I expected to be hired on my

merit and compensated according to my performance. That did impress him, but in the end, Charlie Hedgepeth called me up and said to come to Ocean Systems. It was that simple. I could also stay based in the Washington area.

I was with Ocean Systems then. Ed Wardwell was there as Vice President, with Admiral Stephan as President. Gene Daley was from Harvard University and Dave Watts was from Yale University. Daley was the one who later started the Torpedo Factory in Alexandria, the real estate enterprise that made him millions. He was a fine man and a great hockey player. He was in the Navy League in Washington and just a great guy. His father was a fire chief of a town in western Massachusetts, and Gene was a class valedictorian. He went to Harvard and he had his hands full there. Dave Watts went to Yale. Admiral Stephan was introducing us, "This is Gene Daley from Harvard, Dave Watts from Yale, and this is Walt MR. BERGMAN from Dartmouth University. Afterward, I asked them not to do anything like that. I know Dartmouth is just as beautiful a school, with wonderful ice sculptures and all the rest. It was a great era at Ocean Systems.

MR. BERGMAN: At first, I was really a lost duck because we weren't doing anything. I had to kind of make work, sitting at my desk in Arlington. That was when the SUPSALV got worried about his Mark I DDS. Ocean Systems owned the ADS 4 diving system and was leasing it to SUPSALV. At the same time, SUPSALV was building the Mark I. Bill Searle called Ed Wardwell and asked for someone from Ocean Systems to come help him run that program. Ed Wardwell took me away from Charlie and sent me to be the engineering management for Ocean Systems, in Bill Searle's office. Wardwell had other engineers, but he said none of them wanted to be a manager. They just wanted to design things. I thought it was a big deal. Ed agreed and sent me to talk to Bill Searle. All of a sudden, I was into the Mark I Deep Diving System

fabrication at FMC. As the engineer on the scene for Ocean Systems at San Jose, we had a Phi Beta Kappa kid named Roger Haft. I would fly out every two weeks to go through the whole program with him and then come back to the Ocean Systems office to tell the local engineers what was happening. I'll never forget Roger Haft. He knew nothing of my background and took me to a fascinating Mensa meeting. I had never been in a group with that kind of interest. I was reasonably quiet and not too brash. I just kind of listened. They were studying subliminal learning. You played a tape recorder under your pillow to assimilate information while you slept. I think I read later that it proved to be pretty useless. Roger Haft was also a pilot. He had a single-engine plane. I had vowed that I would never fly in a single-engine plane, but I went up with him.

At that time, FMC was very interesting because we were exploring. There was a problem with forming hemispherical ends for the deck chamber and the Personnel Transfer Capsules (PTC). Mal MacKinnon had successfully used explosives to form the ends of the SeaLab II habitat, but those items were much thicker. Captain Dave Saveger was a very savvy engineer and was exploring the problem with Rockwell. To stay on time and within budget, it was important that the approach worked. Dave Saveger had gone through about three unsuccessful attempts and I was pushing him. We couldn't muck about any longer. We had to be realistic or we would never make our time schedule. Saveger was tight with Bill and complained that I was just raising Cain all the time. He said, "Give him another chance and he'll do it." The last shot did work. If it had not, we were not going to go to the orange peel-type construction. Dave Saveger was a very bright, competent engineer. We had our one nice big piece. It was a great achievement. The system was built.

Then I had to go home to bury my father-in-law. While I was taking care of that sad duty,

I got a phone call from Ed Wardwell, who told me that the *Scorpion* was lost. He sent me to the Azores as the Ocean Systems representative for SUPSALV to see what we could do. That was quite an operation.

INTERVIEWER: Tell me, what did the Ocean Systems contract with the Navy cover, and what did you do for the company, or for the Navy?

MR. BERGMAN: At that time, Ocean Systems had a general servicing contract to help with salvage, diving services, engineering assistance, and management, a really broad brush. When the *Scorpion* went down, I was up at the funeral for my father-in-law. I whipped back to Washington and Wardwell said, "I want you to go down and take charge. This is what we're going to do. We're going to take an ARS and rip off the gunwhales. We'll put the deep diving system on board with an ADS 4 type, and we're going to put Ed Link's submersible on. You're in charge. Let's get it done. If you find something, go after it full bore. We're going to send John Harter out, too. He'll be your technical engineering support and you can take anybody else you want." That was when I took the young kid, Stan, with me, but that's another story. We headed to Florida and were mounting out there at an airport, and Ed Link was very, very, very upset that he could not go. He was a ten-percent minority owner of Ocean Systems. He had no confidence in Walter. He didn't know Walter from a cord of wood, and how was he going to run the submersible operation? I had Joe McGinnis there, and Denny Breeze was going to be the submersible operator. We were having a devil of a time mounting out and getting everything together. We were taking C130s, with the ramps down, and pulling the submarine up right when Ed Link was there. The bloody chain broke and all of a sudden, you saw Ed Link's submarine on the ramp, slowly going down and rolling on the runway. That was not a good start. That was also the time when, as I already told you, I was being caustic with the press. I won't repeat that story.

We did finally mount up, and we brought divers from Louisiana and California. Ocean Systems. What was the Link submersible called? I don't remember. It didn't have a diver lockout. It was one of the earlier ones. I was all ready to go, and I got a phone call from Ed Wardwell. He said, "Walter, we've got a real problem." I asked, "What's the problem?" He said, "We've got the wrong material in the hull of that submersible. If it's cold water and it hits anything with any impact, it has the potential to almost shatter." I said, "You're kidding?" He said, "No. The results of the Sharpey V-notch test were just disastrous. But you cannot tell anyone else!" I said, "Whoa. You're sending me out there with a loaded gun." His reply was, "You've got to go, Walter. If it's life and death, we'll take the risk if we can save the *Scorpion*." He said that he would go to SUPSALV and did confide to Bill Searle that we had this problem. We took the submersible with us. It took a while to take the ship apart and get the divers all together, but finally, everything was loaded and we went. We were ready to start searching. But where were we to search? We got the best area to search and were out there with the ARS. We were fully equipped and ready to go, but I wanted to dive only on something that looked like a very good target. Joe McGinnis was a delightful fellow, but he just really wanted to get the submarine in the water and ride. He and Denny Breeze said, "What's the hesitation, Walter," and I couldn't tell them. I had to keep the thing a secret. It was tough because they knew that I was usually more aggressive than that. They probably thought, "Why doesn't he want to just put the boat in so that we can take a look?" Well, I just wouldn't and there we were. This is the crazy part of the story. We were back in port and going to go out again. They called us back in. I never knew what that was all about, but they said, "Hey, they've got a guy who knows where the submarine went down. He saw it, the *Scorpion*. He saw it go down." Bob Kutzleb was on the Palomares bomb recovery. Some fisherman said he knew where the parachute had gone in. He had done

triangulation with trees and shore features. They ignored him for a time but sure enough, when they went where he said, that was where the hydrogen bomb was. I said, "Hey, it's worth a shot in a Jeep," and I rolled out to find this guy. I bought a bottle of wine and we sat down at the table. We had an interpreter there. All of a sudden, what came out was that he had a dream in which a submarine ran into an underwater mountain. Not having consumed any wine, I left the bottle with him and went back to the ship. Then all of a sudden, we got a recall to the United States and it was all over. We knew where the *Scorpion* was, and it was nowhere near the Azores. The rumor I heard was that it was really the Russians who told us where it was. On a national television show, it was said that the Russians had information that they passed on to Washington. But John Craven contradicted that and I never knew the true facts. It didn't matter to me, but I was pretty upset, being sent out there with an inferior Sharpey notch product.

Stan Kellogg was the young man with whom I had gambled and sure enough, much like I imagined, he got caught naked in the pool on the Air Force base with an American schoolteacher. She was one of the teachers from the Air Force's dependents' school. Air Force had the whip out there. They had good accommodations. You went to the very nice restaurant and could order breakfast, lunch or dinner, 24 hours a day.

INTERVIEWER: Stan could have forgotten to pack his swimsuit, but if she was living there, she certainly should have had one.

MR. BERGMAN: That's right. It's always the woman's fault. James Magendie did the same thing up at General Electric. Oh, God. That was in a secured area, a test area. They didn't send him back to the United Kingdom. They thought Walter was very brash, very outspoken and opinionated, but when the company ran into a jam and needed diplomacy, they would send Walter to clear it up. Ocean Systems was recalled from the Azores because the operation was

over, except for some more intelligence gathering with specific elements dedicated to a better knowledge of what happened. I went back to D.C. I was living in Temple Hills, Maryland. I was with Ocean Systems for little over a year. The main things I worked on were the Mark I, the Azores operation, and a hydrographic survey of the Long Island Sound. I really had an interesting time there. The reason I left the Navy, which I loved, was that I had teenage sons who were proving to be quite a problem for my wife. At Ocean Systems, I had the same competitive motivation and wanted to be vice president of the company. I had this in the back of my mind when I had to travel thirty percent of the time. Then it rose to fifty percent and sixty percent, which was the very reason I got out of the Navy. I realized that was totally unfair to Janet. The catalyst was Bill Searle, who called me up to say, "Hey, I need you. Won't you come back on active duty?" But I couldn't afford that. He asked, "How about a civilian job?" I didn't want to be a sand crab. Then he gave me the duty, honor, and country speech. I discussed it with Ed Wardwell, who said, "I'll tell you what, Walter. You and Kutzleb have been great assets to the company and you've always got jobs here. I will consider you on loan to SUPSALV for a year because we want to keep Bill Searle happy. Don't feel forced that you have to do it, but you can always come back."

INTERVIEWER: This is a good time to integrate. You were assistant officer in charge at the EDU under Bill Leibold in the beginning, and under Gene Mitchell at the end of your assignment. In that period, you saw the monumental, epochal change within Building 214 and in the organization of diving in the Navy. You were witness to the split in responsibility between BUPERS and BUSHIPS, between the old submarine hierarchy and the new NAVSHIPS director of ocean engineering, for the control of Navy diving. You also had a long, close relationship with Bill Searle, who was the energetic individual who deliberately maneuvered most of that change.

MR. BERGMAN: That was only because of the hospital visit I made to him. He had monitored my teaching of the salvage course, but before he went to the hospital, we had had some clashes in conferences. I wonder whether he would have favored me had I not come to visit him in Bethesda. He could turn into a really nice guy. He'd say, "I'll solve that problem for you" or "I'll be happy to take care of that." He delighted in having all the other guys standing around asking, "Who in the heck is that guy from NAVSEA, telling us he's going to take care of this?" But in the end, Bill was maneuvered out. I can give you that transition. What really ruled were three stars over two stars. I talked to Admiral Fluckey, but he told me that he was powerless to change it. It was a three star deal.

I went to work for SUPSALV at NAVSEA, and ended up staying there for 18 years, starting in 1968. Bill Searle hired me but retired in 1970. Together, we were the ones who came up with the concept of a director of ocean engineering. I retired from the Navy in 1967, worked at Ocean Systems through 1968 and then went to NAVSEA. Bill actually spent the last part of his active duty on a different assignment in PMS 383. Gene Mitchell relieved him. It was very, very interesting, at that time. When Bill was there, the Office of the Supervisor of Salvage was really tied in heavily with Merritt Chapman and Scott, doing offshore salvage. We had an admiralty lawyer to cover maritime law and his offices in New York City were in the Merritt Chapman, Scott spaces. There was a lot of money coming to the Navy through the admiralty office. We were commissioning ships that we'd taken from Germany. A transition was taking place in our office in Main Navy. The emphasis on salvage was diminishing and the focus was put on diving because offshore diving for oil was going through an explosive period. It was a fascinating period of time for this technology. Bill just built up his organization. He would take on anything and everything, the cats and dogs that people didn't want. He was actually responsible for chaplains' supplies, even for the reverse cross in the chapel. It was Christ on the cross for the Catholic service and a plain

cross for the Protestant service. He took on ships' silver and petty things like that. He would say, "Well, that's another staff person I can add." He was a great builder, adding staff so that his office could grow. He got a UDT-SEAL officer assigned in order to take on that area of diving. Slowly and surely, he started building up, and that was his objective.

I think one of the most interesting things happened during Brad Mooney's stint in OP-03. The USS *Seacliff* and USS *Turtle* were originally purchased, built and funded to work down in the Andros Island range. There was a relatively small group in charge of that. All of a sudden, we had those two submersibles. In a meeting, Bill Searle said, "If no one else wants to take responsibility for these, I will." Then he called me in. I'll never forget it. He said, "Walter, these submarines are being built up in New London. I want you to go there and be the project manager for that on the side." I said, "You've got to be kidding me." But soon, Walter showed up and went through the program review, looking at those submersibles. It was over my head, but management of engineers was easy. They'd give you all the technical stuff you needed. If you had questions, you went and got another engineer to work it over. It was just basic management. Bill was just SUPSALV. The office didn't take on the directorate of ocean engineering until after Gene Mitchell came. Then Brad Mooney called me up and asked, "Would you please tell me what's going on?" I had the greatest respect for Brad Mooney, but he told me, "If you think I'm going to stand by and have some guy with a diving emblem be in charge of two submarines, you're crazy." I said, "With respect, Commander, when I was skipper of the *Florikan*, we stood by *Deep Star*." *Deep Star* was a small submersible and we were at La Jolla. I ended up riding in *Deep Star* and going down in it, as the skipper of *Florikan*. I said, "I'm familiar with these submersibles, Brad." He said, "Walter, you're joshing, and this is never going to happen. I am going to fight you hammer and nail. You stand by." I didn't know how Bill really felt about it, but it wasn't too long before he saw that was removed from our management. Brad was at OP-03 in the late sixties and a commander or a

captain. Then he went out to San Diego to Submarine Development Group One as chief of staff. He came back to OP-23 as a captain and then went to the command of the Navy training base in Orlando. That was where he made his flag. If you had a problem, he was a problem solver.

INTERVIEWER: Admiral Brad Mooney was a remarkably talented and effective officer, and everybody admired him and respected him. You were in OOC with Captain Searle. You were a witness and a participant in a major change in diving. When you started on an ASR, the submarine force ran deep diving. It was the determination of Commander, then Captain, Willard F. Searle that Navy diving, not only deep diving and shipyard diving, but also what we called 'underwater swimming,' should be run by an engineering duty officer from the Bureau of Ships, and he made it happen. He decided the same thing for the UDT, which became a SEAL operation, and the explosive ordnance disposal cadre. The submarine force said that they wouldn't give up the research submersibles, but that wasn't diving.

MR. BERGMAN: All of a sudden, that was a pretty big change, and the shift also came with a great strive to improve diving equipment. Bill was across the board and very dedicated to diving. We had plenty of money. Partly in hindsight, but partly while I was there, I saw a problem. There were various classes of category six research and development money. It was not all one big pot. It was subdivided into seven categories, with research at the basic level as 6.1. That was what the Office of Naval Research was doing. If the basic research were not already there, we would have to combine basic study with the next levels and put both into our requests for equipment development. We had contracts like that at Panama City, NCSL, Port Hueneme, and Dahlgren. In three Navy laboratories, plus Battelle and Ocean Systems, we were working on improving diving equipment with an almost unlimited budget. With the Mark XII, we came up with something like the Tucker automobile. We studied all the available diving equipment in the world and traveled all over the world looking at it. We were looking at Beebe's old helmet and upward. We were asking,

"What is the optimum? What do we need?" Our intent was good. The Mark XII was the new fiberglass diving helmet that was going to be not only better than the old Mark V but part of a completely new integrated and system-designed deep sea diver's dress. It was to be the whole outfit. We were going to go from the canvas suit and the copper helmet to a completely human-engineered diving dress for the deep sea diver called the 'Mark XII.' The laboratory at Dahlgren was a basic asset in our program. We found them flexible in working for us. They gave us good engineers. We got them cheap and could control them. We didn't want them to control the project. We wanted to control the project. That was the big thing. They were with whom we worked on the Mark XII. We were also looking at shallow water diving. We were asking, "What do we really use out of a PTC?" At that same time, we had PMS 395, which was the offshoot of the old Deep Submergence Systems Project, or DSSP, the outfit with which you are very well familiar. In my opinion, Bill Searle had always had a tremendous jealousy toward the DSSP people on Wisconsin Avenue. When an ASR failed to recover an object on the bottom, or from a plane in the Pacific, that was Bill's entrée to say, "Hey, the salvage force has to have a deep diving system." He initiated the Mark I DDS, which was being built at the same time DSSP's earlier initiated Mark II Deep Dive System was being built.

INTERVIEWER: You're actually confusing me a little bit. You're jumping back and forth in time, because I think that the Mark XII development was in the seventies, when Gene Mitchell was SUPSALV. When Bill Searle was in office, DSSP was PM-11. In 1970, I left DSSP. After 1970, PM-11 became PMS-395. It was in 1971 that Tex Brewer was assigned to that office.

MR. MR. BERGMAN: That's true, but it all started with Bill Searle. Almost everything started with Bill Searle. It was when you were still on Wisconsin Avenue at DSSP that this great jealousy existed between Bill and Captain Mac Nicholson. There was just some heavy competition, which was to the detriment of us all. DSSP was developing a push-pull breathing system for divers

working out of their PTC. We were working on a breathing apparatus to work out of our PTC. Our breathing apparatus worked with a combination of bottles and hoses, or just hoses, or just bottles. Push-pull was not in our game. A lot of money was being spent for diving boats, diving cars, and a lot of different stuff was going on. We were still going down two parallel avenues. But OP-03 said, "Keep it up." In fact, when I retired from the civil service in 1986, a captain over there said, "I understand you have some ideas to blow the whistle on duplications." I said, "I'm a Navy man. It's not me. I'm retiring. You'll not see me blow the whistle on my time." But it was an explosive period of time. We had to debate how we were going to heat a diver and how to do so many new things at so many times. Bill Witte and Gene Mitchell were go-getters. They were quite a team together. They were very deeply involved with Taylor Diving. It always amazed me, when they were down at Taylor Diving, prior to Ken Wallace taking over diving there. Ken was a very colorful character and very brilliant. We had an interesting relationship because they had gotten a contract similar to some of the services Ocean Systems used to perform. Ken, of course, was a really straight shooter. He was a hard working diver and did very well, I think, doing that. It was a lot different from the days with Mark Banjevich. There would be symposiums on offshore diving and those would be big deals. Guys like Andre Galerne and many others would come. It was a big show and a lot of 'rah, rah' stuff. Then all of a sudden, the industry showed up in civilian displays in New Orleans, like at the Superdome. It was somewhat like the recent bubble in the stock market: unreasonable, unfounded and overly glamorized beyond reality. Is that too judgmental? Then all of a sudden, things really, really took a rather huge downturn. I don't know whether it was that offshore oil stuff stopped or money started drying up everywhere. Maybe it was because the engineers beat us and came up with their underwater vehicles and equipment that could perform at a 1,000 or 2,000 feet or deeper. They could completely replace the diver at shallower and shallower depths. Finally, the chief of naval operations said that the strategic operational

requirement was for Navy divers to dive no deeper than 350 feet, which was what they could do when you and I came into diving in the late fifties. We were going to dive past 850 feet, and we went to a thousand. Now, the Navy limit is 350 feet! That's just crazy, and there are no ASRs.

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UNDERSEA & HYPERBARIC MEDICAL SOCIETY

INTERVIEW OF COMMANDER WALT EAGER

PROCEEDINGS

INTERVIEWER: This is the interview with Commander Walt Eager.

CDR EAGER: Well, I think what happened in the ocean facilities program relates quite a bit to how we got it started and so forth. It relates a lot to my career as it started. I was a design engineer for Food Machinery Corporation (FMC) back in 1953, after I graduated from the California Institute of Technology, and designed amphibious vehicles there, and armored vehicles for the Marine Corps and the Army. The company paid those who depended on a draft deferment less than it did the rest, and I didn't think this was very kosher. In came a CEC officer who had gone, served his time and come back to the Food Machinery Corporation and the ordnance division. I decided to go into the Civil Engineer Corps. When I got in, my first assignment was to the public works transportation center at Treasure Island, and it was a special program being developed to improve the efficiency and economics of land-based transportation. It wasn't quite giving me enough technical work, so I was working on the side.

Captain Martin, who decided that they really needed to be getting 24 hours out of me then, put my hat in for the nuclear power plant program. I went back to school, and went to Fort Belvoir, in what was called the Army Reactors Branch Program, and was the start-up engineer on the first nuclear power plant. Of course, we all know that Don Island, who was associated with Rickover, was very instrumental in the shipping port pressurized water plant.

Anyway, we built that plant, and I was the research and development officer and project officer on several projects. I came to the conclusion through vision that this program wasn't going to go anywhere, so I requested a transfer. I wanted to go into a program that had more importance, I thought. I was sent to the Civil Engineer Officer's School, where I taught nuclear defense engineering and disaster control. I also started up the disaster control organization there.

At that point, I applied for postgraduate school, and was sent to Monterey to study nuclear defense engineering. It was a very multiple-disciplinary course that involved, basically nuclear physics and all of the life sciences associated with the effects of nuclear weapons. When I got through there, I then went to the Armed Forces Radiobiology Research Institute and developed accelerators for developing radiation to test the effects of nuclear weapons at the National Naval Medical Center, and actually did the facility's work associated with the electron microwave accelerator.

I decided that the work that I was doing there was pretty much complete, so I requested a transfer, and it just happened to be that there was a billet opening at the Deep Submergence Systems Project. This was, of course, the group that followed PM-1, which did the nuclear submarines, and its interest was in deep submergence. John Craven was the chief scientist there, and Captain Bond was the medical person there. I was head of the Man in the Sea branch. The purpose of that branch was to basically develop equipment for doing deep saturation diving.

At the same time, a coincident group, setting along side of mine, was the group that developed the DSRV, the Deep Submergence Rescue Vehicle. Of course, those of you who know of that program understand what was involved there. I served two years there, and then the Office of Naval Research decided to involve NAVFAC in the Tektite project. The Tektite project was, of course, an underwater research project created principally to do scientific work using saturation diving. This was shallow saturation diving.

It involved General Electric, who built the habitat, and the Department of Interior, who had two geologists and a biologist there, as aquanauts. The function of the engineering command was to basically provide the facilities for that operation. I should backtrack a little bit and say that in my role as Man in the Sea branch head at Deep Submergence Systems Project, PM-11, I became a diver and trained at the Washington Navy Yard. In fact, I swam the Anacostia River with my radium-dialed, or

luminous-dialed compass glued to my faceplate, and I was only eight inches under the surface of the water.

Anyway, I was detailed to the NAVFAC as the PC-2. That program office, of course, was where we started putting together the underwater construction teams and so forth. Tektite was done in the Virgin Islands, and I don't know with how much of this detail you're familiar. I guess I'll err on the side of detail. Basically, the project was a two-story habitat. This Navy underwater construction pre-print that I'm leaving with you shows some of the details. But there was this two story underwater habitat placed in Lampshire Bay in the Virgin Islands, St. John, and General Electric Corporation constructed the habitat. The National Aeronautics and Space Administration (NASA) was involved because one of the purposes of the project was to find out what happened to people under isolated conditions.

They couldn't come to the surface under some sort of threat environment because they were looking at post-*Apollo* flights. Therefore, NASA was involved. The Department of the Interior was involved with the geologic survey, and there was one other Department of Interior organization also involved.

We essentially installed the habitat and put down, throughout Lampshire Bay, all of the facilities that communicated to both the habitat and shore-based station, including underwater refuges. We put all of the life support systems on an ante-pontoon and jacked that up out of the water in-shore. We used guardways for the landing. St. John is a piroclastic-formed island. It's very steep-sided. We were out in the bay, so there was a need to transport back and forth to our shore base, which the Seabees' amphibious battalion built. Amphibious Construction Battalion Two (ACB-2) was what I used. I went there as the commanding officer of that organization and had an ACB-2 officer under me, Jerry Pachillo .

Anyway, we went ---- went down and built the base camp, which was basically a base camp that provided personnel support. Then, at a distance from the base camp, at the bay, were these pontoon causeways. We then used those as a pier. Then, offshore, over on the side of the island was this ante-pontoon that we jacked up out of the water on hard rock. We had the helium source there. This was a helium auction diving operation with, I think, one percent helium being in the mix.

We then, of course, had the habitat to place. The habitat being a two-story structure, we had to get it down somehow. It had to go on a landing ship dock, and the landing ship dock, of course, couldn't bow us down far enough to get it on, so we mounted it in the Philadelphia Navy Ship Yard on an ante-pontoon. We transported the ante-pontoon on this landing ship dock down to Lampshire Bay, floated it off, and then drove piles through the spudwells and into the sea floor, which was sediment. Then, we attached winches to the top of these pilings, and the ante-pontoons were repaired by cutting holes in the bottom and putting a manifold on top so that we could sink it. But the winches were used to stabilize it so that it wouldn't roll over when we started flooding it. We had various compartments. We had this thing compartmentalized so that we could flood various compartments to maximize stability. Still, you had to have some means of stabilizing it. The interesting part of that process was that we did the test down in Little Creek. Is that what you still call that area, Little Creek?

INTERVIEWER: Yes.

CDR EAGER: That was in Norfolk. There, we had some wave action. In Lampshire Bay, being on the lee side of the island, there wasn't much wave action. The tests were not performed in realistic conditions. We got down to Lampshire Bay, and drove the piles into the ground through a template. We got ready to put it down. There was a tendency, even with the winches, for the pontoon to jam up on the piles. The interesting part of this program, which became nationally publicized, was that it attracted *Life* magazine, the whole works, and it attracted all kinds of people.

Lawrence Rockefeller, who was the owner of the resort on the other side of the island, and quite a bit of St. John, was there. *National Geographic* was there, covering it. All kinds of newspapers were there, including the Associated Press stringers. As we were trying to do it, these people were circling around the launch platform, watching this going up, and we didn't make it.

I should also say that Phillippe Cousteau and his wife were there. In fact, I escorted them around the site, underwater, and so forth. I think he was the one who was killed in a shark attack. Anyway, it came out in the St. Thomas newspaper's headlines the next morning, "The Unsinkable Molly Brown." You can understand the pressure that was on me, with all this publicity, and the potential problems for our program if we didn't get it done.

I spent a rather sleepless night figuring out what was wrong, and went back the next day and took very small increments of control. I had one Seabee in a crow's nest on each of the piles with his winch, and by commanding this thing in very, very tight increments, and very carefully controlling the manifolding, we got it down. Once the habitat was down, it was a floater, and we had to add lots and lots of ballast to the base of the pontoon to get it down. We actually moved it on over to the site. We did a number of different things. Once the facilities were all installed, it was then a matter of a salvage officer, and I don't know how much of the politics you want me to discuss. Anyway, I guess you should know that there was a major political problem in getting this program started. The director of salvage, who was a very strong-minded person, had decided that he wanted control of this program. I was equally determined. Since it was a new program, no NAVFAC, there wasn't a lot of understanding of the program in the command structure. The whole matter of doing things rested with me. I, as a commander, was dealing with this captain at the supervisor of salvage office, and it took a lot of very, very strong will to keep that program from absorbing this program.

However, there was a compromise that had to be made that the Office of Naval Research sort

of negotiated. In fact, let me just tell you the whole story. When we arrived on St. John, a supervisor of salvage officer, a limited duty officer, was there to greet them and immediately tried to take charge of the Seabee unit.

Of course, I didn't let that happen. Anyway, he ended up staying on the island and caused a lot of problems with the enlisted men. We had line Navy boat drivers, coxswains, to run our mail back to St. Thomas and supply and that sort of thing, and they were line. Of course, he tried to take charge of them.

One of my coxswains got into trouble going into St. Thomas. There was a lot of shoal area there, and he ended up puncturing one of the boats. I heard about this, and I knew it was going to create problems. I jumped on the other boat, and went on in and tried to figure out how we could salvage this thing and get it out before this guy started causing problems. He finally found out about it.

Unfortunately, in order to sort of appease him, I agreed to let a bar be built there in the base camp, and this fellow had an alcohol problem. I should mention that this concerned me with regard to the development of our program. The salvage divers were pretty heavy drinkers. I could see that as a problem for us because we had to deal with things that were much more precise and controlled. We didn't need somebody coming in the next morning with a hangover.

Anyway, this guy got hold of my coxswain in the bar one night while he was under the effects of alcohol, and chewed him up one side and down the other. I wasn't there, of course, but the coxswain came to me and said, "Commander Eager, I just can't drive anymore. My confidence is completely ruined." Of course, we were depending upon these coxswains to drive our boats.

Well, I got on the shoreline. We did have some telephones there, very poor telephones, but I got on the radio and radioed COMSEABEELANT's office, and told them to get this guy off the island. He was sent back to St. Thomas, and he set himself up in the public relations office there, so

that solved that problem. Well, anyway, we got the habitat in place, and we had to have ballast, which we brought ashore. We had causeway sections in which we had our equipment mounted, in addition to ante-pontoon on which the habitat was, and the ante-pontoon on which the support system for the habitat was. We had causeway sections loaded with our trucks and various other mike boats. We had mike boats and various things like that. I have to go back in my memory, and this is the first time I've really reviewed this in a while, so some of the things that come out shouldn't be for publication. Anyway, I'm following my nose here.

Incidentally, I brought the engineers from NAVFAC down with us. Don Potter was a very fine engineer, and we used him. Of course, all of the design and everything was done under my direction, using the engineers at NAVFAC. They came, and I trained them. I had the design background. I also had all of this life support background from having gone through the course at the naval post-graduate school, the nuclear engineering course, because it had all the life science involved, so I could completely understand that.

Then, having worked with Dr. Bond and the others in the Deep Submergence Systems Project, I had full understanding of that program, and could direct and supervise all of it. There was nothing that I didn't have control of. Therefore, I could deal with the challenges from the supervisor of salvage and so on. I also had the respect of the Office of Naval Research, so that helped a lot. We got the habitat in place and put out these weigh stations that the divers could have refuge in.

Prior to doing that, of course, I took everyone on a night-diving exercise, for which we actually went out by boat, peeled off of the boat while underway, dived down and searched the areas and so forth. We were very concerned about sharks. In fact, we had some problems of remoras while we were working there. Lampshire Bay, being a tropical area, develops a lot of plankton, and the remoras are almost as big as sharks down there. We had one diver who was fairly robust, and the

remoras loved to come in and try to attach to him, as they do to whales and sharks, I guess. They would circle out around us, so we'd have to be concerned.

We had bang sticks. They were basically poles that we had constructed, with shotgun shell detonating devices, in case we did get attacked by a shark and were really in trouble and couldn't get away from it. We had those sticks right at our sides. Those remoras would cause us some concern. But finally, we got used to those, and we didn't have any shark problems in the daytime. At night, we found that the nurse sharks would come in and settle on the bottom. Of course, the aquanauts that we were going to be dealing with were going to be doing night operations. Because I was to become the safety diving officer, and the salvage officer was going to become the operations officer, once the project got underway, I wanted to do a complete survey of the area and find out what the hazards were. The remoras and poisonous eels were part of the threat.

Anyway, we got the habitat down, and we got the aquanauts into the habitat. We, of course, had a hyperbaric facility on the support platform. The aquanauts got down, and they had never worked in this environment before. Of course, back at the Deep Submergence Systems Project, we had Scott Carpenter and all of those guys, who were very seasoned. These guys were completely green. They were good divers, but they didn't understand all of the elements of the problem. They were mostly scientists. We had to be really concerned that they might get so involved in their science that they would end up not doing what was right. They were using hookah rigs, incidentally. Their air supply was back in the habitat. They had both oxygen rebreathers and hookahs. They used hookahs a lot. This was basically a habitat-supplied line that ran out through a mask. I don't know if you're using those now today. But it turned out that one of them proceeded to swim out and failed to turn on his supply. He got out a long ways on just the residual in the mask and tube. Suddenly, he decided that he didn't have gas and came swimming back. He barely made it.

That kind of thing concerned us a lot. I was a safety diving officer. Of course, the salvage officer was in charge, and he decided to raise heck with these guys. Well, they weren't about to take orders from anybody. We had a close circuit television in the habitat, so we could see everything they were doing. That enabled us to know what was going on and allowed us to intercede in case there was a problem.

INTERVIEWER: Were the divers civilians or military?

CDR EAGER: These were civilians. Yeah, these were civilian scientists who basically worked for the Department of the Interior ---- survey was one, and one was a geologist. I think the other two were biologists.

INTERVIEWER: Okay.

CDR EAGER: This was, of course, Tektite I. There was a different mix on Tektite II. Anyway, they had decided that they were going to thwart the whole operation, in terms of safety. They proceeded to put a t-shirt over the closed-circuit television, which cut us off completely. The decision was made to not pull them out, not to go down and take them out and let them go with a warning. We still had oral communication there. Things went rather well from that point on.

Having, of course, been brought in from the Deep Submergence Systems Project six months before we had to go to sea, I think, I had done everything I could do to get the project ready. We were supposed to have the habitat down in December of 1968, I think. I could be wrong on some of these dates, but they are in the paper pre-print.

While I was down there working as a safety diving officer, I thought, "Gee, wouldn't it be wonderful if we could start the underwater construction teams in an experiment?" Incidentally, this was a medical experiment, or an experiment that involved approval from the Bureau of Medicine and Surgery. I figured, "Wouldn't it be great if we could go down there and start doing underwater

construction on a saturated diving basis like what we had been doing?” Of course, we had brought devices to test soil strains and all of that stuff, so we had already done a lot of this work. We thought, “Well, it would be interesting to do this under saturated conditions.” I wrote a proposal and went back. I left the team there, and went back to Washington. At that time, NAVFAC was over in Arlington, Virginia. I worked with the Bureau of Medicine and Surgery to try to get this approved. But the policy required a long lead-time for getting approval to use human subjects, and I failed at that. I went back to Tektite a bit disappointed, but understanding that that policy was pretty rigid and there was a reason for it.

Back there, we completed the project successfully, and as I said, we had many prominent visitors from the Cousteau to *National Geographic* and got lots of publicity throughout the country. That was helpful because it had some influence on how the command structure at NAVFAC viewed us. It was really important that we didn't fail. Of course, as you all know, when you go to sea to do something, you can't run to the hardware store. You've got to have everything planned out precisely. You've got to have every I dotted and T crossed, and you've got to end up making very sure about the safety aspects.

We succeeded in everything that we had planned to do. Oh, there were some interesting incidences. The saturation depth was, I think, forty feet. The entry well for the habitat was at forty feet water. The saturation depth was forty feet, but it was still saturation diving because those guys had been down there for months.

One night, we ended up having the water bladder. Of course, we had to bring water in from St. Thomas, and it came in bladders. Basically, the bladders the Seabees used were gasoline bladders or something like that, rubber bladders. Those were, of course, up on the support platform, and there was, incidentally, a command center up on the support platform with all the televisions. It was a van

up there. One night, all of a sudden, the bladder went flat, so I took a team of divers down. We followed the supply line out to the habitat and found that there was actually a separation in the line. In the course of doing so, we were, of course, using lights, and as we were swimming along, we could see the sharks and the poisonous eels on the bottom. Anyway, we saw those. Of course, when we got back, some of them came up, and when we got back to the camp, the base camp, we mentioned what we had seen. They were three or four-foot sharks. I won't tell too big a fish story here, but they ended up being six and eight foot sharks. Most of them were nurse sharks. Of course, in the southern hemisphere, they're on a severity rate of two, I think. But in that area, they were so well fed. Incidentally, Lampshire Bay went down to about sixty feet. Then, as you went off there, it dropped off to a deep depth. It was a really interesting area with lots of sea life.

The coral was just beautiful. It was all formed up on the side of this island, the piroclasts, the igneous rock island, and it was just beautiful. You'd go touch them and they'd just pop in, flowers and so forth. It was beautiful. Anyway, we completed that project. It turned out the ranger station for the national park was on that island. The ranger's house was on that end of the island, and there were lots of tourists who came to Lampshire Bay because, unlike Camille Bay, which was effected by the storms, this was on the lee side.

When we went down and built the base camp and installed templates and so forth, we came back on the deployment with the LSD, or landing ship dock, and had things ready to go. We had the diving barge down there. I have to work the webs out of my memory. I was just trying to figure out how we got that diving barge down there. I guess that came down to the final deployment. Anyway, for liberty, we would actually take the diving barge over to an island and some of those places, and look for wrecks. At about the turn of the century, there was a royal steamship line that got caught in a hurricane. It went down and broke up in thirty feet and sixty feet of water and it was our target. We

went out there on the back of this barge, which were basically pontoons. That was how we gave our divers wreck diving. We went down and took pieces off of the ship. There was a cannon on it, but we worked pretty hard with just scuba gear. We weren't able to get too much off, but we got bottles, porthole nets and stuff like that, which I think the Seabee divers really enjoyed.

Now, we'll go back here. I guess I had better just go ahead and provide all the linen here, dirty and otherwise. I've got to tell you this. When we went down to build the base camp, of course, we deployed with ACB-2. The Seabees from ACB-2 did the base camp construction.

INTERVIEWER: Were the Seabee divers part of Fifth Seabee II at that time?

CDR EAGER: No. Those were UCT-1.

INTERVIEWER: Okay.

CDR EAGER: Yeah, the divers were UCT-1. I'm pretty sure that's right.

INTERVIEWER: Right, those were the east coast organizations.

CDR EAGER: ACB-2, okay. Well, I'll tell you. You need to check that. You have to realize that this was 1968. That was 35 years ago, so I'm a little bit off on this. Let me flash back one more time to when we were doing the preparation of the ante-pontoons. Of course, when we were doing this, NAVFAC was very interested in this project, so we consulted with them quite frequently and came to understand his ante-pontoons very, very well. He was a very, very impressive fellow who has done a lot for the corps. Anyway, ACB-2 actually did the modification of those ante-pontoons to create the platform on which the habitat was to be placed.

I've always felt that on these new projects, the officer needs to get right in there with the enlisted men. You've got to know what you're commanding. During this work, we had to cut holes in the compartments of these ante-pontoons, in the bottom and in the compartments and prepare them, and I made a practice of going in there while the welding was going on to inspect everything that was

done because it was my responsibility. Of course, what customarily happened was that an unrated or third class welder or steel worker would be doing the work, and those above him would be sitting back and having coffee in the ward room. On the first day that this work started, I crawled into that ante-pontoon, and pretty soon, I had the chief and everyone else right down there with me. They came to understand that it was a project that you did not end up delegating to your lowest rated man, and that worked out well.

Okay, now, we'll go back to Tektite. The project being over, of course, we put all of our equipment back on the pontoon causeways and got the ante-pontoon with the support platform jack down, and got the habitat back on the ante-pontoon that we sunk down to load it. No. That's not correct. Actually, let's see. I think we may have floated the habitat. We dumped the ballast. No. We kept the ballast. Anyway, I think we floated the habitat. Oh, I should also say on the way down, we hit a storm off Cape Hattaras, and that was the storm of all storms, at least for me. Of course, the gear was all latched down and so forth, but this ship really was in a terrible roll condition. You could hear the stuff moving around in the well deck of this amphibious LSD. That created a few moments. I think there were only saltine crackers eaten for a couple of days on that whole ship. The Seabees got a good chance. Well, of course, they were used to it.

Anyway, getting back to Project Tektite, we got everything ready to go. I had two junior officers down there, one ensign and one lieutenant, I believe, with ACB-2. Of course, they had great expertise in dealing with amphibious equipment, and that was very helpful. The landing ship dock was to come get us. You have to understand that this was a time when Navy budgets were extremely tight. One of the things not happening was the maintenance on our landing ship dock. The captain of the ship was supposed to come into Lampshire Bay, well inside of the area where lee was created. Then, we'd load there. That was what was agreed to. We went aboard and had the pre-loading

conference, and everything was set. They were going to stay in there, in Lampshire Bay, and we were going to load from there. Well, it turned out that a squall blew up that night, and because of money restrictions, the radar and so forth on the ship, the radar, principally, was not working well. The ship captain got a little goofy about this thing and moved out into the open sea. The next morning, we got ready to load, and I had radio communications, walkie-talkies, to the ship. The captain said that he was not going to come back in, so we were to load out there. I debated with him for quite some time because I was quite concerned about this. The sea had calmed somewhat, and I thought he should be able to come back in, but he wasn't about to. I agreed to let the deployment go on out there. Now, I was staying on the island. I had invited my wife, mother, and kids to come down, and we were going to spend some time there while the rest of the crew went back. We went to bed that night. Actually, we were staying at the ranger's house, and I could see everything there, way above. It was during daylight. The causeways and the mike boats with the causeways hooked to the sides of them and so forth went on out.

The habitat was already in, and the support platform was in. No, that's not quite right. Anyway, they got out there and a squall developed. The causeways were beating against the mike boat, and the ship, of course, was headed into the wind. They couldn't beat their way up to the ship. I was becoming very, very concerned because I was watching this with a pair of binoculars. This went on for hours. Finally, the wind abated a little bit, and I could see the lights from the trucks that were on the causeways come up toward the landing ship dock. They had been there once before, but they failed to throw them a line to secure them, so they drifted back and got beaten up some more.

Finally, at about midnight, I saw the lights on the truck actually merge into the well deck of the LSD. I breathed a sigh of relief and went to bed. I got up the next morning, and there I saw a mike boat and a causeway section drifting free. It ended up down on a reef down island, down the shore a

ways, and the other mike boat was coming ashore with a causeway section.

Oh, and then, the mike boat decided to cut the causeway loose, and it drifted down the island with the truck. I guess there was just one of each of those. As they got back into Lampshire Bay, I saw the junior officer stand on the side of the mike boat and ceremoniously take out his wallet, throwing it into the well deck of the boat and jumping into the water. That really surprised me. It turned out that the causeways punched a hole in the mike boat, and it was sledding. Well, again, I don't think I can be court marshaled for this now, so I'll tell that part of the story, too. It turned out that I was so impressed with these Seabees that I had worked with, and there was a problem on that island.

We were on the remote end of the island and there was just nothing for them to do. This was one of the reasons I agreed to letting a barbie set-up, which was a very serious mistake. I allowed one of my officers to put a motorcycle on board one of the mike boats, which was strictly against Navy regulations. Let's see, did we have two on board? I think we might have had two on board. The mike boat was coming back. It had this motorcycle on it, so I could see a big problem for the Seabees, and for me, if a salvage officer came to rescue that mike boat.

I was determined to salvage the boat and get that motorcycle off. I had kept some diving gear there, or I rented some diving gear from the local diving shop. Anyway, the park service had a boat and a little submersible that could be towed, so I searched the bottom of Lampshire Bay to find that mike boat. Incidentally, the Seabees who were on board the ship stayed there. The Seabees who were on board came ashore with some coxswains from the mike boat, on a personnel boat. It turned out that their equipment on the ship was so bad that they could not communicate. Their communication gear for messages between the ship and the shore didn't work. My wife's pocket mirror was used to send light signals to the ship to communicate as to what was going to happen.

My kids, of course, were four and six or something like that, and they saw the Seabees coming

ashore, the few Seabees coming ashore, and they were really impressed. Of course, when the sea rations came out, they were even more impressed. They arrived the next day. Because the storm had died, we decided to try to recover the causeway sections.

What had actually happened was that the causeway sections had damaged the mike boat. There were supposed to be two of them coming alongside each other into the well deck of the LSD, but it turned out they wouldn't fit. That was why they got pushed back out that night and got beaten up. That was why we had the sinking. Anyway, we got the motorcycle off of the boat with the salvage bags, which I think I had also rented, and brought it over into the adjacent bay. I've forgotten which one that was. We moved that motorcycle over until it grounded out in the bay. There was a group of school children on an outing, a teacher, an old fellow and so forth, and all of a sudden, this group saw one of our chiefs wade out in his green and khaki camouflage uniform, and wade out into the ocean, into the bay. Then, they saw the two divers' heads emerge. Then, all of a sudden, they saw this chief coming out of the bay.

My wife was there with all of this, and the old fellow said, "Well, I'll be darned. I'll be darned," so it was really pretty humorous, but not so much for me. Anyway, we got the junior officer's motorcycle back, but it was kind of spoiled. I went on board the mike boat, on board the landing ship dock, up the Jacob's ladder and all, and we had a conference to figure out what was going on. It turned out that the captain had an appointment in Puerto Rico, and he decided he wanted to go back.

Anyway, I called. The telephone was still operating. I called COMSEABEELANT and told him what was happening. When he got to Puerto Rico, he was told to return and came back. I guess he actually took off. Once the mike boat was ashore, he took off. I was furious over this, so I called COMSEABEELANT and told them what was going on. They ordered the boat back, and the boat

came back, and we went aboard and did a planning conference to try to figure out how to salvage these things. It turned out that the captain still was very reticent, so they took off. I guess they ended up selling the salvage boat to take the causeway sections off, and the mike boats. Anyway, that was kind of the story.

Now, these things are important because, again, they tell what kind of pressures, concerns, and things that we dealt with in that early part of the program. I should also tell you that there were some really interesting race relationship problems there. This is late enough now that it's not going to affect anybody's career in the National Park Service.

When we first arrived on the island, we had a conference with the park ranger. You have to understand that the park ranger there, that billet, was a stepping position to the director of the National Park Service because it had a lot of prominence with regard to congressional visitors and so forth. In fact, Lady Bird Johnson and her family were down there. They were taught to snorkel by one of the guides down there, one of the black guides with whom we worked, in fact. It was a really prominent position. This fellow was on sort of a political hot seat. There were black and white population on St. Johns, but it was predominantly black. The schools, though, were completely integrated. There were very jealous attitudes among the whites and the blacks about their relationships. They felt this relationship was extremely strong, and that there was no bias in the system and so forth.

Well, you have to understand that historically, this was a time during which there were some activists who were trying to stir up black hatred here in the United States, and particularly in the Caribbean islands. You can recall the history of Grenada and that sort of thing.

There was a guy who had been the head of the Congress of Racial Equality, Roy Iness , and his wife was the administrative assistant to the governor of St. Johns. In fact, I was invited over to spend a few of my leave days at that house. He spent his time in St. Thomas, and I got to know Mary

Iness very well.

The two were either separated or divorced. Roy was running around the Caribbean islands, trying to get a black power movement started, a hate group, and Mary would have no part of that. Mary basically told me about the situation, but that was after, of course, I had interacted with the Park Service superintendent. He wasn't a ranger. He was park service superintendent. Anyway, the superintendent told me to try to keep my Seabees separated from the black population because he was concerned about race relationships. This was when we were building the base camp. We had been on the island for ten days, and because of the time pressures we were under, I didn't give liberty to anyone for ten days. All of a sudden, the park service ranger got a call from the ---- *Amali* newspaper, of St. Thomas Island, saying that she heard that there was a racial bias going on here because we were not allowing the Seabees to come into the community.

Incidentally, I think that was one of the reasons that we brought the motorcycle there. We were concerned about what the guys had to do, and particularly because we were warned ahead of time. Anyway, the park service ranger called me and said, "We got problems," and I said, "Oh?" He said, "There's an accusation that there is racial bias going on here, and we need to deal with that. I need to come over and talk to you immediately." He came to me. As an aside, these were formerly Danish islands. You drove on the left side, and the roads to that end of the island were really bad, but he made it in record time. We sat down and he said, "You know, we got this problem. I'm going to rescind everything I told you." I said, "Hey, there's no problem. First off, our guys haven't been out there because I didn't give leave or liberty, so that's what we tell the newspaper." That solved that problem.

However, from that point on, we brought black people into the base camp, and we had dances there and all sorts of things. It was a really interesting island because it turned out that when the Danish left there, they vacated these sugar lands. The island was basically a sugar production island,

and there were no slaves to work there. Slavery had been abolished; there were no slaves to work the plantations, so economically, they went down. A lot of the land went back to the blacks who had worked the land for many years. There were guys with baseball caps running around there who owned a lot of the islands. We got to know these people. They were really fascinating people. It was really an interesting cultural situation for our Seabees and everybody involved.

INTERVIEWER: Seabees, even today, still do a lot of outreach programs on behalf of the State Department.

CDR EAGER: Yeah. That was an interesting aside. You can see that we had some pretty fascinating times getting this program started. Well, we went back, of course, and with all of this publicity and having kept under control all of the problems that developed, the organization became quite accepted at NAVFAC.

Now, I don't know if there was actually BC-2 was actually in existence when I left on this project. I think it was. A guy named Whitey Oden , incidentally, was back at NAVFAC as a civilian, and he was a very good person. He helped a lot. He deserves credit. He probably didn't get as much credit as he should have.

We came back from that operation. Of course, ONR was very pleased with the outcome. I think everyone was. We came back and got the base going for the team. Now, what's failing in my memory right now is whether we had an underwater construction team at the amphibious base or not. I know UTC-1 was involved. UTC-2 was out in Port Hueneme. We used UTC-1, from Davisville. I don't think there was anything at ACB. I think everything was UTC-1.

INTERVIEWER: Okay.

CDR EAGER: We came back. Then, of course, we started organizing. There may not have been a UTC-2. Well, I'm sure there was.

INTERVIEWER: They were both established at the same time.

CDR EAGER: They were?

INTERVIEWER: Yeah, or they were both commissioned at the same time.

CDR EAGER: Okay. Well, you're going to have to check that history because I've forgotten whether we got them started ahead of time or not. Anyway, we got them well organized.

INTERVIEWER: Were these a part of the regiment at that time? They were so like ----.

CDR EAGER: Yeah. I think that was it. I'm sure that was it. I've forgotten all the things we did to get prepared there, like whether they went into training while we were doing the engineering or what that was, but it was something like that. Now, we went back. Let's see what project came up next. There were two projects. What's in this book, or in the photos at least, is the AFAR. Let me talk about the AFAR. The Naval Research Lab in New London wanted to put an antenna ray on the sea mounts off the Azores Islands, and the antennae were to be a test facility to determine whether we could actually go through the water for direct communication from submarine to submarine.

These sea mounts were very sharp mounts that came up within 1,000 to 2,000 feet of the surface of the ocean. This was a NATO nation project. Now, that meant it wasn't a NATO project. It was a NATO nation project that also involved France. We actually did the test in the on this thing, but then there were other projects as well.

In any event, we put together a cable laying ship from Italy, on which I deployed for a while, and we had a French ship for in-placing the antenna and a German ship that supported the diving operation that had to occur at the surface before the antenna went down. Of course, we were self-sustaining from the shore, with regard to the in-shore cable.

There was a laboratory on the top of the island. The cable ran down, over the land and into the in-shore zone, and over rock, incidentally. The sediment went to sea each winter, so our responsibility

was principally for the in-shore portion. We used cast iron armor and anchored in that in-shore zone. But I was involved in other parts of the operation. Bob Hudspeth ,who had been aide to Admiral Hudson , was my junior officer. Bob actually went on and got his Ph.D. at Florida Atlantic, I think, under Dr. Dean, and is now a professor at Oregon State University. I see him fairly often.

Anyway, he and a couple other officers wanted to get as many people involved in this thing. We started getting some input from the ocean engineering post-graduate program. That project was carried out pretty much, I suspect, similarly to what you are doing now, with regard to in-shore cable. We had to do some blasting of rock in certain areas with plastic explosives to prepare the path. Then, they would put this armor on. We then anchored the armor because it was pretty rough.

INTERVIEWER: Was that like a split pipe?

CMDR. EAGER: Yes. Anyway, I participated in part of this project, but we then had a lot of organizational work to do, so I left Bob Hudspeth in charge and came back and prepared for this thing.

I was involved in the testing of the launch. I directed the design of that. Again, we had really low budgets and once again turned to the ante-pontoon. As you can see in this picture in this paper that I've provided, we took an ante-pontoon and put individual pontoons alongside on the corners. We then used salvage bags and basically brought that array to the island. Which island that was, I don't know. It's in the paper, anyway. We prepared it.

As a practice, I would take my junior officers, and we would go through a stress analysis even after all the engineering had been done and we got there. We'd go through a stress flow analysis all the way from the top of that antenna down through all of the structure to look for potential local buckling and that sort of thing. We calculated in our minds what was going on so when we got to sea,

if anything went wrong, all of that was completely in our minds. We knew exactly what was happening, structurally. Basically, we were going to put this thing out.

Now, the weather out there was too severe for that kind of work, so we set up the weather watch. The wind direction changed when storms passed through, because this was on the windward side of the island. We ended up taking this from the island out to where we had to launch it. It was going to be going down in, if I recall correctly, 1,500 feet of water. This thing had an anchor on the bottom, and it had buoyancy at the top, the antenna did. They were hollow-tubed antenna structure, and they were pressure-compensating.

In other words, once the antenna started lowering, seawater would come in through a lithium high dried bed, generate hydrogen, pressurize the inside of these flattened, hollow tubes that were in an antenna ray, looking somewhat like an antenna from a satellite. But instead of being solid in the back, like a microwave, it had spaces between the tubes.

We went out and basically flooded the pontoon again, this time using salvage pontoons at the surface to stabilize, as well as the fixed pontoons, and winched from the salvage pond to the platform down until we could float the antenna ray off of this pontoon. The antenna ray was way up above the pontoon. We had to be really concerned about stability problems.

Well, we got it out and went down, did this experimental work and then recovered it. When we recovered it, as we were coming back, again we watched for the weather to give us the condition. I was on the platform on the barge, in command, so this was a command at sea project whether the Navy knew it or not, and there were no salvage people around. There were no line people around.

When we were coming back into port, a storm blew up, and this was serious business. Fortunately, I had done a lot of sailing and understood the sea, with regard to how it works, and I

managed to basically tack back into port, so we got in there to port safely, got the project put to bed and flew out the next morning, having worked all night.

Actually, we brought it in at night. This whole structure was brought in at night. I think we finished up at 6:00 in the morning, caught an airplane and flew back. We had no trouble sleeping through an eclipse of the sun on that trip back.

The other one that I participated in was the installation associated with the test of magnetometers for submarine detection. Let's see how much of that I remember. Compared with these other projects, it was not so notable. The devices we put down were fairly simple. Oh, I could tell you a little story about one of the things that occurred while I was involved in a deep submergence systems project, or possibly while I was a PC-2.

For experience, I went out to the Bermuda range, and of course, there were sensors out there, basically sound sensors. One was put down on the bottom, floating up from a radio isotopic generator. I think the Naval Electronics Laboratory in New London did that one, too, and it had been put down five years earlier. Of course, it was down at about 16,000 feet. I think it had some problems.

We took one of the ATT cable ships to go and recover it with a grappling hook. There were cables strung out that you could grapple and bring back. I guess that was the most impressive corrosion exhibit I have ever seen. It was, of course, mild steel. When it was pulled out of the water off the bow of that cable ship, you could see the label of the naval laboratory. It was in perfect condition, with no corrosion whatsoever. You could see the red growing on this device as it hung off the end of the bow, a really impressive sign. That was principally it. The rest of the work was done back at NAVFAC. By that time, things were going well, people were well trained, and deployments to Iceland were occurring. I continued on until 1974, building the organization and dealing with the organizational problems associated with it.

INTERVIEWER: Let me get a little background information. That was a great story, a book in itself.

This is great stuff, but I want to get a little background. When and where were you born?

CMDR. EAGER: I was born in Butte, Montana, in 1931.

INTERVIEWER: Where did you go to school? CalTech?

CMDR. EAGER: Yes. I went to high school in Butte and was selected to CalTech in 1949. I went there to study physics, actually, and decided after I was there, engineering was the better course for me because the competition there was extremely intense. There were 700 undergraduates and 700 graduates. The IQs for the physicists were out of this world. Something like 140 was the minimum. I studied engineering there, and it was a very broadly disciplined course. Although it said 'mechanical engineering,' it was an all-across engineering. I studied geology there, too. That was a required course at Cal Tech for sophomores, and it was a very analytical program.

When I left there, I went to design amphibious vehicles for food machinery preparation. Some of the amphibious vehicles that you see in Iraq are successors, or descendants, of those we built, the M-59, the T-119, and the Marine and Army vehicles. Then, of course, I was selected to the naval post-graduate school to the nuclear engineering effects program. I taught nuclear engineering to the engineers and officers who actually designed the missile facilities for the Titan and others.

INTERVIEWER: Did you ever play sports or any other extracurricular activities during high school or college?

CMDR. EAGER: I played tennis.

INTERVIEWER: You talk about why you came into the Navy, but why have you agreed to be interviewed today?

CMDR. EAGER: Well, I'll tell you. I had second thoughts. Jim Osbourne approached me once, and I was pretty busy as an engineering consultant. I've done a lot of work in ocean engineering, ocean

mining, incidentally, and a lot of work in the corrosion control of concrete bridges on the west coast. I was extremely busy, and I rationalized that I really thought NAVFAC ought to be looking forward instead of back.

Sometimes, I think we spend too much time looking back. My career has always been spent looking forward, and I've had one of these wonderful projects after the other from nuclear power, nuclear engineering effects work, missile silos, and all that stuff. I didn't have a difficult career. Incidentally, I was continuously warned by admirals and captains that I wouldn't make commander if I didn't move out of that specialty, but I said, "I don't care."

INTERVIEWER: Some things just don't change.

CMDR. EAGER: Right. I was determined to create the conditions while I turned my back on the nuclear power program. I was determined to make the ocean program because I could envision its value to the Navy. I was determined to make that a program in which we did have officers who were as respected as the people who had the typical career pattern. I was scheduled to become the head of the laboratory there as my next duty assignment. I had stayed, of course, in Washington, to make sure this program was on a solid basis before I would leave.

It turned out that at that time, there was a lot of problems in the area with school, drugs, and so forth. One of the civilians I knew said that his daughter was continually forced to flush narcotics down the drain. I wanted something better for my kids, so we decided to head off to Corvallis. I settled in Corvallis, where there were some facilities for testing ocean systems with the principal consultant, International Nickel Company, on manganese mining. That turned out to be a cover story, but it was still an interesting program. It wasn't the International Nickel part of it. They got sucked into it.

INTERVIEWER: You were involved in that?

CMDR. EAGER: Yes. Then, of course, I went on. I didn't think too much of looking back. Well, as you grow older, you grow a little bit wiser. I started thinking, "Well, maybe this is needed, as a tool for motivation, for the understanding that we really need diversity in the civil engineering corps." We probably lost something when we got rid of the draft. That was the only reason, probably, that I ended up in the civil engineering corps.

We need diversity, not just what you get from academy or ROTC, but something broader than that. I don't know how you can get that now, but I'm not sure it isn't really important, because there may be something that the Navy needs to be doing now completely different from what ocean engineering. I'm just extremely pleased to receive your briefing today and understand what has happened with the program. Everything that I had envisioned has happened and even more.

INTERVIEWER: That's great.

CMDR. EAGER: But it's important to communicate. The paradigm is of value to us because it gives us tradition, and it gives you opportunity to recruit and continue to do things you've been doing. Vision is extremely important, too, and it was vision that got this program going. That is one of the reasons I'm doing this interview. Another reason is that I can see there's some advantage from a recruiting standpoint.

INTERVIEWER: I think some ought to stay where we came from. I want to talk a little bit about diving because the focus on the oral history program for the ONR side is really the diving track. You first got into diving as part of the DSRV program?

CMDR. EAGER: Actually, my program was the Man in the Sea program, which was manned diving. The DSRV, of course, was a vehicle program, but I was sitting right next to it saw everything that was going on there. I should mention, incidentally, a little bit about how there was real recognition of our program, and I can tell you about some of the elements of that. I was awarded the Legion of Merit

for work on project Tektite, in fact. Senator Warner was the one who, as Assistant Secretary of the Navy, awarded that. There were awards given. I think the Navy commendation medal was given to my senior chief. From the deep submergence system project, I got the Navy commendation medal, and from NAVFAC, I got the meritorious service medal. In terms of medals, that shows that there was a basis for this program being recognized.

INTERVIEWER: Were you always motivated to get into diving or did you have a mentor who influenced you into that direction. Did you just fall into it?

CMDR. EAGER: No. When I go into any project, I go into it a hundred percent. There was no way that I wasn't going to be a diver when I was managing diving operations. Now, let me tell you, I wasn't a good swimmer. I had one heck of a time passing my swim test at OCS in Newport. I was a little weak when I got here and trained from one of our civilians at DSSP. I trained in the Bethesda pool. Diving, per se, has not had a major impact. What has had an impact, of course, is the engineering experience that I developed while in this program, including the construction experience, which was a vital part of the engineering experience, since this was a new field.

I did get involved in some diving with regard to the test work associated with the deep ocean mining. We did a test of the nodule collectors at the weigh tank at Oregon State University. As an aside, my kids got involved with me as technicians and became engineers. One of them is now a lieutenant colonel with the Air Force, directing a special sensors project for the Defense Intelligence Agency. My other one is involved in Star Wars, basically in adaptive optics, using flexible telescopes to take astronomical observations.

Anyway, I guess that's really not a part of this, but the ocean mining thing was a really interesting thing. In fact, I used a consultant to do some analysis, Dr. Lew, at NCL. We were doing the analysis on the electromechanical cable that put down the test vehicles. It was pretty interesting

because it was a multi-national project. The Japanese were involved, and I learned about face saving in Japan. I had informed them that if they failed to put a particular device on sleds that they would end up weakening the cable and it would break at a hundred feet as they were bringing it back. Sure enough, it did so. There was a Japanese collector sitting down at 15,000 feet about 1,000 miles south southwest of Hawaii. That was a major project.

I was all set to go to Bechtel and work in their program once I got out, but I interviewed there and decided that that was too big an organization. I decided instead to go on my own as a consultant. Anyway, that would have been ocean engineering work, basically waterfront work so I ended up taking that.

A little later on, I collaborated with Bob Ballard, who was the one who found the Titanic, on a deep ocean mining project that involved the mid-ocean ridge. We did a study for major mining companies in that area. We had a team together back at Woods Hole to do that.

Gradually, I went on over into certain other fields in my consulting practice because there wasn't a lot going on at that time. Well, that was a time, of course, when the oil companies bought up a lot of the minerals industry, which went flat. They started digesting these companies, and there was really nothing going on in that area. I did work for the Oregon Department of Transportation, and that was work that relates to what you're doing.

INTERVIEWER: That was with the bridges?

CMDR. EAGER: Yes. Actually, the coastal bridges are concrete bridges, and they were built back in the Depression period. The salt had finally worked its way through the rebar, and it started weakening the concrete. They had actually replaced one bridge, and it was an old bridge, and they gotten in a lot of trouble with the public. I came in there and said, "Hey, we can save these bridges." The next bridge, we did corrosion protection on. Basically, it was a process of replacing any really damaged

rebar, then spraying it with zinc and setting up a rectifier to methodically protect it. That was a major program. That got started in that organization, too. I have to tell you that I brought a CEC officer in there to relieve me, Frank Nelson . I don't know if you know him.

INTERVIEWER: I do know Frank.

CMDR. EAGER: That program is going well now. In fact, his organization is the only one that isn't getting privatized. Basically, it was ocean engineering that I was involved with, and things related to ocean engineering, like bridge work. I also designed rehabilitation for bridges and stuff like that.

INTERVIEWER: In your diving career, what is the one thing you found or did underwater that you will never forget?

CMDR. EAGER: I guess it was so routine to me. In the salvage Navy, the diving officer stood on deck. In the Navy that I was running, the officers were in the water with the enlisted men, observing and learning and directing where necessary. I was inside the base of that habitat, checking out the ballast and all that stuff. I got trapped in there one time and had to get out by really staying calm. I was able to move myself out because the access was pretty small. I set up a safety program as a result. I was the first one in, and I set up a safety program to make sure that safety was involved. It was like driving. For me, it was a tool to get a job done. Like your program, if there's a better way to do it, that's what we want to do it. Diving is important, very important, but it needs to be looked at in the same way we ought to be looking at unmanned space flight. We ought to be looking at unmanned ocean flights, and you're doing that, so that's good.

INTERVIEWER: It's interesting you say that, because one of the things where our paradigm is different than most of the other fleet organizations is we take diving as just a means to get to the job site. It's not the job itself, but it's interesting from the very beginning you have that attitude.

CMDR. EAGER: I might throw one other thing in there. One of the things that disturbed me a great deal was that business of alcohol and diving. I saw it in the salvage Navy, and I saw people die as a result of it. Unfortunately, some of our officers are too close to that bottle. I did everything I could to discourage that, knowing that it's almost impossible. When I got out of the Navy, I started getting the retired officers magazine, and I saw the number of alcoholic treatment center advertisements in it. I understood, and particularly with regard to this salvage officer that I had down on project Tektite, how much damage alcohol can do.

From that point on, the alcohol got out of my house and was never seen again. My kids have never taken an ounce of alcohol. This sounds like a men's temperance league thing, but if there's any of that going on in our diving system now, get rid of it to the extent that you can. We ought not have packaged liquor stores on Navy bases, Army bases, or anywhere else. There are more problems, socially, that people just bury, and it is worse than what you have from narcotics.

INTERVIEWER: I think you'll see that the Navy as a whole has taken a very strong attitude against that. It used to be a guy would get a DUI, and wink, wink, someone would take care of it. Now, as an officer, if you get a DUI, you've terminated your career, absolutely terminated it. You'll find that at a lot of the social gatherings, a lot less alcohol is being consumed. People have more soda, more juices, because the Navy has just taken a real intolerance to it. It has started to come around. We're not there yet but it's going in the right direction.

CMDR. EAGER: What about your divers?

INTERVIEWER: We still have a problem. They still have that attitude of work hard and play hard. But I've got to say that even in my short twenty-year career, there's a lot less of it now than there was twenty years ago.

CMDR. EAGER: Let me tell you what the low point of my experience with ocean engineering was. I don't think it was alcohol-related, but it was the loss of that diver in, I think, the Azores. We lost one there who went down, panicked and embolized.

INTERVIEWER: I can see that. A lot of talk has been not so much about Tektite but about the SeaLab program. The feeling is that when the Navy lost Barry Cannon on SeaLab III, the whole habitat diving program lost its luster. What is your opinion? Was it Barry Cannon's unfortunate death or something else that was going on in the background?

CMDR. EAGER: I'm not sure I know. I knew some of the personalities in that program. I knew Scott Carpenter quite well, and of course, there tends to be a macho attitude amongst divers. They can't die, and so on. I know Scott Carpenter was careless. He had the benefit of all of the information about physiology and so forth. He decided to stay on double time there and ended up with a necrotic condition. He, of course, was a risk taker. Now, you need risk takers. I'm a risk taker. But you need calculated risk takers. Of course, Scott Carpenter, as you recall, was the one who ended up 400 miles off target in Gemini. The Navy had to go chase him, and he got into a lot of other things that suggested that the guy should have been weeded out. He got into aquanautics when he washed out of astronautics. I think the lesson that can probably be learned there is that we should pay attention to psychological condition. If there can be a test to screen divers, it should be used. I was thinking about that with regard to Iraq and the suicides that have occurred as a result of Iraq and other wars. There ought to be a way of moving those people out before they're exposed to that environment. I don't know what history you've had with regard to loss of divers in our program. Have you had any more after that one? Now, you had the one, of course, that the terrorist had killed.

INTERVIEWER: We've had several, unfortunately.

CMDR. EAGER: Were they from diving accidents?

INTERVIEWER: Yes.

CMDR. EAGER: Well, my only suggestion is that you might talk to really knowledgeable psychologists. There's a bunch of quacks out there. See if there's anything that can be done maybe in coordination with ONR and the salvage Navy, perhaps, although I don't know that they're going to listen. See if there's a way of screening people so that you get calculated risk takers.

INTERVIEWER: That is a good point. Well, this is more on the DSRV strike.

CMDR. EAGER: Let me go back to Berry Cannon. I didn't know him. That actually occurred before I went to DSSP. I was at DSSP in 1966, I think, and it occurred before that.

INTERVIEWER: But Tektite happened after the SeaLab program, so we did try to get back into it. For other reasons, that whole program got cut. You said you were involved a little bit in submarine recovery, the DSRV?

CMDR. EAGER: Oh, well, I was alongside it. Now, let me tell you another part of my experience with DSSP. That was to develop a system for submarine escape from American submarines. It turned out that was one of the DSSP responsibilities, escape from shallow enough water. The British had a great system. Ours put four guys in a trunk. They'd compete with each other as to who could get out the hatch. By that time, they've absorbed so much air pressure that they've got a problem. The British started from 600 feet, and they put one man in at a time and evacuate him in a closed container, completely closed, with air flowing over his face. He rips off that face mask when he gets to the surface. I made that escape at Southampton and came back and tried to sell it to the Navy. I got absolutely nowhere.

INTERVIEWER: It's interesting. One of the questions here is about your opinion of the equipment that was developed for submarine rescue, such as one atmosphere diving suit, submarine escape emerge equipment, and the British submarine personnel escape system, and you just answered that.

What would you consider to be the most significant achievement made in the underwater field in the past fifty years and why?

CMDR. EAGER: Well, I think it was probably the development of the deep submersibles, in particular, the unmanned deep submersible. I think for certain reasons, which you know, and I'm not going to mention, they were extremely important to us. I think also of major importance is our ability to put down arrays and intelligence devices that stayed there, because there were lots of failures before we got involved.

INTERVIEWER: They weren't moving around because they were fastened to the sea floor?

CMDR. EAGER: Well, no. The Naval Research Lab, or another lab, had the suspended array, which was supposed to be a successor to SOSYS. Again, not taking care of how you designed the facility and doing contingency planning, resulted in failure. In fact, that failure was probably one of the reasons that we were invited into that Tektite program.

INTERVIEWER: That's interesting. Think about your career, which is just absolutely fabulous, in my opinion, in undersea technology. If all barriers had been removed, and I fully appreciate your comments about our CEC brethren, and you had been given absolute authority to do anything you wanted, what would you have changed?

CMDR. EAGER: What would have changed in the CDC or in our program?

INTERVIEWER: What would have changed in our ability to work underwater, in underwater technology?

CMDR. EAGER: Well, of course, I would have probably done precisely what you all have done, and that is to start moving over to unmanned operations and continually concentrating on how we could best serve the fleet, and you've done that. In terms of details, we've got to be careful not to end up

getting a toy and playing with it. In other words, things need to be used that really have a need to be used.

For example, simply going and getting a deep underwater vehicle like what they use up at Woods Hole and playing with it, is not the way to do it. You need the mission first. Then, you decide what to get to support that mission, in terms of efficiency and cost. That's the other consideration, value engineering on this system. I went through the American History Museum and saw some of the stuff that went on early, and I could see value engineering completely disregarded, and we valued engineering because we didn't have money. But we wanted to keep value engineering to make sure we don't spend anymore of the taxpayer's money than we absolutely had to in order get the job done properly, safely, and effectively.

INTERVIEWER: Look at about a hundred-year time line in the development of undersea technology. Of the many events that took place over the last century, what do you believe were probably the top three events that caused major changes in the way man viewed undersea technology and the whole philosophy of Man in the Sea?

CMDR. EAGER: Well, of course, saturation diving had a major effect, commercially, for the oil industry and so forth. Of course, they are using remote vehicles, too. I think the use of remote vehicles and the development of integrated circuits that give more automated control of those technologies can continue to be exploited to improve efficiency and safety and effectiveness.

Not looking into your black programs, with regard to the highly classified programs, knowing that I was going to leave the Navy, I specifically avoided exposure because I didn't want to take any chances. I wanted to have complete freedom to do what I needed to do. But my vision into that area tells me that there was a huge amount that could have been done. I suspect that you've probably done those, so that's where I would have concentrated.

INTERVIEWER: For the first half of the century, the Navy was the world leader in diving. Since that time, many of the Navy divers have been leaders in the commercial diving field, as you mentioned already, but currently, neither of these facts seems to be prevalent. What are your thoughts on that? Is that a normal course of evolution?

CMDR. EAGER: I'll go back to the idea that you need a problem before you start inventing a solution. As long as you can effectively get your job done for the Navy, you can either develop it yourself or bring on board from other organizations, agencies, or private industry. It doesn't matter where you get this technology. The key is that you get it and certainly don't want duplication. If industry is going on and doing things that benefit you, fine. If for some reason, because of their particular environment and requirements, they miss some areas, those are the pockets you want to look for. That's where you want to concentrate your technology.

INTERVIEWER: You said we should always be looking forward. Now, what would be your prognosis for our future? Where will we be going?

CMDR. EAGER: Well, not knowing the black programs, I really have difficulty in answering that. But it's very clear that our focus ought to be heavily on the business of how to protect our fleet, some of which you're doing now.

There's probably someone around with a vision who could spend some time and look at contributions that you could make. Maybe the people who are currently running the program cannot see or do not have time to see. Again, we get back to this business of making sure we don't inbreed and instead keep people coming in who are different. They might be the Steve Jobs kind of people. We need to be patient with them and let them look at where you ought to be going, independent of you, and when they're debriefed, debrief them fully before you start putting up barriers. Work with them.

Vision is something lacking in humankind, and vision is the most important thing in keeping one's organization from becoming obsolete. I would say that a focus on the business of how to overcome terrorism is a really important aspect. It ought to receive a lot of attention. People who are not involved are somewhat compartmentalized from those who are running everyday operations.

INTERVIEWER: I want to thank you for your time. This has just been fascinating.

(Whereupon, the PROCEEDINGS were adjourned.)

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UNDERSEA & HYPERBARIC MEDICAL SOCIETY

INTERVIEW OF CAPTAIN WALTER MAZZONE

Kensington, Maryland

April 2003

P R O C E E D I N G S

CAPTAIN MAZZONE: My name is Walt Mazzone. I can go by the title of Captain. I can go by the title of Doctor, or I can go by the title of Mister, but you can call me Walt.

INTERVIEWER: We'll start at the very beginning. When I spoke to you in San Diego, you mentioned that you're really the son of immigrants.

CAPTAIN MAZZONE: That's right. My folks came from Italy in about 1897 or 1898, and I joined them in 1918.

INTERVIEWER: Where were you born?

CAPTAIN MAZZONE: I was born in San Jose, California. Well, it was just outside of San Jose, California. I was raised in the Bay area.

INTERVIEWER: You went through the school system there?

CAPTAIN MAZZONE: Yes. I went all the way from grade school through college there. I went to San Jose State College and if it hadn't been for the war, I would probably still be in that area. Unfortunately, I was lucky and won a lottery that read, "Greetings and Congratulations." Rather than go into the draft and into the Army, I took one of the programs in the Navy to get a ninety-day commission. From there, I went to submarines.

INTERVIEWER: You said that you had an uncle who served in World War I in submarines.

CAPTAIN MAZZONE: Yes. My mother's oldest brother was on what they, at that time, called the "L-boats." They were running on gasoline engines, and that was always in the back of my mind. I knew that if I ever had to go into the service, I wanted to go into submarines and join my uncle. At midshipman school, when it came time to put in a green sheet of where we wanted to go, I put down, "Submarines, Submarines, Submarines," and that was what I got.

Even worse than that, though, was that I did not go to submarine school because I was one of about 12 or so individuals who were selected to go directly to submarines. We were to serve as a basis for comparison as to how long it would take us to qualify as submarine officers, versus those who had gone to submarine school. In that regard, it worked out really well. I didn't have to go back to school.

INTERVIEWER: You got your orders to report to your first submarine, which was under construction?

CAPTAIN MAZZONE: Yes. First, it was the USS *Pompon* being constructed up in Manitowok, Wisconsin, and then, just as it was going to go into commission, I was moved over to the USS *Puffer*. I stayed with the *Puffer* through its construction and commissioning, and the trip from Manitowok, Wisconsin, all the way down the Mississippi River to New Orleans, and then it out on war patrol.

INTERVIEWER: Could you describe that trip, from Manitowok down to the Gulf?

CAPTAIN MAZZONE: It was really a fantastic trip because during the first part, you came down the Chicago drainage canal, and they pulled the sub with two tugs. It was not good, clean water, as you can imagine, in which to attempt to operate the engines.

Then, at Lockport of Joliet, they put us into a floating dry dock and one of the pushers on the Mississippi River picked us up and took us all the way down. At night, because of the uncertainty of the channel shifts that occurred in the early evening, we would just push the barge right up against a tree and tie off and spend the night there. Then, we went down all the way to New Orleans and into Algiers, where we loaded up for war patrol. That was where they put on the truck.

INTERVIEWER: Not having gone to submarine school, you had to qualify on that boat like everyone else. What was the procedure?

CAPTAIN MAZZONE: For me, it was pretty easy in that while the submarine was in the builder's yard you could climb all through it there. I was able to make drawings of every system because the bulkheads were not put up, so everything was out in the open. I made sid drawings of every valve and all their functions. That really became a very major part of the qualification exam, knowing the boat, the systems and the valves and what everything does so that you can react in an emergency.

INTERVIEWER: When you brought the boat to New Orleans, did you have to bring the vessel up to the Electric Boat Company first, to have the outfitting finished?

CAPTAIN MAZZONE: No. Everything was done in Algiers. We went right from Algiers, out of New Orleans, down through the Panama Canal, and out on war patrol. One thing that was interesting about that was the bridges. As you fly over the United States and see the Mississippi River, you can see all these bridges. Well, those bridges were not high enough for us to go through, so they would have to call ahead. Some farmer would come out with his tractor, hook on a cable and swing the bridge open so that we could go through. He'd take the other cable and close it because they didn't have a lot of steamer traffic. Somebody who had either a team of horses or a tractor to open them controlled most all the bridges in the middle part of the United States.

INTERVIEWER: You were down in Algiers, fitting out the submarine. You were an ensign at that point? You were a junior man on the boat.

CAPTAIN MAZZONE: The junior man was George. I had every collateral duty you could find. My primary job, as an ensign, was to be the food service or commissary officer, because it was

the least desirable job aboard a submarine. The collateral duties, however, were the things that were important. I was the assistant first lieutenant, which gave me an opportunity to get in and help paint everything and learn more about the boat. I was an assistant gunnery officer, so I got a chance to learn something about torpedoes that we didn't get at the college to which I went. It stood me in good stead, I think, for later on.

INTERVIEWER: From there, you said you headed out on your first patrol, your first war patrol, and that was in the Pacific? Could you describe that?

CAPTAIN MAZZONE: Yes. It was interesting. It was a long ride across the ocean to our spot. We were up in the Makassar Strait, which is between Borneo and Sulawesi Islands, and we attacked a little convoy, which included a tanker and some escorts. It was nice. We hit the tanker and everybody celebrated. Then, all of a sudden, we had to dive because the escorts started to come over to depth charge us. The person looking through the scope was not taken aback by what he saw because he thought the scope was in high power and could hardly see the so-called 'Tudori class' destroyers that were coming over, when, in fact, he was in low power and they were right on us. We were just going past periscope depth and they started dropping a stream of torpedoes. Much to our chagrin, our dive spot was just off of Borneo, which was one of the ASW training sites. They called out about five destroyers that kept us in sort of a diamond, with one destroyer going out and making the run and taking information from the four others that were listeners. It got to the point at which they were forcing us deeper and deeper, and then they started playing with us by using our own ASW signals. You could hear the propellers picking up, and speed was picking up, and they would give us a U.S. equivalent in code like, "This is a trial run." They would complete the run, go right over us, and then come back with a code and say, "Can you give us your course and speed to confirm?"

INTERVIEWER: How did you receive that code? What was it?

CAPTAIN MAZZONE: It was UPC, or underwater code. In other words, it was as though they could give you something that came out of a codebook. You would use it even in the U.S. so that you wouldn't say, "I am going to start a fire and run."

INTERVIEWER: They were using a little psychological warfare on you?

CAPTAIN MAZZONE: Oh, indeed. It saved them. We didn't know how many depth charges they had, but there were hundreds dropped over the 39 hours. We were down for 39 hours and 45 minutes, I think. Toward the end, the hydrometer and the battery fluid just dropped. It wouldn't even register anymore, and we could only run the propellers maybe one, two or three turns.

You took that lack of propulsion capability and combined it with the buildup of the carbon dioxide and the lessening of the oxygen, and the carbon dioxide was way up, from between four and five percent. The oxygen was down, close to 17 to 18 percent. We just decided to come to the surface, and if the need be, abandon ship once we got there. We started up and it came up heavy, but we were able to get up. As we got on the shallow side of 33 feet of seawater, the boat started to heel over a little bit. We hit the surface and the boat heeled quite a bit, at almost 45 degrees. We didn't know whether we were going to stop or roll.

Overall, it stopped. I don't know if you've ever been in that part of the world, but the clouds hang low and cast shadows on the waterfront with the moon. We came up in one of the shadows. We could see the destroyers milling around from where we were earlier that day. We just started to drift. We tried to get the engine started. We found out that the one reason we had heeled over was because the induction that provided air for the engine had flooded. We got that drained and one engine started. Every time you started an engine on a submarine, an air engine, it would make a lot of smoke. That time, it made not a bit of smoke, as though somebody was

watching out for us. We got one engine started and put it on battery charge. We started another engine and put it on propulsion. We got the other two engines started, put them on battery charges and gradually moved out. We had to go back to Australia then, because the depth charges didn't knock our periscopes out. It just sucked the lens right out of the scope, so we were essentially blind when we went off.

INTERVIEWER: How deep had they driven you down?

CAPTAIN MAZZONE: I can't tell you, except to say that it was in excess of 400 feet. It was a 312-foot test depth boat. It was considerably in excess of the test depth. The patrol reports have been released. One end of the boat was around 850 feet down.

INTERVIEWER: Okay. What was the group SO number for the *Puffer*?

CAPTAIN MAZZONE: I think it was 261.

INTERVIEWER: That was the L class. Psychologically, you said, and I think it was before we ran the tape, you really had no question as to whether you were going to get out of that thing alive.

CAPTAIN MAZZONE: No, because in everything I'd ever seen as a kid, and in every submarine picture, they always survived. The movie that I saw before I went off to war was *Crash Dive*, and they all survived that. I saw nothing really wrong with it.

It was interesting, later on, when I read the patrol report. Reality began to strike. The commanding officer said he noticed that all the 'worriers' and 'hurriers' soon faded, but the more stoic individuals took over and became the stability for the boat. That was true. I remember seeing a lot of people sort of fade at the wayside. They were saying, "We're gone and this and that." I said, "Who knows?"

INTERVIEWER: You went back to Australia and refitted?

CAPTAIN MAZZONE: Yes. We went back and they refitted the boat. One thing they did, though, was transfer about fifty percent of the crew. They also moved people around a little more than they normally would have. I think that really helped to get new people in. One of the problems we did have on the second patrol was them saying, "Well, you weren't with us on that first patrol." There was a little bit of 'clubiness,' but it soon faded.

INTERVIEWER: That was in Freemantle? Was that where that base was?

CAPTAIN MAZZONE: Yes. That was in Freemantle.

INTERVIEWER: You weren't transferred to the USS *Cravale*, were you?

CAPTAIN MAZZONE: I was not transferred then. I made the second patrol on the *Puffer*. Then, when we came back in, I was transferred to the *Cravale* because the *Cravale*, at that time, needed a diving officer or was looking for one. I had been training on the *Puffer* as a diving officer. I went out with them on the pre-patrol workups and acted as a diving officer in a pre-rough sea and the old man, the skipper, put me through a lot of tests. When we got back, he said, "You're going to be my diving officer. Go get your clothes." In those days, they could do that. You didn't have to wait for orders or observe anybody else.

INTERVIEWER: What were your responsibilities as a diving officer?

CAPTAIN MAZZONE: Well, for one, a diving officer was really doing a collateral duty. The diving officer was responsible for maintaining control of all the weight and balances on a submarine so that you could balance it. The balancing of a submarine was sort of a delicate thing. You know, you realized that you needed to maintain how far above the surface the water the scope got by trying to balance a 300-foot long stick that weighed 1500 tons. It got to be kind of tricky. You had to ask people, "What weights did you move?" Then, you did a trim dive and balanced everything out.

Then, on attacks, anytime you did an attack running bout and went to battle stations, you had different kinds of trims. Sometimes, the commanding officer would like to take in the bow planes and go. Sometimes, you'd leave them out, and those were just little, simple things.

INTERVIEWER: Since you had not gone to submarine school, you said that was an experiment, really?

CAPTAIN MAZZONE: Yes.

INTERVIEWER: How did that come out?

CAPTAIN MAZZONE: I don't know, except that I qualified after my second run.

INTERVIEWER: You got your dolphins after your second run on the *Puffer*, on the second patrol?

CAPTAIN MAZZONE: Yes. Well, actually, I took them after the second patrol, but I got them on the *Cravale* because it took awhile. You had to have an FC. They took you through the boat. You went through. You had to answer all the questions about the submarine itself and about procedures and processes that you used, and then you did an FC. You had to do torpedo firing, ship handling and coming into a port. I did that on the *Cravale*.

INTERVIEWER: By the time you got to the *Cravale*, you had essentially done the equivalent of going through submarine school?

CAPTAIN MAZZONE: Yes, sir.

INTERVIEWER: I know there were instances of at least two or three reservists who actually ended up commanding boats in World War II, even though they had not gone to submarine school.

CAPTAIN MAZZONE: That's right. But it's hard for me to contact some of the other people who I knew who did the same thing because I only have two others, and they were lost on other submarines toward the end of the war.

INTERVIEWER: Do you know Frank Hoskins?

CAPTAIN MAZZONE: I know of him, yes. I can't say that I know him to the point at which I could go up and knock at the door and say, "Hey, Frank."

INTERVIEWER: He was one of them.

CAPTAIN MAZZONE: Yes.

INTERVIEWER: We interviewed him a few years ago.

CAPTAIN MAZZONE: Yes. I think he was on the USS *Seadragon*.

INTERVIEWER: That's right. He was, in fact, involved in that appendectomy. He insisted on that.

CAPTAIN MAZZONE: Yes. They did some other things, too. They sent a rubber boat onto shore at one time to pull off some people. He was a tremendous guy. I think Frank Walker and Bill Rue, with whom I served, were shipmates of his, and I did see him and perhaps talked to him at the rest camp in Australia. In Perth, we had a submarine rest camp.

INTERVIEWER: Yes. You were there on the *Cravale*. Did anything of note happen on any of its patrols?

CAPTAIN MAZZONE: Oh, yes, but not so much from depth charges. We did have some good runs, but I think two things that stand out. First, we were selected to go to the Philippines and make a landing, pick up women, children and other survivors. We went into, I think, the Negros Island, which is down off the Panay Peninsula, and picked up what amounted to be about forty women, children and some Army ex-prisoners of war. They all joined us on the submarine and

we brought them back. The notable thing about that was that there was one family by the name of Lindholm who were missionaries, and Mr. Lindholm was on the submarine, ready to go down below. He turned to Bill Rue, who was the executive officer at the time and said, "Would you please tell my wife that my work is not done here?" He went ashore again and didn't come out with us. I think he survived, but I'm not sure.

INTERVIEWER: What was it like aboard the submarine with all those extra passengers?

CAPTAIN MAZZONE: It was crowded. It was crowded because we actually had to take the chief quarters and make it a female dormitory. Feeding was something else and minding the little kids was something else. Fortunately, for me, there were two little girls who were maybe three or four years old. One would come and play with my beard. I had a beard at the time, and she would sit there and twirl my mustache. Of course, we couldn't speak because she spoke Vessiam.

When it got to the point at which it was time to call me to go on watch, she would bring a cup of coffee in to me and always waited for me to get off watch. We delivered them to Darwin, Australia. On the way back to Australia, we got word of a small enemy convoy nearby, so Frank Walker, who was the training officer, talked it over with the passengers and they agreed that our job as a submarine was to fight the enemy. We went after this convoy, fired and hit some ships and were then forced down by aircraft. We took a pretty good depth charging, but we gradually got away from it. That was one of the most impressive things about that patrol, and you see those things in movies but you never believe it. A lot of the passengers were nuns and missionaries, and when you heard them say "The Lord is my shepherd," it was tough. It was very tough.

INTERVIEWER: You figured they knew something you didn't.

CAPTAIN MAZZONE: Yes. It was tough to keep a dry eye, I'll tell you. But we dropped them off in Darwin and were never able to contact them again until recently. We had no idea where

they went. They didn't discuss too much about their relationships, so we didn't know if this little girl or boy was an orphan or if his or her mother or father was there. They were apparently instructed not to divulge a lot to us for fear it would prejudice any further efforts of submarines going in and picking up people. Thanks to our yeoman at the time, who is now retired, of course, in the last four years, we've managed to have almost all of the people come to the reunion. He has held the ship together for its annual reunions

Two years ago, we were in Racine, Wisconsin for a reunion, and we were sitting there. This young lady came up and sat on my lap and gave me a big hug and a kiss. It turned out it was that little girl. Oddly enough, she lives in Mission Viejo in California, which is only about eighty miles away.

INTERVIEWER: Wow.

CAPTAIN MAZZONE: We've been in contact since then. The other notable thing, I think, if you want to call it notable, was that the *Cravale* was selected, toward the end of the war, to be one of the nine submarines to go into the Sea of Japan. To do that, we had to come back on a flying trip to Mare Island, where they installed a particular kind of sonar.

INTERVIEWER: Was that the inland sea patrol?

CAPTAIN MAZZONE: Yes. It's the sea between the mainland of China and Japan. The problem was that we had to go through the Toshima Straits, which were heavily mined, and come out one of the other straits, which were also heavily mined. They had this gear that supposedly could detect mines, and they put cables that went from the bow out to the bow planes and around the stern planes and the screws. If you came up in a mine cable, it would sort of slide off.

Then, we went back out to train, going through minefields. As far as the *Cravale* was concerned, we found it easier to just rig in the bow planes and come up with a particular trim of

the boat so that we could maneuver through minefields. The procedure was on about June 1st of 1945. Three submarines would go in each night. Preferably, you'd go in a line so that if the first submarine hit a mine, chances were that the second one would get through. Once in, every submarine had to go to a selected area. You could not fire, unless it turned out to be a major man of war, until a particular date, like sunset of June 6th or June 9th and at that time, you could fire on anything you saw. We had to stay there for thirty days. Then, all the submarines were to rendezvous up in the northern part of the Sea of Japan and come out or make exit through La Perouse Strait, which is between Sakhalin and Hokkaido Islands. All nine boats were to meet there, and if one did not meet, you did not wait. If anything happened and we had to abandon ship, the understanding was that you were going to be a prisoner of war for the rest of the war. One submarine did not show up, so we left.

INTERVIEWER: Did you sink any ships?

CAPTAIN MAZZONE: Yes. Everybody did really well because at that point in time, no submarine had been in the Sea of Japan since they started the war, so they were even to the point of leaving their lights on at night while they were bringing in freight and stuff. We had a pretty good patrol in there. The commander also got a Navy Cross. Coming out, the commanding officer was Edward Steinmetz. Coming out through La Perouse Strait, we were the second boat in line. The USS *Wolfpack* was the first boat to come out. We got word from our navigator that within 15 minutes, we would probably be approaching the first line of the mines.

At about the same time, a message came in that said, "*Cravale*, my radar is out of commission. Take the lead." We took the lead out. It was an interesting night because we could see Russian ships coming in on the far side of La Perouse Strait and going out to Russia, or across to Vladivostok or whatever. We made bets on what would happen after we passed the last

row of mines. The navigator said, "I think we have passed what could be the last row of mines, according to our information." Fifteen minutes later, we got a message that said, "*Cravale*, our radar is back in commission. We'll assume the lead."

We then started back to Guam, I guess, and got into the Sea of Okhotsk. We heard a funny noise, like there might be a cable or something caught on one of the propellers. Since I had a little training as a diving officer, it was nice of me to volunteer to go over to try to clear it. All we had was the little shallow water rig. We could get air from the after torpedo room up through the hatch there. I went over and fixed what we had to fix and got back in.

INTERVIEWER: Was it a cable?

CAPTAIN MAZZONE: It had been a cable, yes, and it bent the propeller a little bit, and that was singing, you know. But it was interesting because it was a mine cable.

INTERVIEWER: You were close.

CAPTAIN MAZZONE: Yes.

INTERVIEWER: You made a couple of them.

CAPTAIN MAZZONE: I got back in and asked, "What happens if you have to dive for aircraft?" He said, "Well, they'll cut the hose and shut the hatch." I said, "Yes, but, but..." He said, "He'll come back and he'll thank you." Fortunately, we were able to do that work and get out of there.

INTERVIEWER: Was that your last patrol on the *Cravale*?

CAPTAIN MAZZONE: Yes. I think that when we got back, I had orders for new construction. That was my fifth or sixth patrol on it. I forget.

INTERVIEWER: You reported to new construction. Where was that?

CAPTAIN MAZZONE: It was at an electrical company for the USS *Pomadon*. In the meantime, I decided that in looking around, I didn't have an engineering background. An engineering

background for the command of a submarine was pretty important. Again, looking at the fact that most commanding officers were Naval Academy graduates, my chances, coming from a school like San Jose State, were pretty slim. I opted to get some education and go work with an uncle who had a drug business up in the Bay area.

INTERVIEWER: You went to UFC at that point?

CAPTAIN MAZZONE: I got out, went to UFC and got a degree in pharmaceutical chemistry. I didn't really like drugstore work, so I went back into the Navy and into the Medical Service Corps.

INTERVIEWER: That was around the time of the Korean War?

CAPTAIN MAZZONE: Yes, because the Medical Service Corps didn't come into being until about 1948 or 1949.

INTERVIEWER: It was 1947.

CAPTAIN MAZZONE: It was 1947?

INTERVIEWER: Yes.

CAPTAIN MAZZONE: I had talked to a Commander Taylor or Captain Taylor and another fellow by the name of Timberlake. They were on a recruiting tour. That was what made me sign up.

When I finished school, I was in the Reserves. I was still a submarine officer in the Reserves. I requested a transfer to the Medical Service Corps, got it, and was ordered to San Diego, to the old hospital. At the end of the first year, and I think I went there in 1950, I went to Japan and then to the Yokosuka Naval Hospital.

INTERVIEWER: You came up with a blood program for getting blood to...

CAPTAIN MAZZONE: No. At the hospital there, we came up with a way of handling casualties to increase the rapidity by which casualties could be handled. When we first started, when I first got there, casualties would come in and sometimes wouldn't get to a ward for hours because of the lack of a doctor to check them over. They were sending too many people to one ward and what not. We worked out a program and that gave me something to do. Working with the hospital ship, we were notified when casualties were coming. We had ambulances go up to Tachikawa Air Base in Japan to pick them up. The drivers would find out how many ambulatory patients we had and how many would be going to wards. When they got down to Yokosuka, the ambulatories would all go to the mess hall. They had meals waiting for them with juice. We had the other casualties laid out on gurneys. We'd get them juice. We had all the doctors ready to go. We knew where every bed that we could use was because when a doctor assigned a patient to a ward, he took a tab off this board and put 'pasted' down. That took one bed away from the board. When all the beds were gone, they didn't do it like they did in the past, when they would send ten or twelve extra patients, who would just be out in the hallways. It turned out to be a really good system, and it's still much in use today, as far as the triage programs are concerned.

INTERVIEWER: They just added computers to the main.

CAPTAIN MAZZONE: That was about it. What you can do in the field is still pretty limited. You can't take a heavy computer out and say, "Well, I want to see the background of this patient. I'm going to call her up, with shells flying overhead and some of the people hollering, "Corpsman!" But it's improved a lot.

INTERVIEWER: Then, you met an individual named Harry Alvis, who really changed everything.

CAPTAIN MAZZONE: I had orders to New York to the Armed Services Medical Procurement Agency.

INTERVIEWER: That was in Brooklyn?

CAPTAIN MAZZONE: It was in Brooklyn, yes, right outside the Navy Shipyard. There, I had some additional training and became a contracting officer for all drugs, chemicals and biologics. At that time, there was a council called the 'Armed Forces Blood Policy Council,' and it was made up of about seven or eight people from all the services. They disbanded that board and I inherited that. That wasn't too bad because everything was winding down. However, I inherited all of the renegotiation contracts that had to be done for blood drawing for the American Red Cross, which involved millions of dollars, you know. I was sitting there with the accountant and everybody just got quiet. They said, "Well?" I said, "What do you mean?" They said, "You have to make a decision." I replied, "Who, me?" They said, "Well, you're the new contracting officer," and if I said yes, the contractor would have made five million dollars more. If I said no, the government would have gone after the contractor for the five million dollars. Being government oriented, I said no. That was my introduction to renegotiations. The contractor people didn't talk to me for a week, but it was an interesting tour of duty, and that was fortunate.

One day, they were going for lunch. I met Dr. Harry Alvis, a submarine medical officer. He was a former submarine medical officer and now working for the State of New York, at the University of New York in Buffalo. He wanted to know what I was doing in New York, and I told him. He said, "You belong in submarines. Take advantage of your background."

Within two weeks, I had orders to go to a submarine base. I went to the submarine base as the officer in charge of the School of Submarine Medicine for Hospital Corpsmen. All the hospital corpsmen going to submarines had to go through the school because it involved

independent duty and much more of specific knowledge than a corpsman going to a hospital had. In those days, they didn't have doctors on submarines. All they had was a medical officer.

That job then expanded because the Polaris program really came along. They put in submarine medical officers. They wanted a medical officer on every submarine with every crew. They had gold and blue crews. I helped to set up the curriculum for the School of Nuclear Medicine for doctors.

INTERVIEWER: These were just for the FBMs?

CAPTAIN MAZZONE: All the doctors had to go through it. There was no doctor assigned to it. That's right. But the squadron medical officer was, you know, a circuit rider.

INTERVIEWER: Where was the school located?

CAPTAIN MAZZONE: It was in New London. In one of the buildings, you had the research lab. It ultimately became part of the submarine medical center.

INTERVIEWER: Thank you. Did you meet George Bond about that time?

CAPTAIN MAZZONE: Oh, when I first got there, yes. I met Dr. Bond. I had been there a few days and not met him. When I met him, he was, at the time, a commander and staff member. He was not the officer in charge. I mentioned that I hadn't seen him before, and he said that he had been down in New London. I asked what he was doing there. He said he met with the Surgeon General. Essentially, he actually said he was having lunch with the Surgeon General and that he was the lunch. I asked what had happened and he said that he had written an article that was published in the *Hartford Current*, in sort of the 'Parade' section. I think they called it "Roto Gravure" or something. The picture on the front showed this diver with a gill-like structure. He said that he predicted that man would one day live and work in the ocean as a free agent. Bond said, "You know, they're going to do that some day. We'll have a city center down there." I said,

"George, you can't do that." He asked, "Why not?" I said, "Buildings underwater?" He said, "We'll just build a dome over it." I said, "Well, okay." He said, "That's an engineering problem, not a medical one." He was a very charismatic guy, you know.

INTERVIEWER: He was the idea man. He was the man who came up with the theories.

CAPTAIN MAZZONE: Yes, and I've said this before. Dr. Bond had more original ideas in 15 minutes than most people have in a lifetime. Like a lot of people who are just of his ilk, they need others around them to pick up the good things and run with them. Fortunately, for me, that was the position I was able to fill with Dr. Bond and later on with Dr. Workman. They were two really smart idea people, but they needed somebody like me who wanted to hang on and do the work.

INTERVIEWER: Was that about the time when he did the article for the *Current* in which he came up with the concept for Genesis?

CAPTAIN MAZZONE: Yes.

INTERVIEWER: Why did he call it 'Genesis?'

CAPTAIN MAZZONE: He called it 'Genesis.' I asked him that question. He said, "Well, I call it 'Genesis' because it said in the Good Book that it's written in the scriptures that man would one day acquire dominion over the seas and all the animals therein. By God, that's what we're going to do. We're going to help Him." That was even reflected in the SeaLab prayer that he wrote at the end, when he said, "And when the divers work and thy will together be done." He was a driving force.

INTERVIEWER: Well, he said that he had lunch with the Surgeon General and the Surgeon General wasn't keen on any of this.

CAPTAIN MAZZONE: Yes. Some of the other medical officers who were in the Bureau of Medicine and Surgery at that time, in the chain of command, were not keen on it. That's correct.

As a matter of fact, I'd love to find something. An individual who was in the chain of command of providing funding wrote a letter to us. He wrote, "Cease and desist because I see no social significance to be gained from continuing this type of research."

INTERVIEWER: With George Bond being the kind of man that he was, that letter was nothing to him. That was just a bump in the road?

CAPTAIN MAZZONE: It was just a bump because we kept going even to the point at which he, Dr. Workman and I often bought guinea pigs and mice and food for them to continue the experiments. Finally, we got some money, little by little. But whenever George had an opportunity he took advantage of it and it just seemed serendipitous that he would be asked to fly on an airplane that the Secretary of the Navy was flying on.

INTERVIEWER: That happened, didn't it?

CAPTAIN MAZZONE: Oh, yes, and they would talk. George would tell him what he was doing, and the secretary went back and called, I think, the Surgeon General at that time, and asked about this project of George's. That changed things a little bit and the Surgeon General went back and asked, "What is he talking about?" He found out that we were doing it. Then, George was called down and we started to get a little laboratory funding to support the effort.

INTERVIEWER: It started out as something that you were doing as an additional duty? Or was not sanctioned at all by the medical department or by the Navy?

CAPTAIN MAZZONE: Oh, when it first started, it was not at all sanctioned. That's right. To us, it was the right thing to do. To coin a recent phrase, "It was the right thing," and we believed it. The unfortunate part for us, at any rate, was that no roads had ever been paved for us.

Everything that we did was kind of blazing of a new trail. Even the monitoring equipment for the atmosphere had not yet been developed except very crudely, you know. We still used for carbon dioxide the old Dwyer, which was good, but not automated. I think the program came a long way with limited funding and limited technology, to support what we wanted to do. I think that we drove the technology somewhat.

INTERVIEWER: Which Secretary was it that Dr. Bond convinced, or peaked curiosity in, perhaps on the airplane? Which Secretary was it?

CAPTAIN MAZZONE: Paul Nietzsche, wasn't it?

INTERVIEWER: Thank you. Yes.

CAPTAIN MAZZONE: He was very supportive later on.

INTERVIEWER: That would have been late 1959, 1960 or somewhere in there?

CAPTAIN MAZZONE: It was 1959 and early 1960. With all the wrangling that was going on, we finally got permission to do some of the animal work. We were trying to develop an atmosphere in which a human could breathe for long periods of time at high ambient pressures without physiological impairment and could really work so that we could then look at this habitat and diving, deep diving. We needed to find then an atmosphere that would do that. We breathed air. The first experiment we did with the animals was with compressed air. It worked like a charm on the first day. On the second day, at about 35 hours, all the animals were dead. We would bring them up, decompress them to the surface and do an autopsy and tried to find out why they died. We thought we saw problems related to those things you see with oxygen toxicity. We said, "Aha, we'll cut the oxygen down." We cut the oxygen down to about thirty percent of the surface equivalent. When you get older, you forget the exact numbers. But at any rate, we put them down. We controlled the amount of oxygen.

We did not control the amount of nitrogen. We essentially had, at depth, 97 percent nitrogen and 3 percent oxygen, which at the surface would have been equivalent to 80 percent nitrogen, 20 percent oxygen. We saw pretty much the same thing, except a couple of animals survived for a little longer. We brought them to the surface through decompression, autopsied them, and we saw pulmonary changes that you would associate with nitrogen toxicity. We said, "We need to try something else." Helium had been used in diving. Dr. Al Behnke and some others were using helium to digest inert gas. We put them down on helium and oxygen. We stuck with our philosophy of maintaining control over the amount of oxygen because we knew that was going to be a problem if it got too big. I think the first ones that we put down under helium oxygen maintained a surface equivalent of seventy percent helium and thirty percent oxygen. They survived. All the animals survived and we saw no problems. We saw what might have been an Oriental advantage.

For some reason, the male guinea pigs seemed to be overly active, sexually. We thought that maybe helium was an aphrodisiac, and we never did see that on compressed air. But we didn't do any more helium work with guinea pigs. We couldn't really confirm it. That was the animal work. Then, with a lot of harangue, we got approval to do human efforts.

With humans, we had to do the same sort of thing. First, we had to prove that helium, at one atmosphere, on the surface, was not harmful. We then did a series of dives. That was all part of the so-called 'Project Genesis.' The Genesis had two animal phases and one human phase. The first animal phase was the initial exposures to determine what atmosphere was suitable. Second, we had to work on a decompression schedule. We moved to primates. We used a monkey run and two goat runs and had no problems with the monkey run, as far as physiological changes were concerned. A goat has a lung function very similar to humans, and we found that

goats will tell you when they hurt. With decompression studies, the criterion was that you either bent or you did not bend. That goat would pick up his foot, and 'say,' "I'm hurting here." We'd stop and go back down and get it treated. We did that and we found a good decompression schedule.

One time, we put a couple of goats in there and one was a friend of Bob Barth's. It was Gladys, a blonde goat that we put in there. We started the pressure chamber down and the goat raised its leg. We went back down a little bit and said, "Let's try something." We just ventilated the chamber, which means that we opened up the vent, turned on the air at an equal rate so that we weren't moving the internal pressure at all, and the goat raised her leg, reacting to the noise.

Once that was over, and we had a breathing medium, we could put them under pressure, keep them there, and we had a way to decompress them which we felt reasonably sure would work. We got approval to go to humans. Really, we got into the last phase of Genesis, which consisted of three human runs. One was at one atmosphere pressure, which was right at the surface. One atmosphere was absolute, and that was done in Bethesda, Maryland because we had to wait to use their chambers so that we could keep out the nitrogen. I think all those runs were 144 hours, and we saw no problem. The only problem was helium voice with the divers. It's a real bear to understand because sound travels so much more quickly. I think it's 17 times faster in helium than in air, so the voice is very distorted. The divers were kind of cold because heat is dissipated at a faster rate from the body. Other than some practical jokes that were played by the divers on the inside, the runs were sort of uneventful.

INTERVIEWER: Most of the runs were being done up in New London?

CAPTAIN MAZZONE: No.

INTERVIEWER: They were in Bethesda?

CAPTAIN MAZZONE: They were in Bethesda because the arrangement in Bethesda had to have two chambers tied together that tied into an igloo or wet pot. We flooded everything and then forced the water out with the helium environment. When the divers were ready to go in, they went into one of the locks. They were breathing helium oxygen. We pressurized that down with helium. We were reasonably certain that we had the nitrogen down to less than one percent.

INTERVIEWER: Where was the funding coming from at that point?

CAPTAIN MAZZONE: It was coming from ONR. Special Projects was probably providing some funding, and there was some coming from the Bureau of Medicine and Surgery.

INTERVIEWER: Your background in diving needed to be upgraded at that point. You had to go to the Experimental Diving Unit (EDU), didn't you?

CAPTAIN MAZZONE: I went to diving school, the deep-sea diving school, in 1959. As it was, I became a helium officer and a diving officer and then had SCUBA training and all. It was whatever they gave you. To get a little more training in physiology, the Navy, for my good fortune, sent me up to Harvard University for a year to get my Master's Degree in some area of pulmonary physiology, and I did that.

INTERVIEWER: You came back from Harvard and went back to work with Dr. Bond again?

CAPTAIN MAZZONE: When I got to go to school at Harvard, the detailer said, "You're going to come right back to the sub base." It was kind of like a favor they were doing me to send me to school. I didn't move to Boston and I came home every weekend and worked with Dr. Bond on weekends, doing what we could, as far as getting ready for all these things.

INTERVIEWER: You were in the human phase of Genesis at that point?

CAPTAIN MAZZONE: Yes.

INTERVIEWER: It was well established.

CAPTAIN MAZZONE: It was well established in the human phase. We had accomplished one atmosphere. We did the hundred-foot dive at the experimental diving unit down in Washington, D.C., at the gun factory.

At that time, we were having a chamber built in New London. It was a big chamber that could do depth pressure work, as well as atmospheric space work. In a matter of milliseconds, we had a big valve that could do these explosive decompression studies. At any rate, we got that chamber ready to go, and we did the last of the human efforts up there. One of the things that I saw in the office that I was assigned to at Harvard was the box of books and notes that had been left there from 1935 or 1936, probably. The notes belonged to Louis Shaw, Dr. Louis Shaw. He was a hyperbaric man. He had postulated that if you could control the rate of ascent from any given depth, you should be able to intercept all these stages of a stage decompression so that you could travel continuously, rather than coming up, stopping for five hours and then going more. Dr. Bond and I talked about it. He wasn't too keen on it because he already had the people in the chamber at 200 feet, and he said, "Talk to Dr. Workman." We talked to Dr. Workman. Workman thought, "Well, it sounds like it might work." Dr. Workman gave me a decompression schedule for some heavy dogs. I got in a car, drove from New London to Washington, D.C. and went over to the NMRI, the Naval Medical Research Institute, and said, "I want to borrow one of your cameras. I want to do this." They said, "Well, you can't. You need a protocol." We argued, but at any rate, by that late afternoon, I had three large dogs down to seven atmospheres.

INTERVIEWER: You did it right there at NMRI?

CAPTAIN MAZZONE: Yes, and we did it without going to a motel for a night of rest after the drive. We saturated the dogs. The saturation for the dogs was done in a shorter period of time. We brought them up on a continuous decompression. It worked fine. I got in the car, drove all

the way back to New London and said, "Bond, it works." He said, "But we've got to make some changes." One of the things we had to do was take one of the relief valves off the chamber and hooking up a regular valve to it so that could be controlled with an 'on/off' switch. We put a long rod down so that we could sit there with a big push gauge and gradually decompressed on the surface. It was the first time a continuous rate of ascent had ever been done on a human.

INTERVIEWER: Did you put in a dog or a human?

CAPTAIN MAZZONE: We did it on a human. Well, it got on the dog, as well. We saturated dogs in New London, too. There were a lot of dives we did that on that were not recorded on the programs because the programs were thrown together and we went ahead and tried to do something.

INTERVIEWER: You went from the gradual state, in which you brought them to a plateau, to the continuous rate of decompression, and you found out that it worked.

CAPTAIN MAZZONE: That's right. It worked fine.

INTERVIEWER: Did it work better?

CAPTAIN MAZZONE: Oh, yes.

INTERVIEWER: You didn't kill all the time at the plateau.

CAPTAIN MAZZONE: Well, yes. Instead of a week, the decompression might have been a decompression of thirty hours, so it was time saving.

INTERVIEWER: What about the episode in which you and Dr. Bond treated tetanus hyperbarically?

CAPTAIN MAZZONE: Oh, in between SeaLab II and SeaLab III, we had a call from a doctor in the New London area who had a dairyman who had tetanus and wanted to know what we thought of treating him with hyperbarics. At that time, the work that Boerma had been doing,

over in Belgium was being discussed, and we thought, "Let's try it." Dr. Bond had him come up. We brought him in, put him in the chamber, and in his history, we found out that his tetanus came from the fact that he had had an injury, an abrasion, to which he had applied a cow manure poultice.

INTERVIEWER: He used a cow manure poultice?

CAPTAIN MAZZONE: He used a cow manure or horse manure poultice. Well, it was good because it generated heat but, unfortunately, it was contaminated with tetanus. We treated him with hyperbaric oxygen and also with curare to block the effects of the tetanus itself, and he survived. I don't know what the history is on survival of tetanus, but he walked out.

INTERVIEWER: There was another incident in which you got a diver from the Bahamas who was bent pretty badly.

CAPTAIN MAZZONE: Well, the one who came from the Bahamas was interesting inasmuch as when we were first notified, he had been bent and treated for about three days somewhere in the Bahamas. We didn't get him for another two days or so because he essentially had to hitchhike by plane and whatever up to New London. They brought him in an ambulance, and he was paralyzed from the waist down. The medical officer started debating as to what the rationale was to be for treating a five-day-old case. Bond said, "Put him in." We put him in the chamber and took him down. He had a little relief at 165 feet. We gave him what they called a 'table IV treatment,' and he walked out of the chamber on his own. He had a limp, but he walked out. That taught me a lesson there. Never refuse a treatment unless it's dead on arrival.

INTERVIEWER: Genesis had gone through its animal stage. It'd gone successfully through its human stage, and you were leading up to SeaLab I.

CAPTAIN MAZZONE: Yes. With SeaLab I, we had support from O&R, and we had a fellow by the name of Hal O'Neill, a brilliant man. We also had Denzil Pauli, another smart individual who was a doer, and Lou Nelson, who was a naval officer, helping us. They found a buoy from the net tending days when they had to close off harbors in Panama City, and it was of a pretty good size. They thought that could be modified into a habitat. It was then the Mine Defense Laboratory in Panama City, and they refurbished the thing into a habitat. They put it up on stands and legs and whatnot, and it worked out really well. We used that as the personnel transfer capsule to get down to it. We had to have a personnel transfer capsule. We didn't have one. While we were looking around for a chamber that we could adapt, we got word from somebody in Virginia Beach that if we could get a truck there within a day or so, we could have a chamber. But if we couldn't get it, it was gone. I was talking with Bond and we decided that the best way to do it was to just get a truck and go.

I checked out a truck and drove to the base and got hold of the people and said, "Put the chamber on here." They said, "We need an officer's permission to do that." I said, "I'm a captain." They said, "Driving the truck?" I said, "Yes. Yes, sir." They put it on there and I turned around and drove back up to New London. We modified it and made it into a personnel transfer capsule to get the divers down to the SeaLab.

We also needed something to decompress the men when they came back, so we rigged that thing with a stand and a platform so that in the upright, it would act as a personnel transfer capsule, or you could roll it over. We had the valves on it to use it as a decompression chamber. That's what we used. We took that to Bermuda with us, and we had SeaLab I transferred down to Bermuda on one of the YFNBs, and that was where we married up the system. We did the SeaLab off of Vargas Island, which was south and east of Bermuda.

INTERVIEWER: What was a YFNB?

CAPTAIN MAZZONE: Your Friendly Navy Barge?

INTERVIEWER: Yes.

CAPTAIN MAZZONE: It was a yard barge, and it was equipped as a cable layer. It was fairly well suited to be able to handle large weights like that.

INTERVIEWER: What was the program? Maybe I should step back. You said earlier, before we ran the tape, how SeaLab got its name.

CAPTAIN MAZZONE: Oh, yes. Earlier, before we really got started looking for a suitable habitat or money to build one, in Bermuda, the officer in charge of the Naval Research Oceanographic Support Center, if you want to call it that, said that they were going to take down the Argos Island sooner or later. But they were getting rid of what they called a 'survival sphere.' It was a large sphere that, in the event of a hurricane, all the people working on the offshore islands could get into, shut the little hatch, and it would roll off and somebody could then find it and rescue them. We thought that it would be a nice habitat and had it shipped to the submarine base. Bob Barth, some other people and I were out looking at it and started cleaning it all out and getting it ready to see what modifications would be necessary. Barth and I got outside, and it was a very warm and humid day. I took my brief pencil and wrote on top, "Bond's Folly, SeaLab I." The name stuck and Bond was quite pleased. He didn't like 'Bond's Folly,' but he did like 'SeaLab,' so the name has stuck with it ever since. We called it 'Bond's Folly' then, but look at what it did for the world, insofar as the offshore oil industry is concerned. Was it really a folly?

INTERVIEWER: What did it look like, the actual habitat itself?

CAPTAIN MAZZONE: SeaLab I was just an orange buoy tapered at the ends. At one end, it had a stairway coming down. It had legs. It had a little stairway coming down, which was the access

to the inside. There was a hatch there. When you shut that hatch and built up air pressure inside, or helium pressure, whatever it was, the hatch could no longer be opened until you dropped it down in the water to where the pressure outside was equivalent to the pressure inside. Then, you could open that up and the divers could go in. Water would not go in because you had an equal pressure on both sides of the hatch that you opened up. It was like if you take a glass tumbler and put it in the water and pushed it down, the water will just only go up so far. Well, if you made a hole in the top and decreased that pressure, the water would go all the way up. We had a pretty good system there and it was maybe 36 feet long and maybe seven or eight feet around at its widest part. I forget. But it was fixed up. We had a galley installed and life support equipment was installed. Electric power was available. We had hot water for showers and a television camera for monitoring for pain.

INTERVIEWER: Do you want to tell the story about where that television camera was mounted?

CAPTAIN MAZZONE: The camera was mounted up in the forward part. It essentially looked down on the access hatch where divers would come up. Unfortunately, beyond that was the shower, and so there was really no secrecy unless they closed the shower curtain. Every time we had visitors on board or expected visitors, we would notify them. One time, Dr. Bond said that Grozier was coming out from National Geographic, and he wasn't sure who might be in his party, but he would like to have everybody on their good behavior.

It was going really well. All of a sudden, the curtain slid back and the SeaLab diver put his hand up in the shower curtain just bare naked, turned around and walked off and said, "How do you like that?" Things could prove kind of embarrassing, but in the right light, they were humorous.

INTERVIEWER: Dr. Bond had a program as to what he wanted to accomplish on SeaLab I.

CAPTAIN MAZZONE: Yes.

INTERVIEWER: What was that program?

CAPTAIN MAZZONE: SeaLab I, being the first thing out of the box, really, in open water, we were primarily concerned as to whether or not we could get the divers into the habitat safely, have them subsist for 144 hours, and then bring them back up safely. We didn't care if they did anything specific in the way of projects, other than to go out and take their diving equipment with them, swim and play with the fish or whatever they wanted. The fact that they could do that was what we were really looking for. It was basically a physiological run. We wanted to be sure that we could do it.

INTERVIEWER: What was the depth?

CAPTAIN MAZZONE: It was 192 feet, I think. We had a couple of problems. First, we were using a thing called a 'mach VI diving rail,' which was semi-closed and, again, through diver error, he forgot to open up his carbon dioxide canister. He went out to dive and had absolutely no carbon dioxide removal and blacked out to the point that when Dr. Thompson was inside the habitat and saw him flailing, the doctor ran out, grabbed him and brought him back in. His eyeballs were absolutely black from the lack of oxygen. Theoretically, he should have died, but he didn't. He lived and became much more morose than he normally was. He was Tiger Manning, or Saunders Manning, a really good corpsman. SeaLab I didn't go to 144 hours because a storm came up. A hurricane was coming through, so we had to get them out and back into this chamber, up to the surface, and then tip it over and decompress them. It was working well. Again, they played tricks.

INTERVIEWER: There were little pranks?

CAPTAIN MAZZONE: There were little pranks, yes. I noticed one when I said, "Stand by."
At that time, we could now ventilate them with air, so I said, "Stand by to ventilate." We were ventilating the chamber for a few minutes every half-hour or so. Well, I noticed a lot of water was coming out, and what they would do when that happened was put a hose on the inside and suck out the water in the bilge and the pressure would force it out. But I was looking in the window and I saw this man urinating into that hose. I said, okay. The next time we were going to ventilate, Watts was in there and getting ready to do the same thing, but that time, I turned on the vent without the air. Then, I hit the air wide open. He spoke to me later on. It was not much, but there were little things like that.

INTERVIEWER: All of Dr. Bond's goals were met in SeaLab I?

CAPTAIN MAZZONE: Yes.

INTERVIEWER: The fact is that you can live at that depth for a length of time with no untoward effects. Men could do work in that environment?

CAPTAIN MAZZONE: That's correct.

INTERVIEWER: They could do useful work?

CAPTAIN MAZZONE: That's correct.

INTERVIEWER: I was going to ask you this earlier. How did one qualify to be a diver on SeaLab, or any of the SeaLab projects, particularly SeaLab I?

CAPTAIN MAZZONE: They would have to say, "Boy, I'd sure like to volunteer for that program."

INTERVIEWER: That was it?

CAPTAIN MAZZONE: Well, yes and no. Between Dr. Bond, Dr. Workman and myself, we knew a wide number of the divers because of our association with the training tank in New

London. The submarine medical officers were obligated to provide medical coverage for the training tank, and with my interest in this, I was there every day for probably two hours. You got to know a lot of divers. For SeaLab I and SeaLab II, he and I essentially selected almost everybody except that in SeaLab II, we had civilians from Panama City. I think we had two of them. We had one from the Naval Ocean System Center and the command selected those people. They came aboard, trained and went with us.

INTERVIEWER: Was it on SeaLab I that you had the two interesting devices? One was the attempt to unscramble, if you will, helium speech.

CAPTAIN MAZZONE: There was the helium speech device, yes. There were two things. The Applied Science Laboratory in Brooklyn, which was a Navy activity at that time, worked with a electronic device called a 'helium descrambler.' We tried it. It helped a little bit. They also had an electronic device, which was hard wired. It was a pad that you could write on, and it had a slave pad and pencil at the other end. As I would write there, it would write on their tablet down below, and as they would write, it would record up there. It was pretty good way to communicate, but it was slow because, you know, you had to write. Readability really depended on a man's penmanship capability.

INTERVIEWER: You had completed the SeaLab I and had some O&R support on the project.

CAPTAIN MAZZONE: Yes.

INTERVIEWER: Obviously, you had some View Med support, but probably not much. Dr. Bond was looking to something else. He was looking beyond that.

CAPTAIN MAZZONE: We were looking to SeaLab II. SeaLab II was going to be much more ambitious. We weren't too interested in going a lot deeper. We wanted to know if man could actually go to these depths and work, or do tasks. Could we do multiple team concepts, such as

you do in industry? If you wanted to take advantage of a 24-hour day, you had two or three teams that could alternate, all under pressure. SeaLab II was set up to use multiple teams. We had three teams. I think there were eight people in each team. We intended for them to stay for two weeks, except on one team, one individual, Commander Carpenter, as a matter of fact, was going to stay on for another team. Dr. Sonnenberg was going to stay for his team, come back up for one stay and then go back down again. We had two people stay, really, for sixty days. Only one was interrupted. The building of the habitat was funded by O&R and by the Office of Special Projects, and they built a whole new habitat at Hunter's Point in the old shipyard in San Francisco.

INTERVIEWER: What did that look like?

CAPTAIN MAZZONE: It was a complete cylinder with hemispheric domes on each end that had to be explosively formed because no one in the industry could roll domes that size. I think they were twenty feet or so. I forget. They were 18 foot in diameter or so. The gas bottles that contained the helium and the oxygen were all welded and fixed to the outside of the stand, and it was on the stanchion so that divers could have access, in and out, without having to crawl on their hands and knees. We built a little room underneath the access area which was called a 'shark cage,' and that was essentially it. It also had all of the accoutrements you needed. It had a range, a refrigerator, life support, and communications. We also had a wire hooked from the habitat to the surface so that we didn't take pressure pots to bring supplies down and take waste away. We had a better version of the descrambler. In the meantime, we looked at other diving techniques, such as how far down you could go if you were in the SeaLab habitat and wanted to go out. How long could you stay and then come back to the SeaLab habitat without decompressing?

INTERVIEWER: Those were the excursion dives?

CAPTAIN MAZZONE: Those were the start of the excursion dives, but they were not yet really finalized, such as when we were getting ready for SeaLab III. That was the start of the excursion dives and we found that you could go two atmospheres below where you were and come back and not have to worry. But you could not go much more above, maybe one atmosphere.

INTERVIEWER: The Navy, obviously, found a great use for this type of diving?

CAPTAIN MAZZONE: We certainly thought and hoped so.

INTERVIEWER: Did you have any specific ideas as to where it would be used?

CAPTAIN MAZZONE: Well, sure. We thought it could be used in any kind of salvage in which you could move a ship above a site. Instead of having divers go down and work at a hundred feet for twenty minutes, you could have them go down and stay there for a whole shift and come up and stay at a pressure activity on the surface while another group went down. Then, you could alternate them. We thought that there were other things, things that Dr. Bond and I had talked about, that were of real interest.

You said earlier that you had talked to Mal Mac Kinnon. At one point in time, Mal and I got talking about using one of the submarines, the USS *Seawolf*, not the nuclear one, but the older one. We were going to use it to do personnel transfers of individuals from sea to shore and drop them off like you would do with SEALs, you know. It would be a covert method through submarines.

We worked on life support systems, too. That didn't go far, but it certainly gave George and me an idea. What happened if we could make one end of it, like the four torpedo rooms, into a decompression chamber? Then, we could make a hole in there and go down and have them go out and come back, close the door and bring them up all under pressure. With us, it didn't get that

far, and maybe we'll find out what else was developed later on. That might be one of the things that other people may have in mind when they read Craven's book.

INTERVIEWER: Yes. There were some other activities going on while SeaLab II was being prepared. There were some activities and deep diving stuff that you guys were working on.

CAPTAIN MAZZONE: Well, yes.

INTERVIEWER: I was thinking of the 1,000-foot dive, you know.

CAPTAIN MAZZONE: Yes. Well, there were a couple of things. Looking at emergency procedures, what did you do if you lost your helium? We checked around and looked at the literature and found that a human could not survive breathing compressed air at a pressure of 450 feet of seawater. I think it was a Dr. Hempleman in England who had postulated that. If that was true, then using air underwater could have been a real problem.

Dr. Bond, the Doubting Thomas, said, "We ought to go down and test this." We worked with the Experimental Diving Unit. They had the facilities for us to do it. We had, by rote, a procedure to follow. In other words, my job was to rig a board as it would be for a decompression and the certainty in that one procedure. What they were going to do was see if they could have me change my mind because of the narcosis that you get from nitrogen. We went down in the chamber, on helium, with masks. In the chamber, we had a safety diver with us who was breathing masked helium oxygen. The chamber was brought down to 450 feet on air, at which time I had to take off the mask and do the task. The topside people said, "Now, do this, and do this."

I was able to function for about five minutes. After that, I was in 'la la land.' At that point, the safety diver put the other mask on, and the narcosis cleared almost immediately. They did the same thing with Dr. Bond at the end of nine minutes.

INTERVIEWER: He was still functioning?

CAPTAIN MAZZONE: He was still functioning. They stopped. Well, they came to find out that your tolerance of nitrogen narcosis was enhanced if you had a capacity for drinking.

INTERVIEWER: He had that capacity?

CAPTAIN MAZZONE: Dr. Bond had been known to drink a drink or two.

INTERVIEWER: Or two.

CAPTAIN MAZZONE: I asked him once, and he was sort of like a comedian. I said, "Well, how much do you drink, Dr. Bond?" He said, "I drink a lot." I said, "Well, how much?" He said, "I drink a lot." I said, "Well, all right. Do you drink a fifth, a pint or what?" "A pint," he said, "I spill that much."

INTERVIEWER: There was a dive to 1,000 feet?

CAPTAIN MAZZONE: There was a 1,000-foot dive. We were getting ready to finish our workup dive for SeaLab III at the Experimental Diving Unit. They had just had all the chambers reworked and re-certified to 1100 feet, I think. I was working with Gene Mitchell, and it was Captain Mitchell who was head of the research at the dive school and NEDU. I asked him what he thought about it. He said, "If you can get permission, yes, let's do it." I went to the Deep Submergence Systems Project (DSSP), for which I worked, and we finally got approval to make the 1,000-foot run. But we had to get the secretary of the Navy's approval. They got that, but there were some people from that office who really didn't want to see us go to a thousand feet.

INTERVIEWER: I want to ask you about the thousand foot dive, and then I want to move on to the escape training because I think there are some interesting things with that, like the Stehnke Hood, for example. Let's go back to the thousand-foot dive.

CAPTAIN MAZZONE: The profile for the thousand-foot dive was that we would go to 850 feet, saturate all the divers there and take two divers and put them in a wet pot or under the igloo. Then, we would close that off from the pressure chamber and take it down to a thousand feet. At that time, the divers would be on breathing equipment in water, not dry, and they were observed through some ports. As a diving officer at the port, one diver, Fran Lugo, came to the port, and I noticed his hands. Both hands had tremors. I asked him, "Are you scared?" He said no. We were at a thousand feet, and I think it was Dr. Bond who said, "Okay. You're at a thousand feet. Bring him up." The secretary of the Navy was standing behind me because we had invited him to come over. He said, "Could you go deeper?" I said, "Yes, but we need approval." He said, "Who would have to approve it?" I said, "You." He said, "Do it." Not wanting to push our luck too much, we went to, I think, 1024 feet, and then back up.

INTERVIEWER: That was Nietzsche?

CAPTAIN MAZZONE: Yes, and we came back to 850 feet. We were on an excursion dive that we knew was safe, and we kept the divers at 850 feet until we finished the experiment and then decompressed at the surface.

There was one particular maneuver that was very valuable, according to Dr. Al Behnke, who was a world-renowned diving physiologist. One of the most important features for our system, having gone commercial, was our gas savings. If you could go to 850 feet and then to a thousand feet, and then bring them back to 850 feet, it was a good thing. If you could do that anywhere along the line, stay at a shallower depth, conserve materials like helium and oxygen, it would help. Those things were expensive, and at that time, they were non-recoverable. You just wasted it. He came to the surface and that little tremor became very important to us. Other observers and Herman Ron, up at the University of Buffalo in New York, I think, said that he

had observed the same thing, subsequent to our dive. It ultimately became known as high-pressure nervous syndrome, HPNS. I think a lot of people have tried to solve it.

INTERVIEWER: Yes. For those of us who are novices at the subject of diving, what does it mean to 'saturate a diver?'

CAPTAIN MAZZONE: Well, as we sit at one atmosphere and breathe, the gas that we breathe is essentially nitrogen and oxygen, about eighty percent. Let's say it was twenty percent with maybe a couple of percent contaminants that we don't worry about. As you breathe, those gases go into your blood stream. They're absorbed. When it gets equal so that there's no further uptake by your body, you're saturated at that level. If you increase the partial pressure out there and start to breathe that, you also increase the partial pressure of the gases you're breathing. You're driving more into the fluid portion of the body and it's either taken up by blood or deposited in body tissues. When that comes into equilibrium, you're saturated. We figured that each kind of tissue has a half-life and if the longest half-life is say, ten, when you get to that point you are saturated.

If you went to that depth and came right back to the surface, it would be a surface-supported dive. You came down and stayed a short period of time but had to decompress on the way up. The deeper you went, the longer was the penalty of decompressing. But when you got saturated, the line went up and then, it flattened out.

Workman and Bond were talking about that. They said, "Well, when you get to this point, decompression doesn't increase. If you keep him here for a week, ten days, or a month, can we pay the decompression price all at one time?" The answer was yes. That's the basis of saturation diving. I don't know if that answers your question.

INTERVIEWER: Yes. Thank you.

CAPTAIN MAZZONE: It's a difficult question to answer when you go somewhere to talk and the people are not acquainted with it.

INTERVIEWER: Yes. When they are not familiar with deep-sea rescue, it can be hard to explain. You had some escape training around this time. You were working with this guy, 'Stinky.'

CAPTAIN MAZZONE: Yes. First, we and Dr. Bond were interested in submarine escape because we worked in a submarine escape training tank and wondered about the possibility of going deeper than a hundred feet, because that was what you did in the training tank. I think 118 feet was the deepest you could go. Dr. Bond set up some experiments. There were two teams, Dr. Bond and Cyril Tuckfield, and Dr. Van Orden and me. We went down to Key West and made the escape from a submarine. Van Orden and I would make one escape. Then, Bond and his partner would make one. It was Bond's stipulation that he and Tuckfield were going to be the only ones to make the deep dive. Somebody brought them to about 307 feet or something like that, and Bond and Tuckfield came out. It used just the life vest with relief valves on it. As you came up, the excessive buoyancy would bleed off. You, as one of the participants, were required to blow all the way to the surface. That was called a 'blow and go system.'

Luke Van Orden and I got to make them down to 200 feet, and I got a little bonus. They were going to send a diving bell down for the photographers to photograph Bond and Tuckfield escaping from the submarine. Well, I was in there with a new diving rig on, and all of a sudden, the chamber started to go, and the word came in to stay there.

I started thinking, "I have no way to take decompression." At about 225 feet in just a few minutes, I stepped out and made a free ascent to the surface with nothing other than a breath of air that I had for positive buoyancy.

INTERVIEWER: How did you control the rate of ascent?

CAPTAIN MAZZONE: I controlled it by the blow. As the gas expands in your lungs, if you come up with a decrease in pressure, you blow out the excess. The only problem was that we did those things in the training tank day in and day out, but you always had the side of the tank as a point of reference. Were you going up or staying down? Were you staying with your bubbles and were the bubbles going up or were you going down?

Not having those markers, I stayed as close as I could to the bubbles and I think I came up at about two feet per second, which is the proper rate. Had I stayed down there much longer, I could have had decompression problems. But I wasn't breath holding, I was breathing the air in the bell that went down. We had to have water up to our necks and then there was an air space, so I was breathing air.

INTERVIEWER: What was the Stehnke Hood? What was that about?

CAPTAIN MAZZONE: Well, the Stehnke Hood evolved. We were testing a suit. We had a submarine medical officer by the name of Sam Wrench, who was trying to make an escape suit. It was a whole body suit. You got into it. It had a facemask. The theory was that as you started up, the expanding air in the suit would provide a breathing media for you. There was a relief valve on it. If it got to be too much, it would pop off.

One day, in the training tank, I stepped out, I think, at a hundred feet with it, or maybe it was fifty or 75 feet. I guess I didn't have enough air in the suit because when I stepped out, I went down a little bit, and the excess pressure just squeezed the face mask right on my face, so I came up a little bit and it eased off.

When I finished that, it was going to do something there. I took one of the life jackets, filled it, went back down and put it in the suit. As I came up, all that air started to pop and it was

easy. I could breathe all the way up. Harold Stehnke, who was the officer in charge of the training tank, said, "Hmmm." He took one of the life jackets home and had his wife make a hood that encompassed the relief valves so that air coming off the life jacket would come up into this helmet and you could breathe it.

That was the start of what was called the 'Stehnke Hood,' because his name was Stehnke. It was then called, the 'ho, ho, ho system,' because as you made the ascent, we wanted to make sure that the diver breathed so that he wouldn't embolize. He said, "Okay. Once you leave the platform, start hollering, 'ho, ho, ho' all the way to the surface."

INTERVIEWER: If you held your breath, you would embolize.

CAPTAIN MAZZONE: You could embolize. You took a look at the pressure volume curve and did it easily. If you had a number of a hundred at the surface, you went to 33 feet, which is one atmosphere. That split in half, so you had fifty feet. You went from one hundred feet to fifty feet.

When you went to the second atmosphere and beyond that, it went down to 25 feet. But you only went from fifty feet to 25 feet. Let's just call them 'volume units.' You could see that coming back up, you would go from 25 feet to fifty feet, and then, you went from fifty feet to one hundred feet. That was a large volume.

If there was air in your lungs, it could rupture your lungs, which could lead to an embolism because the air would get into the blood vessels and go up into the brain, and that was something else. Embolism in diving was a big thing. It happened in submarines. We had it happen in submarines during training, and this is one area in which I like to take a little pride. We kept noticing that all the embolism cases were put in the pressure chamber and taken down to a depth of 165 feet for relief. They would then bring them back up on a standard table four,

which is the long table. At about the forty-foot stop, as I said, not always, but usually, they had a recurrence and would have to go back down and treat it again.

If you go back and look at some of the physiology, we found that by the time they got to the forty-foot stop on a table four, it was about the time that you got maximum cerebral edema. Could we avoid that? I got hold of a guy with whom I worked by the name of Mike Greenwood. He was a laboratory psychologist. That's the word I'm looking for. We dug up an experiment that was done elsewhere, in Italy, I think, in which they used a Calvarian window. They actually put a window in the skull so that we could observe the brain. We induced embolisms through the carotid artery and were able to photograph the embolism as it occurred and what happened when we treated them in the pressure chamber so that we could see the bubbles resolved. We were able to photograph that on a movie film and said, "If these bubbles resolved that quickly, why don't we take them to 165 feet? If they feel good, have them come back up to 165 feet or 170 feet for a twenty table." We did that. It worked like a charm but we had one setback. One medical officer out in Hawaii had an embolism case at their training tank, and mindful of the work at New London, he was going to try this.

The only problem was that he didn't read the part that read, "If the patient stabilizes at 165 feet and is recovered from the symptoms." Well, his patient had not done that, and he started to back out and, of course, he got in a lot of trouble. It didn't kill him, but he got in a lot of trouble and we had a little setback because of that. Our system really worked and was approved, and it's still in use today.

INTERVIEWER: Let's go back to SeaLab II again. Dr. Bond had some ideas as to what he wanted to accomplish, and you mentioned some of them. It was useful work with deep diving and a saturation situation. Was it done in Scripps County?

CAPTAIN MAZZONE: It was done just off the Scripps Institute pier, yes. I think it was about three thousand feet offshore. We had a habitat in two hundred feet of water but had a lot of different projects. One was to look at the impact tools that could be used. You needed to come up with some kind of zero gravity tools or zero impact tools. You pushed on a screwdriver and you were going to push away. Anyway, we came up with tools that divers could use, and we tested those. We had a bottom stabilization experiments. If you got on the bottom, you would have silt coming up. How could you stop all that? We had chemicals and things you could put down. We had salvage work in which we had to rig or damage an airplane that was sitting on the bottom and bring it to the surface. We had some construction projects in which you had to put big sonars on top of each other and bolt them. We had meaningful work. Plus, we tested other things. The divers were to test the heated suits for diving, but the suits were electrically heated. My favorite slide, whenever I used to give the talk, was of a diver was standing there with this cord in his hand, saying, "Now, you want me to do what with this?" Dr. Sonnenberg tested the suit to try to overcome the cold. Cold is, particularly with helium, a real bear. In deeper depths on other dives, we found that the cold gas could really ruin your day.

INTERVIEWER: You were all pretty much still in control of SeaLab II? The real change had not happened yet?

CAPTAIN MAZZONE: Do you mean the doings?

INTERVIEWER: Yes.

CAPTAIN MAZZONE: Yes.

INTERVIEWER: Dr. Bond set the priority as to what would be done on the missions?

CAPTAIN MAZZONE: That's right. There were other people from O&R involved with other questions related to the unseen operation. We needed an officer who knew about moorings, so

they had Tom Blockwick, and he was responsible for that. When it came for the people and their activities, it was Bond and I who called all the shots.

INTERVIEWER: How would you evaluate how things went on SeaLab II?

CAPTAIN MAZZONE: We did so by observation because we could see them with television cameras. We also evaluated things through discussions with the divers about what they accomplished.

INTERVIEWER: How long did the project last? How long did you have teams? You had several teams that went down.

CAPTAIN MAZZONE: Each team stayed down two weeks and did their projects. Each team was trained for different projects. Not everyone trained on the same projects.

INTERVIEWER: While the tape wasn't running before, Gary mentioned something interesting, and I was going to ask you about it. That was the sixties and the National Aeronautics and Space Administration (NASA) was getting a tremendous amount of funding for the Mercury program and such. Eventually, you got one of those astronauts, as an aquanaut, by the name of Scott Carpenter. Was there really any exchange of information between the two programs or were you essentially on your own? Were the space project and your project separate?

CAPTAIN MAZZONE: From a technology standpoint, they were not really separate. We did have interplay when NASA used a lot of tank divers and our SeaLab divers to do the gravity free training in that tanker plane to compare performance results. When you worked in the training tank you were, essentially, in a gravity-free state for four or five hours each day. They wanted to try to measure performance standards accomplished by the astronauts versus those accomplished by the divers. Other than that, from my point of view, I saw little other than the phone

conversation between Commander Carpenter and Gordon when Carpenter was in the chamber on decompression.

INTERVIEWER: Was that while Gordon was orbiting?

CAPTAIN MAZZONE: He was orbiting, yes. On SeaLab I, Commander Carpenter came to Bermuda and then had to be air evacuated back.

INTERVIEWER: He had an injury, didn't he? He was injured?

CAPTAIN MAZZONE: Yes. In those days, the commandant on Aeroced announced that American sailors could not ride motorbikes, but he was with NASA and not in the Navy at the time. He rode a motorbike shortly after we evacuated him back to NASA.

INTERVIEWER: From your point of view, what were the circumstances of Carpenter being involved in SeaLab? Was it a publicity thing? Why was he assigned? Was he just a volunteer and was accepted? How did that work?

CAPTAIN MAZZONE: It's a non-published thing.

INTERVIEWER: Oh, okay.

CAPTAIN MAZZONE: Again, as I understand, when Commander Carpenter orbited, he accelerated that step of having the operator manipulate in a manual mode and overshot the mark. Again, it was rumor, but the words that sort of spelled out where he might go came from Chris Craft, who said, "You'll never fly another bird for me." I guess Chris had a lot more clout than people give him credit for, because as far as I know, Commander Carpenter never did go back into space. I'm not saying that against Commander Carpenter, but he had a procedure to follow and he didn't follow it, I guess. I wasn't there. But those are things that I've heard. He was a pretty knowledgeable individual.

INTERVIEWER: Overall, how would you and Dr. Bond, if Dr. Bond were still around, evaluate SeaLab II?

CAPTAIN MAZZONE: I think it was excellent. The only problem we had was that Commander Carpenter was stung by a scorpion fish on the last day of his bottom stay. Much to his credit, he did well in decompression. We had one decompression. Master Chief Sheets, before he went down, told me that he had been bent about two weeks before he came to us and had to be treated in Seattle, where he was at the shipyard or at Keyport. It was at about two or three in the morning of the last day before coming to the surface with his team and he called and said, "I think I have a problem."

At about that time, we had maybe three hours left to go on this long decompression. We got a hold of Dr. Bond. Then, we opted to treat Sheets in the chamber and put the other people in this little chamber, bring them to the surface and continue the decompression at the surface. We had one going up and one going down, and we treated Sheets. We took him down to depth for relief and then back up, and he was all right. We then brought him to the surface.

INTERVIEWER: Those were the only real mishaps, if that is you want to call them, that occurred during SeaLab II?

CAPTAIN MAZZONE: If you want to call them 'mishaps,' yes. Again, how did you know if a person was good or not? He didn't bend.

INTERVIEWER: What was the arrangement?

CAPTAIN MAZZONE: I have to tell you something. Scorpion fish were all over but it wasn't very difficult to avoid them because they would congregate underneath the SeaLab habitat.

INTERVIEWER: How did you treat a sting of a scorpion fish?

CAPTAIN MAZZONE: I think you put ice on it and iced it down. There wasn't much you could do. It was very painful when it first happened, but it passed, I think, in a matter of hours.

INTERVIEWER: Could you explain how the system worked? You had the topside crew, which was in a support vessel and it was named partially for you, as I recall.

CAPTAIN MAZZONE: Well, the support vessel was really a combination of three barges tied together in a 'U,' and no one wanted to keep calling it 'the barge.' This other fellow who worked for the Naval Ocean System Center was named Joe Berkitch. He and I had worked together for long hours on SeaLab II. I came out from New London the first time and met him. We started working about three in the afternoon the first day. I didn't even check into the motel there in Long Beach. I finally got down there at about three in the morning. He said, "You know what? We'll come back about five." It was like that the whole period of time.

He and I became very close. He said, "I'll tell you what. Why don't we use our names? We'll use 'B-e-r-k,' for Berkitch, and 'O-n-e' from Mazzone. We'll call it the 'Berkone,'" and the name stuck. But when Captain Melson, at the commissioning of the SeaLab announced it, said, "We have the Berk *One*," so that was where that came from.

INTERVIEWER: Your job was topside of the rig, monitoring what was going on below. How were the watches arranged? How did that work? Who was involved topside?

CAPTAIN MAZZONE: Topside, there were two people. Dr. Bond had the daytime shift and I would relieve him at four in the afternoon. Dr. Bond would then go ashore on one of the boats. He had a motel over in La Jolla.

When he came back in the morning, at any time from six to nine, to relieve me, I would go down below, into one of the closets in one of the storerooms. They had made it into a bunkroom for me, and I slept there. I stayed aboard the barge full-time. He and I were the only

people who ever really controlled the topside. Other people controlled the behavior of the divers and other mechanical things.

INTERVIEWER: Once you were finished with SeaLab II and had gotten the information that you required, you mentioned earlier that you guys were in total control of the situation. You got the funding, of course, from O&R. You got support from the Navy. Dr. Bond was already thinking about another stage. He was thinking of the Sealab III, with which he wanted to carry the research to another level. What was going on between the end of SeaLab II and the beginning of SeaLab III? What was the situation, politically? What was going on, as far as getting funds for Sealab III?

CAPTAIN MAZZONE: Well, it's hard for me to answer that because there were things that may have gone on that I know not about. But it did seem like there was much more interest in what the future of this program was going to be and at about that time, they had the pressure disaster. They had a deep submersion committee come up and it made recommendations to do certain things. One of them was to establish the Deep Submergence Systems Project Office, I guess, and we were going to become a part of that.

All of a sudden, SeaLab became a part of the Man in the Sea Program. They were going to move away from New London at some point in time and find a base somewhere, and they did dock in San Diego. In the meantime, we got to do a lot more work at New London in preparation for SeaLab III. We explored more fully the excursion diving and some other things. I forget some of the other things. They come to mind when it's too late, you know.

Then, we moved the operation to San Diego. DSSP, the Deep Submergence Systems Project Office, opened up a facility there called the 'Deep Submergence Systems Project Technical Office.' Because of my background, I became the officer in charge (OIC) of that.

Unfortunately, we couldn't operate with the complete autonomy you would expect an OIC to operate with because we were supporting a program manager in Washington, D.C. who said, "That's my office, only three thousand miles down the hall." That kind of an atmosphere was very difficult to operate in because we had to start getting approvals, explaining and getting things turned down only because of a lack of understanding. I'm giving you this stuff for your own interest.

INTERVIEWER: But you were essentially in complete control over SeaLab I and mostly in the control of SeaLab II, as you said earlier. It was getting out of your hands as to what you could accomplish.

CAPTAIN MAZZONE: Yes. Well, it was as though you had people working for you and you were working for somebody. All of a sudden, you found that your boss was going directly to people and you were not sure if it was the same message that you wanted or the same program that you really wanted done. You found people getting assigned TAD to somewhere without knowing about it. All of a sudden, the sack of beans said, "Oh, well. So and so called and said he wanted it." A person could begin to feel like he wasn't really in control.

INTERVIEWER: What did Dr. Bond envision for SeaLab III? What was his intent?

CAPTAIN MAZZONE: Well, basically, we wanted to go to 600 feet and do a multiple team concept. It was really an expansion of what we did in SeaLab II.

INTERVIEWER: Did you want to see how man would work at 600 feet with useful tasks?

CAPTAIN MAZZONE: We also wanted to see him with equipment. That was the point that we did talk with SeaLab I and SeaLab II, and we had tremendous leak problems when we tried to pressurize the habitats. At first, we thought, "Well, somebody made a mistake and put O rings in or something. Somebody put some kind of pressure sealers in backwards."

INTERVIEWER: They were helium leaks?

CAPTAIN MAZZONE: Yes. They were helium leaks. Well, helium will diffuse through most anything and it would certainly go right through an O ring. Technology had not kept up with the containment of helium, for one thing. We saw that on SeaLab I. We saw that on SeaLab II and SeaLab III. On SeaLab III, the only problem was the recognition of how to correct it or figure out what you really did see. That's an area I don't like to talk about, you know. The way to put it, is that you really had to know what you were looking at and what it meant before you could take the proper corrective action.

INTERVIEWER: You had to convince people, who were outside your field of expertise, that that was what needed to be done?

CAPTAIN MAZZONE: Yes, but how could you do that if you were alone in a medical service corps or up against a line officer or a stupid medical officer? I really don't need to say any more than that.

INTERVIEWER: Okay.

CAPTAIN MAZZONE: They said, "We're going to make this a line. We'll bring this program around." I think that the driving force for the continuance, even into SeaLab III, was Craven's new book and the sky, the spice everywhere or whatever it was. I think that was in the background.

INTERVIEWER: Would you suspect, from your point of view now and looking back at it, the line Navy had already acknowledged or absorbed the technical know-how to realize what they needed to do and didn't really need to go further?

CAPTAIN MAZZONE: Yes. That was probably true, but I have a feeling that summer was kind of a blind decision on their parts. I don't think they recognized the problems of containing helium

under pressure in just a hose or umbilical to support things. But they knew what they wanted done and I think we demonstrated what could be done. That's as far as I want to go.

INTERVIEWER: What was Dr. Bond's status at that point?

CAPTAIN MAZZONE: Dr. Bond never went to DSSP. He went onto the staff of Admiral Smith, I think, in the Office of Special Projects as an advisor. He stayed there.

INTERVIEWER: He was really out of the running with it.

CAPTAIN MAZZONE: That was pretty much the case.

INTERVIEWER: The brains, in other words, were removed from the front the front?

CAPTAIN MAZZONE: Yes. He and I were, and it may sound like sour grapes, sort of shunted to the side.

INTERVIEWER: Someone else took over your project, essentially?

CAPTAIN MAZZONE: Yes, but I was still supposedly the diving officer. There was even some talk about putting somebody else in there who might have more public appeal. Those are not the exact words, but I think you understand what I'm saying.

INTERVIEWER: The habitat was SeaLab II, upgraded?

CAPTAIN MAZZONE: Yes, it was upgraded in a different way. Dr. Bond and I always visited the team's habitat while they were down there, except on SeaLab I. He and I went down and opened up the habitat to make sure it was okay. Then, I went down every day with the photographers because we wouldn't allow the photographers to go down and take pictures with the guys running around, so I was there to cover every day. On Sealab II, I went down and inspected the habitat and came back up. The habitat was tilted. When I went down to visit the team, they had named it 'the Tiltin' Hilton.' They had a sign that read 'Welcome to the Tiltin'

Hilton.' SeaLab III then said, "Well, we have to get away from that. We can't ever guarantee we're going to set it on a flat bottom."

What they essentially did was make a big pod that had all the heavy things and the gas bottles. They were going to make the habitat float above that. They wanted positive buoyancy, so that no matter how that pod was there, the habitat would float on a parallel. We don't know how well it worked. We never got a chance to use it. I related one incident, I think, in a paper, that because we were not involved as we had been in the others what happened With SeaLab I and SeaLab II, whenever there was going to be an evolution, we sat down and wrote a procedure. Most of the people we had, including myself, knew every single valve in the system, its function and its number. I don't think that was really true for people who were going to operate SeaLab III. For example, I went back to my apartment late in the afternoon, thinking that the evolution for the day was over, only to find out that one of the program managers decided to test the habitat that night by floating up to dry dock.

When I came back in the morning, they were pumping it out and there was a lot of consternation going on because it had leaked. I asked questions about rigging it for dive. They said, "Oh yeah." I said, "What did you use, metal? Did you have a check-off sheet?" They said, "Well, we had a check-off sheet." I replied, "Well, dang it, you must have left a valve open somewhere," and the only valve that could really flood at that level was one drain valve, which was behind an access hatch and about six inches around. I said, "Did you shut that valve?" They said, "Oh, yeah. We must have." Well, I went up in the habitat and it had been shut. That's not a publication thing. That's for your knowledge to show what can happen when you have a project run by committee.

INTERVIEWER: The location for the SeaLab III was San Clemente?

CAPTAIN MAZZONE: It was on San Clemente Island, yes.

INTERVIEWER: They took it out and it was dropped to its depth?

CAPTAIN MAZZONE: No. We had problems with leaks again.

INTERVIEWER: Were they helium leaks?

CAPTAIN MAZZONE: We had helium leaks and I think that the umbilical also burst from the helium pressure.

INTERVIEWER: Was the selection of the crew for SeaLab III significantly different than it had been for SeaLab I and SeaLab II?

CAPTAIN MAZZONE: Yes. Although we still had a lot of our original volunteers, new people were brought into the program. Some were people Bond and I picked. Others were direct inputs by people in the DSSP office. They would say to these people, "I'll get you in there."

INTERVIEWER: You had a mixed crew? You had both military and civilian divers?

CAPTAIN MAZZONE: Yes.

INTERVIEWER: The medical officers were still Navy people?

CAPTAIN MAZZONE: The Medical officers were all Navy people.

INTERVIEWER: There were a number of corpsman divers assigned.

CAPTAIN MAZZONE: They were all from the Navy.

INTERVIEWER: As much as you feel comfortable talking about, what do you remember happened next?

CAPTAIN MAZZONE: It is what you see in the movie, anyway. There was trouble opening up the habitat. I don't want to go into that because I know it happened and I know what somebody didn't do. Let's put it that way.

At any rate, they were going to go down, try to open up the habitat and do something else. They were going to send out two divers. They took two diving rigs and sent them into the pressure chamber. They said, "This is what you're going to use and this is what we're going to do." Somewhere along the line, somebody did not check as to where the baralyme was in both canisters.

INTERVIEWER: Was it the carbon dioxide scrubber material?

CAPTAIN MAZZONE: Yes, it was used to scrub carbon dioxide. The guy who took them off the shelf said, "I'm going to send these in." He didn't check them. He took them to the pressure chamber to lock them in. The guy who put them into the pressure chamber lock did not check them. Every time you took those rigs, you put them in under pressure and added some more baralyme because it compressed. Then, they took that extra baralyme filled it up again. Well, inside the pressure chamber, they didn't check them again. What I'm telling you is kind of a touchy thing here, you know. You can start tying their names to things and it's too late to do that now. There's nothing to be gained by doing that.

The two divers who were selected to go were given specific instructions as to what to do, but they didn't do that. That was really tough. You had to call the shots that might have hurt a lot of people. I'm not going name anyone, although I think they know, of their own volition, what they did.

INTERVIEWER: That accident in which Cannon died essentially ended SeaLab III?

CAPTAIN MAZZONE: Yes. They came back and had a board of inquiry. Bond, Jackson Tomsy and I were named as interested parties. About halfway through, every time, something would come up. One of the witnesses would say, "Yes, I saw gas coming out of that valve. I saw bubbles." Everybody would go, "Ooh." Then, I would ask, "Well, what was that valve supposed

to do?" the witness said, "Well, it's a bleed off." I asked, "How do you tell if it's bleeding off?" the witness said, "Well, bubbles would come out." I said, "Oh, it was doing what it was supposed to do?" the witness responded yes.

INTERVIEWER: You provided the board of inquiry with professional observations as to what was going on?

CAPTAIN MAZZONE: Yes.

INTERVIEWER: In other words, if a witness saw something but didn't know what they were looking at, you explained what they were seeing?

CAPTAIN MAZZONE: Yes. The president of the board actually said, "I'd like to excuse you, but I need you. I need you here to hear this stuff and keep it straight." Some jerk in the bureau decided I needed a letter of reprimand because I allowed the divers to split. The divers split. It was under no control of mine because they were given specific instructions to stay together. They were told, "Don't move from each other. Go together." They didn't. One split and the other one died. What do you want? It was just that simple.

INTERVIEWER: Yes. The project ended and there were some people who felt that it was an excuse, that the death of this diver was an excuse for the Navy to say, "Well, we don't need this project. It's too expensive in lives. We lost a human being here. We can't go on with it until we figure out what happened." From there, it was not funded any further and it ended. How do you perceive that?

CAPTAIN MAZZONE: I think the death was sort of a serendipitous way for the DSSP to find a reasonable way to end the program. I think they had gotten out of it what they needed to get, what was going to be written about in the years following. That's a personal opinion. I wasn't on the inside and there were other things that were going on. They really weren't part of that. The

standard diving Navy under Bill Serrell and Gene Mitchell did not believe in the SeaLab concept. They may have believed in the concept but didn't get along with the SeaLab people who were then in the DSSP. They developed what they called the 'Mark I diving system,' which was supposed to do a one-day dive. You went down to work and came back.

Then, they made it into a saturation dive system and I felt that sort of diluted the effort quite a bit, as far as funding went. They were both very expensive things and going to compete for the same people and the same kind of work. Progress, when you compete, is okay to a certain point. In a program like that, after a while, you needed to put things together and have everybody working together. I got in trouble because I said it to the wrong individual.

INTERVIEWER: Dr. Bond was, by that time, fairly ill, wasn't he?

CAPTAIN MAZZONE: He was in pretty good health. He didn't start really getting ill until he moved to Panama City, after it was over.

INTERVIEWER: But he was out of the business of being the visionary, in a sense. He was not given that same latitude? He was not able to work in the system?

CAPTAIN MAZZONE: That's a fact. Yes.

INTERVIEWER: When did you retire?

CAPTAIN MAZZONE: I retired in 1970. After we got back, Bill Lybolt came in and relieved me as the officer in charge. Then, I became the DSSP west coast representative and worked on a project in Vallejo.

INTERVIEWER: Was that Miro?

CAPTAIN MAZZONE: It was highly classified. I think I told you earlier that to get in, you had to go through one building. The next building was built inside and it was that kind of a thing.

INTERVIEWER: That was the one that Mac Kinnon was working on, you say?

CAPTAIN MAZZONE: No.

INTERVIEWER: He was involved with it?

CAPTAIN MAZZONE: No. I don't know what anybody else did.

INTERVIEWER: Oh, it was Craven. I'm sorry.

CAPTAIN MAZZONE: It was Craven, yes. Other than Craven, I don't know. At that time, I didn't even know Craven was working on it. I had my role to do and that was what I did.

INTERVIEWER: In the project that you referred to, about which you can't give us details, was Chief John Michelle also involved with that?

CAPTAIN MAZZONE: Who?

INTERVIEWER: John Michelle, from Trias?

CAPTAIN MAZZONE: No. We had no Trias people. They had done their deep dive and everything was over, and only through Andy Richt and some of those people did we get together at the last reunion and had a combined reunion. But we didn't work with the Trias people. We went out to see them a couple of times.

INTERVIEWER: You went to Mare Island. You worked on that project?

CAPTAIN MAZZONE: Yes. After that, I got a set of orders to go to London, England, to O&R. At the same time, they had the funding shortage for travel and said, "Well, since you have orders, we'll make it New London, New England." I went there for a year and then retired. Then, I went back to the submarine research lab and got back into operational research.

INTERVIEWER: You're still doing some work?

CAPTAIN MAZZONE: Well, I'm still doing that, but I went back to San Diego in 1970 and went to work for Howard Tarkinton in ocean engineering at the Ocean Systems Center. I worked for them for about ten years. During that ten years, I had a lot of related projects. I developed the

portable air bank system for the Marine Corps reconnaissance teams. I worked on the three submersibles that they had, including the *Macaca*. We were dealing with exotic materials, such as the glass-bowed submarine and the deep view. The *Macaca* was an acrylic submersible. There was also a stationary observation thing. I forget the name of it. I became the pilot for those and worked out the life support systems.

Then, I moved into other things. I got involved with the computerization of the oceanographic system when they shifted over to computers and changed their display units. My part was to set up the training programs for each of the NAVFAC and the oceanographic offices in Hawaii and Norfolk. That was an interesting job. What else was there? I was in Hawaii and I started working with our lab, trying to build a semi-submersible ship, a DSSP. Dr. Lang, who was on the staff, developed a model and found out that these semi-submersible ships were not really as stable as they should be because they didn't have fins across the back, or any planes. He came up with the working models that really demonstrated the capability of this submersible ship. I helped to get money for the first working model, and the first working model was going to be about 75 feet wide and 100 feet long or something like that. We got enough money to get it built, and part of my job was to come back to Curtis Bay Shipyard and work with the engineer to build it. I then took over as a test engineer and master for the testing of it. I don't know if you're familiar with them, but they were ships that had two pontoons underneath the water. They called them 'small water planes' and the struts came up in a big house. We had aircraft engines on it, T-64 Germans. It would really kick along at a high rate of speed. In a state 5C, once you got over about 12 knots, it became absolutely stable. You could sit a glass of water down and it wouldn't even move. We foresaw all kinds of uses for that in oceanographic work.

INTERVIEWER: Where was that?

CAPTAIN MAZZONE: We took it to Hawaii, towed it to Hawaii, or put it on a ship and carried it to Hawaii. We left it out there and it was used it for a lot of acoustics work. Then, we came back to San Diego and some company leased it because it had an aluminum hull and some steel claddings that were starting to crack. But they were using it for testing of some kind of stuff, and they were building a couple of them. The Navy was not. The civilians were. There was the other project, speaking of saturation diving, and I don't know if it's classified or not. I don't think so. I got to help train dolphins to go into the dry deck shelter on a submarine with saturation diving and we decompressed them. I thought that was clever. It was never written up, nor can it be. Using dolphins was a good thing except that again, a lot of politics got involved. They did not want us to train dolphins, not necessarily for killing people, but for tagging submarines or something else, like putting a transponder on there so that you could query, "What's your position?" They wouldn't let us do that.

INTERVIEWER: They used a dolphin. Was it on SeaLab II? He was a messenger?

CAPTAIN MAZZONE: Yes. That was Tuffy the dolphin. That was the start of my interest with dolphins. Then, in looking at the use for detection underwater, we took the Deep View, which was a one-man, glass bowed submersible, up to Hawaii with some dolphins and did tagging studies. That was interesting. They would come out and put a tag on a submersible. If they could put it on a submersible, couldn't they put in on a submarine? Could you fly them, drop them off and let them go do that? Those dolphins were brilliant.

INTERVIEWER: You were really one of the pioneers in saturation diving, you and Dr. Bond, when you started your animal studies?

CAPTAIN MAZZONE: I think that Dr. Bond, Dr. Workman and I were the first three, yes. I may sound egotistical, but there weren't any before. Just for background, in 1609, Edmund

Haley published a paper to the Royal Navy Physiological Institute in England that showed his little habitat. He made a conical structure that he could lower and said that he could stay in it as long as sixty minutes at depth, and he was at sixty feet. But he said, "For the call of nature, I had to come to the surface. But I felt I that could have stayed there forever." He would have been the first decompression casualty. Beyond sixty feet, he would have needed a decompression stop. He had a very unique thing. Somebody said, "Well, how do you get air?" He took bells. He took the bunt out, inverted it, put webbing around it and pulled it down. The water would go up, compress the air, and then he got underneath the habitat and turned it upside down and the air could be breathed. If you go to Dr. Bachrach's presentation on the history of diving, you'll see that there because that's one of the slides I always use for the history of diving. That was work done in 1609. You might not know who Edmund Haley was.

INTERVIEWER: Oh, yes. Haley's Comet was named for him.

CAPTAIN MAZZONE: He was Sir Edmund Haley, you know, because he was a common man.

INTERVIEWER: The saturation diving that was developed, and the work that you and Dr. Bond did, benefited the offshore oil industry and the deep diving that's going on now? You alluded to it earlier.

CAPTAIN MAZZONE: I think that without it, whether we or someone else, had helped to develop it, offshore drilling could never have gotten to where it is because it was cost effective to do it that way. You actually didn't take time off work because you could have three teams working 24 hours a day. You just rotated them around and decompressed them all at one time. At the end of the month, you paid them off and got another team down there, let them go ashore and come back.

INTERVIEWER: Is there anything that I may not have asked you that you'd like to answer?

CAPTAIN MAZZONE: I don't want to tell you, but in 1980, I got out of the civil service and went to work for Science Applications and got into an area in which I was highly trained. It was in computers. I knew nothing about them and became a manager of people. They needed programmers. They went out and bought them. I found out that programmers were like prostitutes. You showed them the money and you got them. I worked there for quite a while and became an off-center manager. I then gave that up and just worked part-time as an unscheduled consultant. I've given that up now, I hope.

INTERVIEWER: You also helped computerize NAVFAC?

CAPTAIN MAZZONE: Yes.

INTERVIEWER: Was that in the 1970s?

CAPTAIN MAZZONE: Yes.

INTERVIEWER: Was that your first introduction to data automation techniques?

CAPTAIN MAZZONE: It was more for data management, manipulation of data, target maneuvering and houses and the networking of one activity and others. It was interesting, or at least my part was. Training always intrigued me anyway, even when I was working with SAIC. One of my philosophies, if I had to sign up, was if I had one dollar left, I'd want to spend it on training. Today, what's the first thing that goes when dollars get tight? Training goes right down the drain. There is one thing that we didn't talk about, though.

INTERVIEWER: What's that?

CAPTAIN MAZZONE: Remember, I told you I did it. It's in the paper. We started going deeper and we were taking the divers straight down. We were pressing them right down to depth. They got to the bottom and said, "You know, if I had the choice to do something, I'd rather not do anything." We said, "Well, why?" They said, "I don't know. I hurt." We said, "Where do you

hurt?" They said, "I don't know. My joints hurt." We asked, "Well, what about your joints?" They replied, "They feel like they're dry, like there's no juice in the joints." The acronym came up, 'NJJ.' It stands for 'no joint juice.' By going back and looking at some old textbooks we found, we learned that metabolism by synovial fluid is much slower, and what do you have in the knees? You have synovial fluid. We said, "Okay. Why don't we interrupt? We'll go down 33 feet, stop, let him equilibrate for fifteen minutes or a half hour and then go." We got them at the bottom and they said that they were ready to go to work. It's hard to prove the concept, but it worked. Where did it come from? The guy who first started to look at the metabolism of body fluids should get the credit. He said that synovial fluid has one of the slowest metabolisms in the body, and he should be credited with saying, "Well, if you're going to pressurize me and change that pressure ratio, you'd better let me reach an equilibrium or I'm going to hurt you."

INTERVIEWER: That's where the scientific term, 'NJJ,' comes from?

CAPTAIN MAZZONE: Yes.

INTERVIEWER: No joint juice?

CAPTAIN MAZZONE: No joint juice.

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UNDERSEA HYPERBARIC MEDICAL SOCIETY

INTERVIEW OF
LCDR WAYNE WRIGHT

Kensington, Maryland
Saturday, September 6, 2003

PROCEEDINGS

INTERVIEWER: You joined the Navy in 1957?

LCDR WRIGHT: On September 26, 1956, I joined the Navy. I went to the USS *Velalla*. I went to Japan in January of 1957. I went to dive school in April of 1957 and graduated on the 7th of June, 1957. I returned to the *Velalla* in 1958. I went to an icebreaker, the USS *Staten Island*, as a second-class diver.

There were two of us on board. Our main responsibility was to do any over-the-side hull repairs necessary on deployment. Our first deployment was in the Antarctic. My first dive on that cruise was at McMurdo Sound in the Antarctic.

INTERVIEWER: With what kind of gear were you guys diving?

LCDR WRIGHT: We were diving with a shallow water rig.

INTERVIEWER: Was it the Jack Brown?

LCDR WRIGHT: Yes, it was Jack Brown, the bunny suit with the hole and the great big clamp on the back.

INTERVIEWER: Oh, really?

LCDR WRIGHT: Yes.

INTERVIEWER: How long did that keep you?

LCDR WRIGHT: That was the only dive dress we had. The only diving gear we had was the shallow water mask because it was only a two-man dive team on board.

Actually, I made that dive in December of 1958. I was home ported out of Seattle. We went back there and made two cruises up into the Bering Sea, north of Point Barrow, and made a dive up at Point Barrow to check the shafts and the screws. We then went to Adak, Alaska, on the way home. I got out of the Navy in 1960 and went back in 1961.

INTERVIEWER: What made you leave the Navy?

LCDR WRIGHT: I was married. My wife at the time didn't want anything to do with the Navy, so I got out.

INTERVIEWER: What made you come back in?

LCDR WRIGHT: I got rid of my wife. I wanted to be in the Navy. The Navy was where I belonged. I went to submarine school in New London, Connecticut, in January of 1962. My first submarine was the USS *Salmon*. At that point, I was just doing a lot of SCUBA diving. We went on a cruise up into the Bering Sea.

INTERVIEWER: That was on the *Salmon*?

LCDR WRIGHT: That was on the *Salmon*. I had a single 72, a wet suit, a regulator, fins, a mask, and all the stuff that we needed. A good friend of mine, a third-class torpedoman, had his diving gear so that we would be able to do something if we needed to.

We were there, taking pictures off the Russian coast. That was the year that President Kennedy was shot, in November of 1963. Some heavy seas hit us. They ripped all the clamshells off the aft end of the boat. We were asked to go topside, in the heavy weather, and see if we couldn't gag the outboard exhaust with wet suits. We did that. The clamshells had evidently hit the stern planes and broken the mechanical linkage from the drive, so they were hanging in full dive all the time. Anytime the old man wanted to pull the plug, we were in full dive.

We pulled into Adak, Alaska, and went over and checked them and make sure the indicator was indicating that we were getting full rise and full dive – and that the stern planes were hanging. But all the clamshells were missing. We only had one engine because three of the engines were leaking.

INTERVIEWER: On a diesel submarine, what are the clamshells?

LCDR WRIGHT: The clamshells open down into all the piping, all the air tanks, and the hydraulic systems.

INTERVIEWER: They were faring basically ----.

LCDR WRIGHT: They were faring. After that, I went to an FBM. After a couple of years on an FBM, I got out of submarines and went back to the salvage Navy, and went to the USS *Reclaimer*.

INTERVIEWER: The time that you were on the *Salmon* and the FBM, you were still rated as a diver. You were also one of the ship's divers.

LCDR WRIGHT: That's right, I was one of the ship's divers. Back then, and this is way back in the late fifties and early sixties, the dive team was just a two-man team. You only dove if you had a crisis on the ship that required it. I went to the *Reclaimer* in 1965.

After that, I pushed boots for three years, and then finally went to EOD school. I actually got there in January of 1972. From there, my diving career really started. Before that, it was just some minor hull repair and that kind of stuff.

INTERVIEWER: What kind of work did you do on the *Reclaimer*?

LCDR WRIGHT: We did some minor diving. A couple ships went aground, and we went over and checked for hull damage, to see if she was hit.

INTERVIEWER: Where was that?

LCDR WRIGHT: It was in the middle of the South China Sea.

INTERVIEWER: The *Reclaimer* was on the west coast, then? Was it in Hawaii?

LCDR WRIGHT: It was out of Hawaii, yes. In fact, I've got an eight-millimeter movie of us pulling the USS *Excellency* off of a reef in the middle of the South China Sea, loaded with ammunition. She hit that at two in the afternoon, at full speed, and went up on the island, up over

the reef and all the way to mid-ship. It took us three weeks to pull her off. We had two ARSs, and three ATFs with beach gear, because her stern was hanging in 300 feet of water. The bow was dry.

INTERVIEWER: It was dry to the mid-ship.

LCDR WRIGHT: Oh, yes, she was dry all the way back to the mid-ship. She hit it full speed in the dead center of the island.

After that, I got into EOD and started diving seriously, with mixed-gas and the old Mark 6 rig. The fact of the matter was that I only dove the Mark 16 once before I retired, but I used the Mark 6 quite a bit.

I had a big dive job over in Guam in 1975. We dove there for about five months. It was a wreck. A commercial tug was towing an old passenger liner out of Orote Point and got hit with some heavy seas, and the tow sank. When she came to rest at 110 feet of water, she was sitting within fifty feet of an LCU from the Second World War. That LCU was loaded with ammunition. We spent five months diving on the LCU to get all the ammunition off before they could put people down, to start cutting the ship up underwater so that we could salvage it.

For five months, we offloaded 258 tons of ordnance, all the way from small arms, 20 mil, all the way up to 105 WP. We were making a maximum of two dives a day at 110 feet. Like I said, we did that for five months, and no one got bent. One guy missed the decompression stop and spent ten minutes on the stage and then went in the chamber.

INTERVIEWER: What were you diving there?

LCDR WRIGHT: Kirby Morgan with great big gauntlet gloves. We were using two airlifts, one six-inch airlift and one eight-inch airlift. With an eight-inch airlift at 110 feet there was a lot of suction. It would suck a three-inch shell and projectile right out of the ship.

INTERVIEWER: That was how you were doing it? You were sucking the projectiles out?

LCDR WRIGHT: Actually, we were trying to suck the silt out, and then, we handpicked the ordnance out, put it in drums and lifted the drums and put them in the Mike 8. We took it to shore and blew it up. That took us five months.

After Guam, and I made warrant officer there, I ended up on the east coast. I made one Mediterranean cruise. The only kind of exciting diving we did was when they once dropped a safe over the side with some money in it. The old man wanted it back. I basically told him that it was beyond our capability to retrieve. It was in about 250 feet of water. There wasn't enough money in it to make it worth a safe dive. We kind of let it go.

There was a hotel, and I can't remember the town it was in. They had a submersible pump that was down a well. The pump had shut down, and they asked one of the guys to go down and see if they couldn't put a line to the pump. It was one of these wells in which you had to go down headfirst. You didn't have any room to turn around. They lowered you down with a line, tied a line on it, and brought you back up. It was nothing really big on that one. After that, I went to Adak, Alaska, and I took over the detachment up there.

INTERVIEWER: It was an EOD detachment?

LCDR WRIGHT: It was an EOD detachment in Adak. That was in 1979. We did our training dives just to maintain our diving skills. The most exciting part of that tour was actually blowing up two fish processing vessels, to burn the oil out. The first one was up off the Pribilof Islands. There's an island up there called St. Paul. One island belongs to the United States; the other island belongs to Russia, with the border split right between it. The fish-processing vessel ran aground there. The major industry there was seals. Have you heard the term 'clubbing of the seals?' Well, that's where it starts, right up there on the Pribilof Islands.

Well, the seals, they go to those islands and mate every spring, in March or so. There are upward of ten million seals that hit those islands every year.

Alaska's Department of Fish and Game was scared that the fuel on the ship was going to drift ashore and kill a lot of seals. It breaks down seals' insulation. They asked us if we could get rid of the oil in the ship before the seals started coming in. They had already started coming in. There were maybe 200 or 300 swimming around. We devised a method of blowing the ship, forcing the oil up inside and lighting the oil on fire. At 28 degrees below zero it's hard to light diesel.

INTERVIEWER: Oh, yes. How did you do it?

LCDR WRIGHT: We did it with thermite. Thermite would do it, we knew. We put 250 pounds of Mark 8 hose along each side, below the water line. We put satchel charges on all the tank tops to blow the tops. Then, we put thermite grenades on all the stanchions throughout the ship and tied it all in with deck cord. When it blew, the Mark 8 hose created a hole on the outside, with water going inside, forcing the fuel up. We punched holes through the tank tops, so that made a common area inside the ship for the fuel to go, and the thermite pushed it. She burned for four days. They estimated less than ten gallons went to sea, out of 115,000 gallons. It was a pretty clean job. It saved the state of Alaska \$15 million. They had a commercial contract to soak up all the oil as it broke and went ashore. The company gave them a bid for \$15 million, but we did it in 16 days at the cost of 3,000 explosives. It was a good job.

INTERVIEWER: That was a great job.

LCDR WRIGHT: A year later, we did another one off the north coast in the same time frame. After that, diving for EOD was pretty much in the MCM arena. I had a pep tour in Canada. I was the EOD officer for the entire eastern part of Canada.

INTERVIEWER: Where were you stationed?

LCDR WRIGHT: I was stationed in Halifax. Actually, Shearwater, Nova Scotia was where the fleet diving unit was.

INTERVIEWER: You never got tired of diving in cold water, huh?

LCDR WRIGHT: No. I was made the commanding officer of one of the diving tenders when we were up there. I'd made LT(jg) by then, LDO, and I took over the diving tender. Then the Canadian forces wanted to conduct a mine-exercise in Canada. They asked me if I could write the plan and establish an annual training event up in Halifax.

I wrote the first one, and we conducted a mine-ex up in Bedford Basin. We had the mines at a hundred feet. We actually coordinated with the United States. A couple of the detachments down in the U.S. had one parachute in with all their equipment. All we had to do was provide them a boat when they got there, and so it was a joint exercise at that point. Canadian Navy divers and U.S. Navy divers were to clear the mines that we had laid for the exercise.

INTERVIEWER: Do you remember what type of mines?

LCDR WRIGHT: Yes. They were 52s and 55s. I think we had a couple of 36s in there, but they were mostly 52s and 55s.

The second mine-ex that we orchestrated was off the eastern coast of Nova Scotia. We actually brought up minesweepers to get involved in that one. All the Canadian divers and the U.S. divers once again participated to go down and validate what the minesweepers had recognized.

INTERVIEWER: With what type of gear were you diving?

LCDR WRIGHT: We were diving with SCUBA then, with wet suits. That was in November. Of course, the water of Nova Scotia is always cold. I'll tell you what. The Canadian divers were a different breed. They were very serious about their diving.

After that, I left. I went back to MOB Unit 2. I was the ops officer of MOB Unit 2. From there, I became the executive officer of Training Unit One.

INTERVIEWER: Was that in Hawaii?

LCDR WRIGHT: That was in Hawaii, and I started the first Mark 16 dive locker in Hawaii. That was in the 1985 to 1986 time frame.

INTERVIEWER: You said you had a lot of time diving with the old Mark 6.

LCDR WRIGHT: Yes. We dove with the Mark 6 in Guam. We dove with it in Hawaii. There was one other operation on which we took the Mark 6. We went out and dove with a Mark 6 because they had suspected an influence mine, which, in fact, wasn't really an influence mine, but that was what they thought it was.

INTERVIEWER: What were your thoughts on transitioning from the Mark 6, then, to the Mark 16?

LCDR WRIGHT: Well, personally, anything's better than the Mark 6. I had a friend. He and I were going through a Mark 6 refresher in Hawaii before we went to Guam. He had an accident. He was Roger Levine. They told the instructor that his DP gauge was pegged out. If you know anything about DP gauges, they're notorious for being erroneous. Lo and behold, his DP gauge was really functional and he had actually run out of gas and passed out on the bottom of the pool. That was one of those things that you didn't even see coming. You just went to sleep. That was what happened to him. I actually lifted him up, stood him up on the bottom of the pool, put him

on the edge of the pool, and we tried to bring him back. He was gone. It was a pretty serious incident.

INTERVIEWER: People used to call it Mark 6 'green death,' right?

LCDR WRIGHT: That was what they called it. I don't think it was as bad as what the frogs were using, the oxygen rig.

INTERVIEWER: Was that the Draeger?

LCDR WRIGHT: That was the Draeger. Of course, you had different problems with the Draeger. It had pure oxygen, so you were depth limited, whereas if you were diving with helium or nitrogen in a Mark 6, you had got a little more depth capability. If anything happened, you could last a while without freaking out or going into convulsions. Actually, it was better than the Draeger, but it was not as good as the 16. With the 16, you basically look at the lights and the panel, and you're all right. Today, it is probably different. I've been retired 13, 14 years, so it has probably changed a lot.

INTERVIEWER: Actually, we just certified the Mark 16, Mod 1.

LCDR WRIGHT: Is that right?

INTERVIEWER: Yes. We improved the oxygen sensors. It's a 1.3 rig. It's like a 0.7 rig, but with better bottom time and less decompression time. They've improved the facemask and the emergency system to go with it. There are a lot of good things that they've implemented.

LCDR WRIGHT: Have they increased the depth on it?

INTERVIEWER: Yes, it's now capable of going to 300 feet.

LCDR WRIGHT: It can go 300 feet down?

INTERVIEWER: The Mod O could go to 300 feet, but we've only certified it to 200 feet. With the new 1.3 tables and the new EDS, 300 feet is actually reasonable.

LCDR WRIGHT: It gives you a little more capability.

INTERVIEWER: Oh, yes. It gives you a lot of capability.

LCDR WRIGHT: Mines aren't always within reach. During the Red Sea mining incident in 1984, I was actually the staff officer assigned to the CENTCOM. That was the year that the British recovered the Soviet 995.

INTERVIEWER: I don't know about that.

LCDR WRIGHT: You don't know about the Soviet 995?

INTERVIEWER: No.

LCDR WRIGHT: You've got to be careful on this story.

INTERVIEWER: This book is unclassified.

LCDR WRIGHT: Well, I don't know where I'm going with this one. Actually, I was ordered by radio to go and meet with a British diver because they had all the diving down at the mouth of the Suez Canal. They said they had recovered a mine, and they had the *Sea Owl* to videotape it. The admiral wanted me to go down and look at the video and try to determine whose mine it was. I went down there and was basically told that the Egyptians didn't want the U.S. to know that there was a mine. The British had already declared that it was a Central Intelligence Agency plant. I was not allowed to go into the Egyptian naval base. That night, they smuggled me in. I was in a British uniform, and I went aboard their mother ship.

INTERVIEWER: Was that is the Egyptian ship or the British ship?

LCDR WRIGHT: It was the British ship. They showed me the video. I had some publications with me. I said, "Here are all the identifying features of this mine. This mine is a new vintage Soviet mine. It's two bladed. The warhead is about a 1,500-pound warhead. It's magnetic - acoustic by function." I actually wrote that down, on a yellow-lined tablet. The British kept

asking, "Well, are you sure? Do you really know what you're talking about?" I handed them the notepad and said, "Here. Xerox this, because I'm taking a copy back with me and giving it to the ambassador." Our headquarters was in the embassy.

I took a taxi from Port Suez to Cairo, which was a \$75 cab fee. I went straight up and told the admiral what I had found. I gave him my paper on it. He asked me if I was positive. I said, "I'm one hundred percent positive, without a doubt, that this is what you've got." He said, "Okay, I'll get back to you later." I went over to the hotel, the Hilton, where we were staying, and went down into the casino and started playing blackjack.

While we were there, we weren't allowed to be in uniform. There were still people out trying to kill American citizens. I was sitting there at about two in the morning, and a marine bust through the door with a radio in his hand. He was in uniform and he hollered out, "Is there a Lieutenant Wright in here? The ambassador wants you right now." I went over to see the ambassador. Have you ever heard of Larry Kelly?

INTERVIEWER: No. I don't think so.

LCDR WRIGHT: You've never heard of Commodore Kelly? He had Group One. When I retired he was still there. He was a 04 at that time, at Op 372. When I walked into the ambassador's office, he said, "There's a little box over there and there's a phone inside of it." It was a soundproof box, and there was a red phone in it. It was a secure line. He said, "There's a Commander Kelly who wants to talk to you on the phone."

I was on the phone with Commodore Kelly, at the time he was Commander Kelly, for about an hour and a half, trying to explain to him what I had seen on videotape, and what the identifying features were, because this was a big political football. The British, after I left the ship, had radioed London again and told them that they still believed it was a CIA plant, but that

I had been there and said that it was a Russian mine. I finally convinced Larry. Larry would have had to go over and brief the president the following morning on what that thing was about. That was over.

About three or four years later, I was the operations officer of a group for Larry Kelly, who was a commodore at that point. One of my old commanding officers, when I was an executive officer, Dave Resick, came into my office one day. He had a great big book with him. He said, "Here, I want you to take a look at this." It was the intelligence package on the 995. It had my comments in the front of it. He said, "Everything that you said about this thing was precisely right, except you missed the explosive payload by fifty knots."

INTERVIEWER: That's not bad.

LCDR WRIGHT: It wasn't bad, no. That made me feel pretty good because it was a magnetic acoustic and a heck of a find. It was actually built in 1981. We had seen it in 1984. Before I actually left Cairo, I told the Admiral and the ambassador, "Okay, I've told you that his mine is two bladed." The significance of that was when a ship came through the canal, it would just roll over the side. That thing would actually be launched from below the water line. They said, "Well, there were no submarines that went through there." That was really immaterial. I said, "Start looking for a ship that has a double bottom, tubes, and looks very unsuspecting. I guess they found the ship. I think it was the Liberian Registry *Gatt*, up in Marseilles. I think they found one with a double bottom. But during that whole Red Sea mining incident, they brought in HM-14, and that was when HM-14 was just getting started.

INTERVIEWER: That was a helicopter mine-hunting squadron, right?

LCDR WRIGHT: There were the old CH-53s, and they had brand new size. A captain came over there to orchestrate the whole MCM effort in the Red Sea. He actually put the helos out there, running wire up and down the Red Sea. They had identified something like 450 targets.

I went down there. Be careful of what you identify as a mine-like object because you're going to have to verify every one of them before you leave the country. The depth of the water was anywhere from 200 feet to 350 feet. We were looking at a long, drawn out process. I would suggest that you take your helicopters back to see if you can start pinpointing these things again, because what you have over here are 55-gallon drums going over the side on these ships all the time. These are the things rolling down the canal.

Well, sure enough, most of what they were finding were 55-gallon drums, too short to be mines. But we had brought over a detachment. If I'm not mistaken, they came over with Mark 6 rigs. That was Sue Fitzgerald's detachment, out of Sigonella. The admiral made it kind of a joint concern. They wanted to train some Egyptian divers to dive for mines. That job was given to Sue, to go ahead and train the divers. They dove to quite a few of the mines.

INTERVIEWER: The Egyptians dove to quite a few of them?

LCDR WRIGHT: I'm not too sure the Egyptians dove to that many.

INTERVIEWER: Sue Fitzgerald's team did.

LCDR WRIGHT: Sue and her team did because they had to identify contacts that the squadron had put in as mine-like objects.

INTERVIEWER: Were they Russian mines?

LCDR WRIGHT: No. They were actually 55-gallon drums. The only mine found over there was that 995, and it was laid right at the entrance to the Suez Canal in Port Suez. The British actually found it, and that was a horror story in itself. They found it, went down and put a cable to it.

You've got to realize we're talking about an influence mine. They put a steel cable to it, jerked it off the bottom, and I think they said they raised it to within twenty feet of the surface. They were in contact with London the whole time. I guess London told them they didn't want to raise it. They actually just cut it and let it fall back to the bottom, to find out that it would have functioned above 18 feet. By the way, they did this behind a steel tug.

They went down later and actually took their underwater x-ray. It was a lethal dose for anybody in the Pacific because you had to put out so much power. They identified that there was a big control package in the end of it. Then, they went down there and put explosives around it to try to separate the instrument package from the warhead. They actually went too far into the instrument package and damaged some of the components. From what I gather, they got enough information out of it to tell them exactly what it was. They shipped the counters and everything.

It kind of turned me off quite a bit, with Great Britain's MCM capability. They jerked that influence mine off the bottom, put it underneath the steel hull of a tug, and cut the cable and let it go back down, and then dove to it again.

INTERVIEWER: That's surprising because I always heard their reputation was pretty good as mine counter meter guys, or mine divers.

LCDR WRIGHT: I was there for three or four days. I talked to them, and it sounded like they knew what they were doing. But the way they treated the mine was a little cavalier. Nobody was killed. But they were actually allowed to take the mine out of Egyptian Waters, back to the United Kingdom to do all the intelligence work. I'm sure we had a big part in that. That's where it was done, in the United Kingdom.

INTERVIEWER: They only found one, though, huh?

LCDR WRIGHT: That was the only one they found.

INTERVIEWER: It seems odd. You go through all that trouble, and then find just one mine.

LCDR WRIGHT: The threat was all we needed. They had ships over there that were running into mines all the time, or at least that's what they were claiming. They said they were running into floating mines. We didn't find any floating mines, but there were ships that had great big holes in the bow from explosives. They couldn't explain it. We didn't find any floating mines. We rode around on helicopters looking. The only things we could ever find were 55-gallon drums. There was always a theory that maybe there were explosives in the 55-gallon drums. They would float just under the surface. But we never did find any more. I'm trying to remember if there was anything else that would be of interest. You ever dive with a Jack Brown?

INTERVIEWER: I did, but only through dive school, in 1989. They taught us how to use the Jack Brown, but shortly after that, they retired the system.

LCDR WRIGHT: Did you use the bunny suit?

INTERVIEWER: No.

LCDR WRIGHT: I almost drowned in the bunny suit. I guess it was a couple of years after I had started diving. On the bunny suit, in the back of the head there was some webbed lacing. The base of it had a piece of rubber, and it had a hole in it about two silver dollars in size. What happened was when you put thing on, they stretched it behind you so that it opened it up, and then you put on the mask.

Well, the lacing came loose. I was on a forty or fifty-foot dive. The lacing came loose, and all of a sudden that thing closed up. Every time I went to get a breath, I was sucking rubber. I thought I was going to die.

INTERVIEWER: Where was that?

LCDR WRIGHT: That was in Okinawa, off of the White Beach of Okinawa. That was one diving rig that always scared me to death.

INTERVIEWER: Do you mean the Jack Brown or the bunny suit?

LCDR WRIGHT: I meant the bunny suit. I loved the Jack Brown.

INTERVIEWER: Most guys who dove with it said that was the best rig we ever had.

LCDR WRIGHT: It was. A Jack Brown mask with a set of underwear was great. Put me in that bunny suit? No, thanks. It was just impossible to get out of it. The way you got in it was through the back. There was a great big square hole, and your tender had to fold it just the right way and put this great big copper clamp on it and twist it down. There was no way out. It was a lighter weight belt, but it was still a weight belt.

INTERVIEWER: Basically, it was a dry suit, though.

LCDR WRIGHT: Be careful of that one.

INTERVIEWER: It was advertised as dry?

LCDR WRIGHT: It was advertised as dry. The Poseidon was dry. That was dry. But the bunny suit, the old Mark 5 dress, I don't think they ever made dry. In a lot of cases, you really didn't want to. It was too hot. But when you're diving in Alaska or in the Antarctic, you really would like a dry dive.

INTERVIEWER: You went to dive school on the USS *Mison*. What kind of ship was that?

LCDR WRIGHT: It was an ARG. It was an internal combustion engine repair ship. I'm not sure, but I think they scrapped her back in the early sixties.

INTERVIEWER: How many dive schools was the Navy running?

LCDR WRIGHT: We're talking 45 years ago. I don't think they had many. There weren't real, well-established schools. Whenever they needed divers they were authorized and they said,

“Here's a school,” but there was a repair ship that had a group of first-class divers on it, and I think they held a school.

I remember the dive manual was a book about an inch and a half thick. There was a blue cover on it. Compared to what we were diving with twenty years later, we really wondered if we should have been diving. Some of the things we used to do, crazy things, like taking twin 72s and going to 250 feet for black coral. That was way, way down there. I think at one time, the authorized limit was 150 feet for diving on air. One hundred and fifty feet was nothing, and we would do it all the time. Then, the rules changed, and I can't remember what year that was, and we were restricted to 130 feet. That was in place for years. Is it still 130 feet?

INTERVIEWER: One hundred thirty feet is the normal working limit. You can get to 190 feet with the CO's permission.

LCDR WRIGHT: Oh, is that right?

INTERVIEWER: Yes. That's considered the maximum working limit for an air dive.

LCDR WRIGHT: We used to hang jugs off at ten and twenty feet and make it to 250 feet, and come up. We'd spend some time at the twenty-foot stop, and we'd spend some time at the ten-foot stop. I don't remember anyone who did a lot of diving get bent that way.

INTERVIEWER: How long was the dive school, then? It was a second-class course, right?

LCDR WRIGHT: It was a second-class course, and I think it was like twelve or thirteen weeks. There was a first-class diver who was the head of the school, his last name was Raymond. I'll never forget him. Our school was located right off a golf course, but we made our deeper dives at a different location. He was trying to teach us to come up by ourselves, to inflate, hold our chin buttons in, press our chin buttons just to kind of regulate ourselves. It was really funny. I blew up. I mean, my arms went out and my legs went straight. I said, "I blew up." I remember

hearing over the intercom, "Get the shotgun. Blow this guy out of the air when he hits the surface." In another case, we were stretching 250 feet of umbilical. We were diving thirty or forty feet. After we'd done a flange of some kind of task, he'd say, "Okay, stretch two hundred."

INTERVIEWER: Was that two hundred feet of umbilical?

LCDR WRIGHT: That's right. You'd just put the stuff over your shoulder and head out. They'd guide you by hand signals as to which way to go. Stretching 200 feet of it is not easy in a soft, mucky bottom. I fell in a hole. I was up to my armpits in goo, and I couldn't get out. That was what started this whole thing about how you did it. You just held in on your chin button and got a little light. Well, by the time I was light enough to get free of the mud, I was a torpedo. I don't think they teach that kind of stuff anymore. It's pretty dangerous.

INTERVIEWER: When I went through, they were teaching with the Mark 12, which is what replaced the Mark 5. In that one, they taught you how to get light by turning your exhaust down and turning your air up, so that you could run across the mud a little bit. But they never taught us to ascend that way, as I recall.

LCDR WRIGHT: The Japanese did it all the time. When I first got there, they had Japanese divers who were diving to the bottom everyday, those old one-lungers. I mean, they knew what they were doing. But it was an old one-lung compressor. It went, 'pop, pop, pop,' and they were getting air. Those guys were coming up and going down by themselves. All they had for a weight belt was this great big thing. It was a collar weight. It must have weighed ten pounds in the front and ten pounds in the back. Everything else was skin tight. It wasn't like a Mark 5 dress that we used, because our weight belt was 85 pounds. Theirs was just a little weight that hung right there in the weight belt, and they would go up and down by themselves. It would be one

guy in the boat running the compressor, helping him in and out, whenever he would come to the surface.

INTERVIEWER: That wasn't so much different than what you guys did. You said you would dive two guys together.

LCDR WRIGHT: Yes, but we were only diving with the Jack Brown, doing lightweight stuff.

INTERVIEWER: How many guys made up a side for a Mark 5 dive?

LCDR WRIGHT: Back then, I think it was five, routinely. It was with five guys. But when we went to Guam and did that job out of Orote Point, we had about twenty. We had a master who was on the side. He would run two divers at a time, but that was way after all the rules on diving had changed. I think the big change came in the mid-sixties, when they changed a lot of the rules for diving. I don't think they changed the rules because we had a lot of accidents. I don't remember us having a lot of accidents. Even when I was up in Canada, we would have a week at a time to stand by the chamber in case we had a chamber run. Most of our chamber hits were civilian divers.

INTERVIEWER: That's still true.

LCDR WRIGHT: In fact, when I went through submarine school, I'd been through chamber watches a number of times. I actually stood chamber watches right at the old tower, on the submarine base, and treated a number of sport divers.

INTERVIEWER: Tell me about diving in the Antarctic. Were you diving under the ice, or were you diving off the ship?

LCDR WRIGHT: Actually, we'd go off the ship. What we did was we backed down into some ice. The old man feared that we had sheared one of the blades. The blades on an icebreaker are replaceable. They're like blades on a minesweeper, with variable pitch.

INTERVIEWER: That's right. You could still do a blade change in the water?

LCDR WRIGHT: You could, so we went down just to check to see if we had damaged the blade, and sure enough, we had. The big thing about diving down there was that everybody was scared to death of Orcas, the killer whales. We weren't allowed to walk within twenty feet of the edge of the ice. Sometimes, we'd pull up on the ice. That's how an icebreaker does his job. They pull up and it crushes the ice. We'd pull up on the ice, settle down, put out ice anchors, and we would go out and have a party on the ice. We'd play ice football. But nobody was allowed within twenty feet of the edge of the ice because killer whales would come up. They would slide way up on the ice, grab a seal, and go back in the water. We used to witness that all the time.

INTERVIEWER: Did you really? That would be amazing.

LCDR WRIGHT: Yes. When getting a lightweight diver to go in the water, you were always looking around.

INTERVIEWER: How clear was the water down there?

LCDR WRIGHT: It was absolutely crystal clear. You could see forever. It's the same way in the Arctic. It was always really clear.

I never did see a killer whale while I was in the water, but we were about 15 miles off of Point Barrow. The old man wanted us to check the shafts. Actually, there was a walrus'. They were in the water, and we actually could see them.

INTERVIEWER: Were they curious? Did they come up to you?

LCDR WRIGHT: No, they were not like seals.

INTERVIEWER: One would come right up to you.

LCDR WRIGHT: Yes, and it would bite at you. I had seals nip at me. I've been in the water with the white tips and the black tips.

A good friend of mine is Chandler Cook. He's black. We had gone to Truck Lagoon. They had an explosive accident there. The four of us went to get rid of a lot of the stuff. Some kids had gathered a lot of ammunition from out in the jungle. They were cutting the ammunition in half and making fish bombs out of the explosives. Well, they had a whole bunch of projectiles. They had cut them in half. There were nine kids, ranging from twelve to twenty, out in this old quay wall it detonated and killed them.

INTERVIEWER: During what time frame was that?

LCDR WRIGHT: It happened in 1974. The governor of the island's son was one of them. If you know anything about Truck Lagoon it's a national treasure.

INTERVIEWER: I've actually been there.

LCDR WRIGHT: Nobody's allowed to take anything. You can take pictures, and that's it. But we were given carte blanche to blow up anything we could find in the harbor, anywhere. We dove to a lot of wrecks. I've got a picture in there of a good friend of mine. There was a Betty bomber sitting on the bottom with its wheels down. I've got a picture with it. Chandler Cook is in the cockpit and I'm spinning the prop. We took each other's picture doing that.

We actually blew up a 500-pound U.S. bomb not a hundred feet away from that and all it did was knock the sand off the wings. It didn't damage the plane at all. We blew up a Japanese 300-KG bomb out at another one of the islands, just twelve feet from shore and destroyed all the water catchman system in the village. We paid for that one. We had to pay for all the coconut trees we blew down. We blew up some Japanese beach mines in the lagoon.

We were going to leave the following day, so we decided we were going to go out to get some raw goose and have a party. We went down to the outer reef and we were going to get some lobsters and whatever else we could find out there and have a big party.

We found this one cave, and it was dark inside, but there was a whole bunch of those little red fish with the great big eyes. We had a wired sling with us. I motioned to Chandler to go inside, that I'd hand him the spear and he could go ahead and spear fish. Then he could hand them out to me and I'd put them in the bag. He said no. In order to get in it, you had to take your jugs off, get in the hole, pull your jugs back in, and then just sit there and spear the fish. I went in. He would take the fish off and put it in the Bag. I'd take the spear and get another one. All of a sudden, he was not paying attention to me. I had the spear out there. I was bumping him with it, and his eyes were about that big.

I looked out there and there were a couple of white tips going back and forth in front of the reef. They were reef sharks, which are small and don't bother you. I said, "Chandler, you get inside, and I'll stay out here and take the fish." He said, "No. I'm scared of sharks, but you're not getting me in that cave." We were only in about seven or eight feet of water. It was really shallow. He didn't like closed spaces like that. He's a good guy, though.

We had plenty of fish and plenty of lobster for the party. Actually, we had gotten rid of a whole lot of ordnance over there. I believe that was the last time that anybody was allowed to blow up anything because you can still dive those wrecks and find the guns still loaded.

INTERVIEWER: Oh, yes. I've got a picture of myself sitting on 20-inch shells in the Yoshimoto that were in the hold of one of those ships being transported out to the water. It was just amazing. I picked up the chemical horn for an anti-invasion mine. It was just like they showed us in school. I think it had three rings on it, and if you tipped it over, you could see the vile of electrolyte in it. It was still green, and the vile was still intact.

LCDR WRIGHT: We had a guy who took us out to one of the islands. It was where we found a lagoon full of Japanese beach mines with the two horns.

INTERVIEWER: Are you talking about the hemisphere horns with handles?

LCDR WRIGHT: Yes. He said, "Well, they're in the lagoon." He just stood back and kind of watched us. We got a shovel and turned it upside down and started probing with the shovel, just to see if we could hit metal. He said, "No, no, no. Give me your shovel." He went over there, reached down, got some of the mud away from it, and felt underneath it. Sure enough, it was an inverted Japanese mine. He said, "Well, here. Let me help you get it out of here." Chandler hit him with a shovel. He reached underneath there, and the horn was bent at a 45 degree angle, so all the acid was sitting at the bottom, waiting to be turned back up.

We went ahead and we capped into that one, right where it was. When it blew, it rocked everything in Truck Lagoon. I asked the guy, "How many mines were in there?" He said, "Oh, maybe thirty, maybe forty."

INTERVIEWER: They all detonated sympathetically, huh?

LCDR WRIGHT: They were all stacked on top of each other. The Lagoon became a big crater and it destroyed two of the homes in the village. We did a lot of work out there.

INTERVIEWER: You said that was in 1974.

LCDR WRIGHT: Yes.

INTERVIEWER: You were fresh out of EOD school. You said you graduated from EOD school in 1972.

LCDR WRIGHT: Yes. My first experience in EOD work, after I graduated from school, was about three months on Coral Lobby.

INTERVIEWER: They're still cleaning it up. If you want to work on Coral Lobby, they're still hiring.

LCDR WRIGHT: No, thanks. It's because they had some problems out in Coral Lobby. In the early seventies, we would go over there with 200 or 300 pounds of explosives in a backpack. We'd set up camp and backpack all over the island and blow up anything we could find, be it bombs, projectiles, or whatever. It was excellent training. If you wanted to find out how to gain access to a 2000-pound bomb without having to go high order, you could practice anything you wanted to, and we did. We got to a point at which we could cut a bomb in half explosively, without making it go high order. Of course, you didn't get an opportunity to do that every day, but it was good training. Of course, diving over there was a treat. There was ordnance in the water all around it. It had been shelled for so many years. Have you dived over there?

INTERVIEWER: I have not dived in Coral Lobby. I've been to Hawaii, though.

LCDR WRIGHT: There's a little island in between Maui and Coral Lobby called Molakini Rock. From the surface, you can see the bombs and projectiles lying in the water. You can see the munitions underwater. But yes, go and dive and just try to tell what kind of munitions are what.

From Guam, we made a trip down to a place called Angaur. Angaur is about eight or ten miles southwest of Palau. The Japanese had used that as a runway. The island had a long runway on it. We were sent over there to clear the size of the runway because the vegetation was getting to the point that they couldn't land planes or anything. They would bring C-130s in there to the Coast Guard Loran station. We went over to blow the trees. The islanders had begged us to dive in this one lagoon and clear an old Japanese tank that was blocking the channel.

We went down there and found one of those old Japanese two-man tanks, sitting upright in the middle of the channel. We put a couple satchel charges underneath it, launched it, put it up on the quay wall, and it worked out really well.

They were happy. The kids were out there playing on their beaches and they found a number of different bombs. We just hurried everybody to the other side of the island because we could capture the bombs and get rid of them so that the kids didn't have a problem. It was a good trip. All those islands out there are just loaded. I've got some underwater pictures of the island.

They're kind of tricky. They live on fish. One of the best ways to get fish, of course, is underwater detonation. We would get a call, every once in a while, when we were at the detachment, telling us that the islands had found some munitions they wanted us to get rid of. Sure enough, we'd go out there and they'd taken all the munitions they could find down to the lagoon and piled them up. Then they would sit back there with their boats and their nets. As soon as we'd crank it off, they were out there, getting all kinds of fish, turtle, and whatever they could find. There was a big feast that night. It was a lot of fun. I enjoyed that.

INTERVIEWER: Tell me a little more about your more memorable diving experiences.

LCDR WRIGHT: Back when I was diving in the Antarctic and in the Arctic, I was so young, and everything was exciting. I was cold and looking for the killer whales. Going to Guam and diving at 110 feet twice a day for five months was probably the best diving we ever did. You couldn't see a thing because as soon as you got down there and kicked up that silt, you couldn't see anymore. You were using an eight-inch airlift, sucking the stuff out. Twenties would go through there like traps for geese. You'd actually have twenties functioning in it, too.

INTERVIEWER: Oh, were they really? That must have been nerve-racking at first.

LCDR WRIGHT: Yes. You could hear it pop. Every once in a while you'd hear one pop because a 20 mil has that air column fuse. Unless the integrity of that fuse is broken, it will function.

INTERVIEWER: In the beginning, what got you interested in diving? Did you come in the Navy to be a diver?

LCDR WRIGHT: Yes. Actually, the first time I went diving was two years before I went into the Navy. It was down in Mexico, and it was SCUBA diving in January of 1955. I only did it once, but it was a lot of fun. When I was in Japan on the USS *Velalla*, they asked if anyone wanted to go to dive school and pushed me to the front of the line. They told me that I would have to get my mother's permission because I was only 17. I took the letter, signed it myself and gave it back to them because I knew she would never sign it. For probably a year, I think I was the youngest diver in the Navy.

Back then was different than it is now. You go out to make a dive today and it's a major production. It used to be that you'd just snap in your hose, jump over the side, go to work, drive a DC plug, or whatever you needed to do for hull repair, and fly back up on your own line. You can understand the reasons it is a production today. People do much deeper dives using different kinds of equipment. Diving is a risky business.

INTERVIEWER: When you went through dive school, did they also teach you SCUBA?

LCDR WRIGHT: SCUBA had just hit. It was back in 1957. Of course UDT teams had been using SCUBA since World War II, but your everyday Navy divers weren't involved with SCUBA. Believe it or not, when rope divers first started going to SCUBA, they didn't like it.

INTERVIEWER: I've heard that. A lot of them couldn't swim very well, and they had to start the underwater swimmer school.

LCDR WRIGHT: You didn't have to swim. It didn't help you to know how to swim if you were in a Mark 5.

INTERVIEWER: But that's counterintuitive to a guy who went through dive school when I did. You had to take a screening test, and you had to do a lot of swimming, a lot of bay swimming and a long swim with the fins. Swimming was very much emphasized.

LCDR WRIGHT: Yes. But a SCUBA diver is pretty much in charge of his destiny out there, but a rope diver, he's restricted to his tenders. A lot of your rope divers didn't feel comfortable being out there, un-tendered. I enjoyed it. We got something like two days of SCUBA training before we graduated. SCUBA was not a big thing then. I remember the first time I had to go up to Keyport, Washington. I was on the icebreaker then. I can't remember the old master diver who was there. He was one of the old timers.

INTERVIEWER: Was it Bob Sheets?

LCDR WRIGHT: Yes.

INTERVIEWER: Have you read his book?

LCDR WRIGHT: No, I haven't.

INTERVIEWER: It's a great book. It is called *Diving as a Guest of the Emperor: One Man's War*.

LCDR WRIGHT: Well, he was the master at Keyport, Washington, when I was recalled. That would have been about 1959 or 1960. He was a super guy. But man, I'll tell you what. He had a lot of stories. He ran the dive locker there. I could not conduct recall dives unless I went to another facility. We could go ahead and work over the side, drive DC plugs whenever we wanted to, but that's not doing a recall dive. It wasn't qualifying for it. I ended up meeting Bob Sheets.

I'm glad you remembered his name because I'd forgotten it.

INTERVIEWER: Yes. His book's really worth reading. It's great.

LCDR WRIGHT: Yes. He dove for the gold.

INTERVIEWER: He dove for silver pesos.

LCDR WRIGHT: Was that what it was?

INTERVIEWER: Yes.

LCDR WRIGHT: That was a long time ago.

INTERVIEWER: You mentioned the bunny suit incident, when it came unlaced and snapped shut on you. Did you have any other close calls?

LCDR WRIGHT: No, not really. I think that was my only close call. I spent a lot of time in the water, a lot of time. Until I became the operations officer of the group, diving was a lot of fun. But after you do it that for many years, it's work. It's like parachuting in the water. That's a lot of work for a three-minute ride.

INTERVIEWER: Yes. It's fun, but you're paying a lot for a couple minutes of fun. Where did you go to jump school?

LCDR WRIGHT: I went to Fort Benning in 1975. I went through jump master training in Lakehurst. I had my first and only parachuting accident in Lakehurst.

INTERVIEWER: How was that?

LCDR WRIGHT: It was a marginal day for jumping. We were spotting ourselves getting ready to graduate, putting the streamers out, and we came back and made a live run and exited the aircraft. The wind was bouncing anywhere from 16 to 18 knots. About 500 feet off the ground we got some gusts up to about 22 knots. I turned into the wind, so I hit the ground with my heels, my behind, and my head and was dragged across the drop zone. A Wave in one of the basic classes ran across the drop zone, clasped my canopy, and I was unconscious.

INTERVIEWER: Oh, wow. She might have saved your life.

LCDR WRIGHT: I think she did. I woke up in the ambulance as we pulled into the hospital.

INTERVIEWER: Were you injured?

LCDR WRIGHT: Oh, I had cuts and scrapes and bruises all over the place, but the doctor said there was no concussion. That was on a Friday, so I drove home to Virginia Beach. At this point,

I think they should have taken x-rays of my back and my spine. I'll tell you what. If you hit that hard, you're going to damage something. Playing with explosives and jumping out of airplanes and diving is good stuff.

INTERVIEWER: Not a bad lifestyle, was it?

LCDR WRIGHT: No. It pays for itself, too. Do you know Tommy Ligand ?

INTERVIEWER: No. I don't.

LCDR WRIGHT: Tommy Ligand and I go back thirty years. He was one of the detachment officers in charge when I was the air operations officer in Group Two. I had set up all of the training exercises, the parachuting exercises up and down the east coast. I had set up a mine-ex down in Key West, down off of Boca Chica. It was the first time it had ever been done. We put a 52 in the water in Boca Chica. The whole operation was taking off out of Oceana, with the next stop being Boca Chica, for an air entry. I set this whole exercise up, gave it to Tom Ligand, the officer in charge. He planned all this stuff. That was when we were using the inflatable boat package.

INTERVIEWER: We still do it.

LCDR WRIGHT: Well, we designed that. That was back in 1977, with all the corrugated cardboard.

INTERVIEWER: Yes. That's exactly how we still do it.

LCDR WRIGHT: We went in with Mark 6s. A commodore went down there a day ahead of time.

INTERVIEWER: Who was the commodore?

LCDR WRIGHT: The commodore was Tom Moody. He was a submariner. The guy had a photographic memory. His name was Tom Moody, not Red Moody.

INTERVIEWER: I interviewed Red Moody. He's a great guy too.

LCDR WRIGHT: Oh, he's super guy. He was at school when I went through school. But Tom Moody went down there a day ahead of time and got a boat. There was no detachment down there. Anyway, he got a boat from the air station. He was cruising around out in the harbor, watching the whole exercise, watching the guys come over, parachute in, get in their boat, crank it up and then start searching for the mine. It was probably June or July in Key West and it was pretty hot. The guys had been out there for eight to ten hours. They hadn't found the mine yet, and they had forgotten to bring fresh water.

Well, Commodore Moody had water in his boat. So, the detachment called him over and asked him if they could borrow some water. The commodore said, "You didn't bring it. You don't get it. There's a lesson to be learned here." He was serious. He played the game the way the game was supposed to be played. They eventually got the mine, took it ashore and did the intelligence on it. It was a good exercise.

There is a lot to be said about old Tom Moody. He wanted to make sure that you were doing the things the way you would have to do them if the situation was real. I would have to go in and brief him on where the exercise was going to be. If it wasn't real enough, he'd say, "Change it." But everybody hated him. I don't think you have to be really qualified in everything as long as you listen to the people who are qualified, but that's my own personal thing. Larry Ronan was his chief. Do you know Larry Ronan?

INTERVIEWER: No. I don't.

LCDR WRIGHT: He was commonly referred to as 'Lawrence of Westlock.'

INTERVIEWER: Why was that?

LCDR WRIGHT: He was CO of EOD Shipboard Unit 1. He was the last CO of SU-1.

INTERVIEWER: That must have been in Hawaii, the Westlock?

LCDR WRIGHT: In 1973 or 1974, I volunteered. I was assigned to MOB Unit 1 when I got there. He didn't have enough guys to command all the ships that he was having sent over there, so he asked for volunteers. I volunteered to ride one of the ships and went out on the USS *Killer Whale*.

INTERVIEWER: That was the TAE-26.

LCDR WRIGHT: That was it.

INTERVIEWER: I was on her, too, a couple years later.

LCDR WRIGHT: That was back when she was still an AE, in 1974. Then, I rode the USS *Carling*, and that was an 11-month cruise. I was the operations chief for MOB Unit 1. When the shipboard unit came on the MOB Unit, they combined them. Dave Usser was the CO. As the ops chief, I figured out whichever one I wanted to ride. I'd set it up and go do it. We ended up doing a lot of the carrier work-ups. Instead of doing full six, ten or twelve-month cruises, I'd do a lot of the work-ups on the West Coast. So, I rode a lot of carriers doing that.

There's a guy, Roger Lavigne. He raised the USS *Kitty Hawk*. The *Kitty Hawk* had a flooding problem. He actually made a dive inside the ship. There's a guy that would have a heck of a story for you.

INTERVIEWER: I'll have to get in touch with him.

LCDR WRIGHT: He's up in Bangor, Maine.

INTERVIEWER: I'm from Maine, so maybe I can touch base with him when I'm home on leave.

LCDR WRIGHT: I haven't heard from Roger in a long time.

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UNDERSEA & HYPERBARIC MEDICAL SOCIETY

INTERVIEW OF
CAPTAIN WILLIAM MAC NICHOLSON

Kensington, Maryland

April 2003

P R O C E E D I N G S

INTERVIEWER: First of all, thank you for coming in. We appreciate your time.

CAPT NICHOLSON: I'm glad to be here.

INTERVIEWER: I'm sure this is going to be a good oral history and a very, very valuable one. You were born in Napa, California?

CAPT NICHOLSON: Yes, in 1918.

INTERVIEWER: For the sake of the interview, can you ask you to give your full name that you were given when you were born in Napa, California and the title you prefer to go by?

CAPT NICHOLSON: My full name is William Mac Nicholson. Everybody always asks me about the 'Mac.' It's not a nickname. It's my given name. My mother's maiden name was Macilmoyle, but she didn't want to burden her child with all that. It actually came out as 'Mac,' and that confuses many people.

INTERVIEWER: What is your preferred title?

CAPT NICHOLSON: It's 'Captain,' or 'Mister,' or 'hey you.'

INTERVIEWER: It's okay as long as it's clean.

CAPT NICHOLSON: That's right.

INTERVIEWER: You were born in Napa, California, on 15 June 1918.

CAPT NICHOLSON: That's right.

INTERVIEWER: What was Napa, California like when you were a young boy? Was it a good place to grow up?

CAPT NICHOLSON: Well, we didn't live there very long. We left there shortly after I was born. I was probably about two years old. My mother divorced my father when I was about four, I guess, and we went to southern California and lived in Upland on an orange grove. That was where I went through my formative years. I went through school until about the first or second grade, when I acquired a case of pneumonia. They treated my case by putting me in the hospital and doing a rib resection and draining the fluid for about six months. I missed a whole year of school. That was

probably the biggest thing that happened when I was little.

Then, we moved to various places in California, my mother being divorced and living with my grandmother. We lived in Santa Ana, Huntington Beach, Long Beach and a variety of towns, where I learned to swim and got acquainted with the Navy. Long Beach was fascinating. When I was in junior high school, we used to go down to the fleet landing and watch the fleet. In those days, in the 1930s, the fleet would anchor off San Pedro and Long Beach and we could watch the USS *Saratoga* and the USS *Lexington*. The groundswells would roll and dip their booms in the water, on occasion. It was before they built the breakwater. We spent a lot of time watching the Navy and watching the shore boats coming in and I got very much interested in it. My mother knew a chief petty officer on the battleship USS *Colorado*. He took us out there a couple of times, which was interesting. In the mid-1920s we moved to Eureka, where my grandmother lived. That's in northern California near Mount Shasta. We lived there for a year and then moved back to southern California. In 1932, I guess it was, just before the big earthquake in Long Beach, we moved to Mill Valley near San Francisco, in Marin County. We lived there while I went to high school. I went to Tanopias High School, in Sausalito. My dad had a boat, an old 48-foot cruiser. I got into the Sea Scouts, which continued my interest in the ocean. The Sea Scouts had a motor launch and a sailing cutter. In the Sea Scouts, we sailed all over the bay, up to Mare Island and all the way down to Redwood City, and caused our parents quite a bit of anxiety when we didn't show up as scheduled. The wind was variable and we'd be late coming in.

INTERVIEWER: Did you have an adult on board, or you could sail on your own?

CAPT NICHOLSON: No. We had a faculty adviser who was in charge and he was along on all the trips. I thought that was real dedication on his part, because we kept going. My dad liked to go to sleep on board, and soon as I got him out of the dock at the St. Francis Yacht Club, he went down, went to sleep and let me run the boat. I remember that William Randolph Hearst put up a trophy for navigation on the bay for yachts. My dad entered the race. He went down, went to sleep and let me run the whole race. I won the trophy and got some notoriety in the newspapers in San Francisco. As a 15-year-old, I was not supposed to be doing that. But it was a simple mathematical conclusion.

I became interested in ship lines and ship drawings because I had a mechanical engineering drawing instructor in high school who was a Scotsman and had been a naval architect in Scotland. He got me interested in drawing the lines of ships and I thought it was fascinating. I guess that was started my interest in naval architecture. I got out of high school in 1935. I applied to the Naval Academy. The Depression was on and I think my dad probably encouraged me to do that.

INTERVIEWER: That was out of the San Francisco Bay area?

CAPT NICHOLSON: It was out of San Francisco. A congressman had a competitive examination. I took the competitive exam and got a second alternate appointment, but that didn't work. The principal got in and I wrote that off and said that it was not part of my future.

I went to Marin Junior College for a year. That was a fallback position, sort of a general education, but I enjoyed it very much because I was having a good time going fishing and things like that. Then, an opportunity came for me to go down to CalTech. My mother moved to Pasadena and got a small house and I signed up at CalTech as a freshman. They took a look at me and said that the junior college math didn't match their math, so I spent that year redoing the mathematics course, principally.

INTERVIEWER: You were fairly good at the math, weren't you?

CAPT NICHOLSON: Yes, and I worked in the Metropolitan Garage in Los Angeles at that time, parking cars for thirty cents an hour, which was pretty good. A lot of people didn't have jobs. About that winter, I got a telegram from the congressman that read, "I have another appointment coming up. If you're still interested, this authorizes you to take the competitive exam." I was pretty much into taking exams. I was enthusiastic about it. I said, "I haven't got anything to lose. I'll take it." But I really had made up my mind to be an aeronautical engineer. CalTech was aeronautically oriented and was building the big telescope for Mount Palomar and had a lot of fascinating things going on, which I thought was wonderful. I was quite happy to stay at CalTech and be an aeronautical engineer.

But they fooled me. They gave me another second alternate appointment. At that point, I said, "the Naval Academy is out, so I'll stay here." About a month later, I had a telegram from him.

He said that the principal had dropped out and his first alternate had dropped out, so I got the appointment. He said, "If you want the appointment, it's yours." I had a big decision to make. My dad said, "Why don't you go ahead and take the physical?" I took the physical exam, and the doctors out on the west coast told me that I couldn't qualify. I had the scar from my pneumonia at six years old. I had an eardrum that was punctured and they said that those things were disqualifying marks. They said, "But we can't tell you that. You have to go back to the Naval Academy and they will make that decision." My dad said, "Go ahead. You've never been back there. It will be good for you." I actually made arrangements to go back and take the exam. I was going to go to New York, get a ship, and go back to California through the canal. I had that all set up. They crossed me up and took me in. I passed the physical and the next thing I knew, I was a midshipman.

INTERVIEWER: You crossed the country by train, I assume.

CAPT NICHOLSON: Yes.

INTERVIEWER: What was it like, crossing the country by train in the 1930s?

CAPT NICHOLSON: It was an adventure. I had never been anywhere at that point. It was a three-day trip. I had to change trains in Chicago. There was no other way to go. You got off in Baltimore, which is a strange city. You took the Wobble Bounce Enamel, the electric railroad that ran between Annapolis and Baltimore. I sat down with a young fellow who was doing the same thing. The two of us signed up at the Maryland Inn while we waited for physicals. Jim McManus became a great friend and I lived with him at the Naval Academy for four years. He was eventually killed in the battle of the Coral Sea on the USS *Sims*. The ship was sunk. I think there were 11 survivors. But he was a wonderful guy from Chicago. Anyway, the next thing we knew, we were in and going through plebe summer and I enjoyed that very much.

INTERVIEWER: You enjoyed plebe summer? You may be the first person I've ever encountered who actually enjoyed plebe summer. Tell me about your plebe summer.

CAPT NICHOLSON: I guess the reason I enjoyed it was because we got to go sailing. They had the half-raters and all the boats we could sail and I loved to sail. There were challenging things like the rifle range. It was fun.

There were parts of it that were not enjoyable. Coming from California, I was not used to the heat and in June of 1937, it was hot. They'd give you four or five shots at the same time and then, they'd have noon meal formation on top of what's now the mess hall. It was all red brick and blistering hot and you had guys falling on all sides. One of my friends just collapsed right beside me. They carted him in and put him on my bed all covered with blood. They broke his jaw. The heat was something that I remember from plebe summer. I've been in Maryland since, many times, but I don't believe that it's been hotter than that was during that summer. But it was great fun. I enjoyed it.

INTERVIEWER: We encounter things. For example, at the Navy Yard during the summer, when they have a lot of retirements and official parades, some of the young men and women in the ceremonial corps or those with the band will pass out because of the heat.

CAPT NICHOLSON: Absolutely. It was a novel experience for me. Then, when we started the academic year, it went very well. I enjoyed that.

INTERVIEWER: What kind of curriculum did they give you? When you first started up, plebe summer was over and you were a fourth classman, right?

CAPT NICHOLSON: That's right.

INTERVIEWER: You were just starting, right?

CAPT NICHOLSON: Yes.

INTERVIEWER: What were you taking?

CAPT NICHOLSON: Well, at this point, I can't remember what specific subjects I was taking, but there was math, English, history, and Spanish. Those were the core subjects. It was rather typical college first-year preparation.

Then, in the second year, you got into physics. You got into ordnance and gunnery and things like that. You got into seamanship. They gave you the seamanship course. It was challenging and interesting and I had good friends. I had two roommates from Kansas and we were in a four-man room. Bancroft Hall, at that time, had a number of four-man rooms. We enjoyed that.

Of course, we had to check around the first-class men. Everybody had a first-class room that you had check into before formations and so forth. I checked into the Class of 1938 room. It was

comprised by Zeke Jarman, Harry Mason and George Reinhart. They became life-long friends. You hear a lot about harassment and things like that, but those people, especially Harry Mason, became a life-long friend and contemporary.

From that point of view, my plebe year was great. They gave us the normal harassment. You had to go through certain motions, but it was all in good nature and worked beautifully. I have no complaints on that score.

INTERVIEWER: What did the Academy look like while you were here?

CAPT NICHOLSON: It looked pretty much like it is now, except that the big fields out to the east and the north were not there. Those have all been created in recent years by dredging and filling. There was a big boat basin right next to Bancroft Hall that had the thirty-foot pulling cutters and we all had boat drills on those. A great job was to come in, secure your boat, hook it on, and the boat crew would then have to get out, get on the lines, run back and actually hoist the boat out of the water. It was a good drill. That was a lot of fun.

The next year, I got involved in the sailing team. My athletic effort was sailing and swimming. I was on the swimming team. Those things were just pure fun. I can't think of anything else.

INTERVIEWER: What did the sailing team do in those days? Did they simply race or did they go down to Bermuda during the winters even then?

CAPT NICHOLSON: No. The boats we had were not ocean racers and they didn't have us programmed for that. We had races with the half-raters that we had and then, we got 14-foot international dinghies. That started the intercollegiate racing. About that time, I think in 1937, they acquired the *Vamary*, a 72-foot catch from Batam Makarof. We all liked to crew on her. We would crew her for races.

She was entered in Chesapeake Bay races. We enjoyed that. Then, they got the *Highland Light* and a couple of other boats. That built up as the years went by, with more people donating boats and the sailing team becoming important. It was lots of fun. My recollection is that it was challenging and fun. We progressed through our first-year cruise. That is, at the end of plebe year,

we had three battleships. The USS *New York*, USS *Arkansas*, and the USS *Texas* were all assigned to take the midshipmen to Europe. We all stood watches and did normal things on the cruise. The plebes were assigned menial tasks like scrubbing the deck and cleaning things up. The upper class men had navigation duties and things like that. We went to England, France, and Copenhagen. It consisted of mostly work, but it was a lot of fun when we went ashore. I think my buddy and I went to Paris and we had something like thirty dollars to spend for our trip to the city. I don't think we slept more than two hours the whole time. We did things like that. It was a good education, I think. The *New York* broke a shaft on the way back. That was interesting. One of her two shafts broke and we limped home at about five knots and upset the football score, I think. The football players were all on the USS *Wisconsin*. She stayed with us and slowed them getting back. But we finally came home and then went on leave and I got back to California for fun and games for a month.

INTERVIEWER: When you came back, did you come into New York or Baltimore?

CAPT NICHOLSON: We came back into the Naval Academy. The ships all moored out there in the middle of the bay and we loaded from the normal motor launches. That was the cruise. The first-class cruise, when we got to be second classmen or finished the second-class year, was scheduled to go to Rio de Janeiro. We thought that would be great. We were all fired up for that. But the war was heating up in Europe. I don't recall that we were very much interested in that war. We could read about it in the papers and hear about it, but when they stopped our cruise and wouldn't let us go as far as Rio, we really became aware of it. They confined the cruise to the Caribbean, to Panama, Venezuela, and the islands.

INTERVIEWER: That would have been 1940?

CAPT NICHOLSON: It was 1940. That distressed us, but it was fun.

INTERVIEWER: I would have been distressed, too. When you made your youngster cruise over to Europe, you were on the *New York* out and back?

CAPT NICHOLSON: I was on the *New York* all the way. You were assigned to a ship and you stayed on that ship and stood watches on it.

INTERVIEWER: Since none of those wonderful old ships are with us any longer, can you describe

what it was like to be on board on any given day? What was it like to be on a vintage battleship like that?

CAPT NICHOLSON: Well, you got up and the first thing you did was to have breakfast. Then, you'd go scrub the decks down. We used to holy stone the decks. Those ships all had teak decks and holystoning was a ritual every morning. You got up and sprayed water on the deck and ran the stones back and forth and polished it up.

We also had gun drills. We were all assigned to various gun batteries. When we had drills, we had life boat drills. We did all the normal things that a ship did. You went through all of those, and midshipmen manned all the jobs. It was great experience.

INTERVIEWER: Did you sleep in a hammock?

CAPT NICHOLSON: You spent your night in a hammock. I'm not sure that 'sleeping in a hammock' is the proper phraseology, but it was an experience. We all had hammocks, but I guess they don't use those anymore. They're all gone, but it was a good thing to do.

In 1938, the war in Europe really hadn't worked up, so Copenhagen and Paris were fun and we were not really conscious of it. I don't remember being conscious of it. There wasn't much discussion about the German buildup or the threat of war. Even in 1940, the only thing I recall was that there was a lot of discussion about God and they kept us from going to Rio. That was bad.

Anyway, we finished that. Then, when we became first classmen, upper classmen, we realized that war was going to have an effect on us. They told us that we were going to get out in February and were not going to stay on until June. June was the normal scheduled graduation date, but we were informed that we were going to graduate in February.

At that point, the war became a bigger issue. We recognized that. I graduated along with the class but was disqualified because of my eyesight. I could read 14/20 uncorrected, but you had to read 18/20 uncorrected. I was disqualified, along with 23 others. I'll have to give you a little paper on what happened to that group. They graduated us but kept us on until the next June and assigned us the job of teaching the first group of V-7s who came in. Some of us taught seamanship, some taught navigation, and some taught the other subjects. I was assigned to an engineering teaching position.

We brought the V-7s along. There are some interesting comments in that paper that I gave you from the 23 Club. We called ourselves the '23 Club' because there were 23 of us. They never did tell us what our proper designation was. We considered ourselves past midshipmen. We wore half-stripes and a midshipman cap, lived in Bancroft Hall with no restrictions and wore midshipmen uniforms, but suddenly, we could go and come as we pleased. There had not been a past midshipman since 1915 or 1911, I think. We never were formally designated, but that was, in effect, what we were. For years, there was an actual category of 'past midshipmen.' You graduated and were then a past midshipman. Eventually, you got a commission. In June, we were given physical exams and 11 of the guys passed. Some of that group went on and joined the Army. One of them got out. I went over to the Chief of Naval Operations and the Chief of Naval Personnel on several trips and we finally figured out that we could get commissioned if we got waivers. They agreed to commission us as construction corps volunteers special. The construction corps was still in effect then. We got physical waivers and they assigned us to the construction corps.

At that time, they were, as you know, building up the fleet in preparation for World War II. They needed constructors. They needed people in the engineering business. They sent us to a special short course in naval architecture at the postgraduate school. From June of 1941 to February of 1942, we were students at the postgraduate school. We could hook a ride with the Air Force. I went up to Barksdale Field up on Long Island and as a midshipman, you could do that. I hooked a ride with a squadron of V-18s that were headed west, so I could get around. I caught a ride on a cargo plane coming back from Sacramento to Washington, D.C. We were able to thumb on the Air Force planes and that was a big help.

INTERVIEWER: Yes. I imagine it would be. The question I wanted to ask you was, regarding when you found out the class was going to graduate in February instead of March, was there any acceleration of the program to try to get all the material covered in that time?

CAPT NICHOLSON: I'm sure there was. We didn't look at that. We got all the exams that were expected. We got all the subjects, but I think they probably compressed them. As far as I know, we didn't drop any subjects out. We just sped them up. I was not paying any attention to that at the time.

INTERVIEWER: When you received news that your vision was going to disqualify you, what was your reaction?

CAPT NICHOLSON: I was miserable. All my friends were going out to the fleet and we were in limbo. We didn't really know what was going to happen to us. When they did it, they told us that they were going to pay us midshipmen \$65 a month until they made the determination at the end. They said, "When you are commissioned, we will give you the difference between the midshipman pay and ensign's pay," which was another sixty bucks. Those who passed the eye exam and got regular commissions got that money, but the rest of us didn't. We have all been mad about that ever since because we were all doing the same thing. But they refused to pay us that extra sixty bucks a month. That was important.

INTERVIEWER: In those days, it was especially important. That went a long way in those days. After you finished your educational responsibilities in that post-midshipman period that you described earlier, you found a way to getting a commission, as you described?

CAPT NICHOLSON: That's right. We got a secretarial waiver of physical defect and that allowed us to become construction corps volunteers.

INTERVIEWER: That was a commission, was it not?

CAPT NICHOLSON: That was a commission as an ensign.

INTERVIEWER: Out to the postgraduate school at Monterey, where did you go?

CAPT NICHOLSON: No. The postgraduate school was in Halligan Hall, here at the Naval Academy. They didn't move it to Monterey until about 1949 or 1950.

INTERVIEWER: I'm sorry. That is my mistake.

CAPT NICHOLSON: We finished at Halligan Hall, on the top floor of the hall, which, again, was blistering hot. We were doing drawings and things like that. That is a vivid memory.

We finished that and did a few things in the field. For instance, we went down and helped launch the battleship USS *Alabama*, which was being launched down in Norfolk. We spent the night under the ship, getting her up on the ways and things like that. It was all an educational experience.

When we graduated from that program in February, several of us were assigned to

Washington, to the Bureau of Ships, in various jobs. One of us went to salvage and one went to auxiliary. I was assigned to the preliminary design section. I was specifically assigned to the war damage analysis group. For the next couple of years, I concentrated on analyzing war damage, looking at battle reports, looking at the structural effects on the ships, and figured out improved design factors. We researched whatever we could learn from it and it was quite interesting.

We did a number of things. We improved fire-fighting. One particularly interesting thing to me was that we installed magazine sprinkling systems in the fleet. They had never had them in the magazines but we noted, from war damage, that if there were quick flood in the magazines, the powder would not go up. We did an analysis of the fire-fighting systems in the powder factories using quick rise sprinkler controls and called for that to be installed in the fleet. That was one major change. Two years of looking at ship damage was very interesting.

Then, I was reassigned. I picked up a number of jobs working purely on design and doing improvements on the landing craft for better access. One interesting assignment was my assignment to conduct trials in Charleston on the brand-new destroyer, the USS *Blue*. The trials were aimed at deciding what speed constraints they had to have for the new, fast-falling depth charge. You may recall that the old ash can had a sink rate that was rather slow. They developed a new, streamlined depth charge that would sink more rapidly. The question was how far away the ship should be to ensure that it doesn't shoot itself in the tail? I took a team from the model basin down, instrumented the ship with all kinds of strange gauges and left Charleston. My instructions were to drop charges consecutively closer until we did damage to the ship, the damage being undefined.

As you can imagine, the *Blue* was a brand new ship. Her commanding officer had a green crew. Here came this lieutenant JG from Washington with instructions to damage his ship, and he wasn't very happy about that. We did carry that off with some interest.

Another project that I thought was interesting was the LSTs. They were in heavy production because of the upcoming invasion of Europe. With the original LST design, they had big blowers all down the deck. They had, I think, 12 blowers, big blowers to blow the tank deck free of gases and whatnot. They had a production problem because they were in short supply and didn't have enough

blowers to meet the production schedules of the LSTs. I was sent down to Norfolk with instructions to run a trial. We loaded the ship with tanks and tank drivers. We instrumented the tank drivers for blood content, consecutively decreasing the flow of air until we started getting unsatisfactory blood conditions in the tank deck.

The tank drivers had to warm their tanks up before they hit the beach in a confined space. That posed a real problem because of the CO2 buildup. We cut the number of blowers down to about half of what they had before, actually, and rearranged them so as to get better airflow through the tank. There were a lot of problems like that. There were problems that the fleet was encountering in the Pacific, in terms of transfer of stores and transfer of ammunition at sea. When the fleet was at sea, how did you get from the storage ship over to the other ship?

INTERVIEWER: You're talking about replenishment.

CAPT NICHOLSON: We ran a lot of trials on that. We developed some conveyor-type things. Nothing really worked. It finally wound up that swinging it across, was the most efficient way. I spent a long time working on that, running back and forth to a couple of manufacturing plants up in Chicago. That was the kind of thing we were doing, that and writing reviewing specifications for new ships.

I was assigned to another interesting job. I saw a picture of it in the meeting we were just attending. For the demolition teams, they had used the old four-stack destroyers in the Pacific, which were very unsatisfactory. The problem came up, so we said, "Let's modify a ship to be a home for underwater demolition teams." The ship available at the time and in heavy production was the DE. My job was to modify that ship so that it could carry underwater demolition teams. The ship had enough reserve stability and reserve buoyancy to handle additional accommodations and space. That was a real challenge. We got that done. We had to put four landing craft on it. I still remember that when the first completed ship went on trials, it heeled over about thirty degrees when he put his rudder over. We got a real stop order from CNO to hold it. We moved four LCVPs up onto the top deck. We had done all of our weight studies with the weights given to us by the small boat people. The trouble was that each of those boats had gained about two tons when they put them on the ships.

That really made them top heavy. We had to solve that problem. Those were the kinds of things that we worked on. We didn't have a whole lot of spare time.

INTERVIEWER: One of the people I think I missed being able to interview, in terms of officers who did the kind of work that you did, was Captain Harry Burris, who was in charge of the DE program.

CAPT NICHOLSON: Yes.

INTERVIEWER: Did you ever encounter him?

CAPT NICHOLSON: Yes.

INTERVIEWER: Can you tell me about Harry Burris? The only other person who has ever been able to tell me about Harry Burris is Al Mumma.

CAPT NICHOLSON: Al Mumma would be able to tell you that because he was in a senior position.

INTERVIEWER: Yes.

CAPT NICHOLSON: I didn't know him very well, but since I was taking his ships and modifying them, we did a lot of back and forth, on a technical basis. He was widely respected and had charge of a red-hot program. When we were modifying his ships, we had a technical relationship.

Anyway, my buddies and I from the short course in naval architecture were very junior officers. We were ensigns to start with and then, very quickly, lieutenants JG. In Washington, that was an abnormal condition. We were at the bottom of the list. I remember that when I first checked in, my boss told me, "There's a meeting over here. I want you to go and attend the meeting." I thought, "Great, I'll go over." I got to the meeting and the room was full of captains, admirals, one or two commanders and me. All I could figure was that I had better go get out of sight. The result was that most of us tried like mad to get out of Washington. There was a big war going on and that was for what we were originally trained. We wanted to go out there and get in the action. They were adamant. I remember Admiral Cochran telling us, "We need you where you are." Specifically, he told me, "When the war is over, we'll get you to MIT, if that's where you want to go." That was a promise he made to me in about 1942.

INTERVIEWER: Tell me about Cochran.

CAPT NICHOLSON: Later on, he kept that promise. How he had the tracking system to do that, I don't know. He was a tremendous guy. He never lost his interest in ship design. He used to come down and eat a brown bag lunch with us in preliminary design. That was where the conceptual work was being done, in preliminary design. He would often come with a brown bag lunch and discuss the design problems we were encountering, when he was responsible for the whole shebang, and we thought that was great. He was a real person.

INTERVIEWER: He had good personality skills in that he could deal with junior officers without any difficulty?

CAPT NICHOLSON: His personality skills were excellent. He could deal with anybody. He was very close to us. We felt close to him, at least. I'd put it the other way around because we were all junior officers and he was the boss, but he never wore that badly.

INTERVIEWER: Did you ever encounter another boss in your time who would take that kind of interest in particulars, or in the basic conceptual aspect of things the way Cochran did?

CAPT NICHOLSON: No. I never saw anybody who was more interested. Let's put it that way. We had a lot of people. That was our business. My bosses were all in the conceptual design business. But he was exceptional because he was the guy that was carrying all the bricks and we all thought a great deal of him. It's hard to think anything else.

I later encountered him when the war ended. I was out at Mare Island and they actually called up and said, "Do you want to go to MIT?" I was thinking about getting out of Navy at that point. I was still a reserve officer. I thought, "I'll leave," but he arranged for me to go to MIT and take the course in naval construction up there. That was the thing that convinced me to stay with the Navy.

INTERVIEWER: Was the movement out to Mare Island an effort on your part to get closer to the war, to where the action was?

CAPT NICHOLSON: Yes. Most of us who were stuck in Washington didn't like riding back and forth and looking at specifications, working all night and knowing that somebody out there was really in action. We couldn't do anything about it. There was no way we could get out. When I tried

to get into submarines, eyes stopped me again. I tried to get sent to 1 dry dock. They let me go to dry dock school just to get me out of town for a change, but then, I went back to the same job.

INTERVIEWER: What was dry dock school like? What did you learn?

CAPT NICHOLSON: I learned how to dry dock ships. They sent me up to Boston, where there were several dry docks. They had a course for docking officers. They qualified you as a docking officer and I thought that was a little more active than looking at ship specifications. That gave me kind of a two-week vacation from Washington.

INTERVIEWER: What did a planning and estimating assistant, which is what you were at Mare Island after October 1945, do at a shipyard?

CAPT NICHOLSON: The way I got to Mare Island was because my boss, Admiral Wheelock, who was then Captain Wheelock, went to Mare Island and I asked him if he could get me out there. One way or another, I wanted to get into a shipyard so that I'd be closer to the action. He arranged for me to get out there, but I was not in planning. I was in the dry dock gang. I was assigned dry-docking and ship superintending on repair ships coming back in from the Pacific. I did that at Mare Island until the war ended. I went out there in 1944 and when the war ended, Admiral Cochran asked if I wanted to go to MIT, as an alternative to getting out of the Navy. I did take the MIT duty.

INTERVIEWER: Tell me about the course at MIT. It had been around for a while. It was established years before as the logical place for naval constructors and naval engineers to go as a technical finishing school, so to speak.

CAPT NICHOLSON: Well, more than a technical finishing school, it was basic naval architecture, basic ship structure design and the whole thing for designing a ship. The course had been run at MIT for I don't know how long. All of the people I worked for had been through that course. Cochran and all of those senior naval constructors were sent through that program to qualify as ship designers and builders. It was a three-year course. The officers in that course, as they still are, were sent to sea on graduation. That was the normal rotation. You graduated, were sent to sea and got through the division officer experience. After about two years, if you requested it, you were selected and went to MIT.

The problem was that the Naval Academy mathematics and basic physics was behind you. Not only was the Naval Academy, at that time, not up to the conventional college level, but you had a two-year hiatus, so you had to start over again. Everybody got pushed through a summer course in mathematics at MIT. Then, it took a little extra time to get up to speed and you spent the next three years doing a conventional advanced degree course, which, at the time I went there, led to a master's degree.

Later on, that course was modified and they changed it to an engineering degree, which is kind of a step above a master's degree. It became an engineering degree in both naval architecture and marine engineering. In pre-war times, it was primarily naval architecture. There was a big split that followed, which was the bureau split in Washington. You had the Bureau of Engineering and the Bureau of Construction and Repair. Those were put together and the course came together at MIT. That was how that evolved.

INTERVIEWER: Tell me, before we move on to MIT, about your actual activities in the Mare Island yard. What did you see coming in? What did you have to help dock and repair?

CAPT NICHOLSON: We had damaged ships coming in, in general. There were really two classes. Some would come in with significant damage. Others would come in just for update and modification. It was mostly that. They were principally coming in for modifications and alterations that are ongoing. In other words, a ship would get an availability to come to the yard to overhaul machinery and deck stuff, get modified, and we'd do it.

There was also some design work. I remember Art Schuling came in with a ship. He had a whole set of plans as to how he wanted his cabin rebuilt. He had been a ship and boats designer before he got into the Navy. We had a big discussion about how much we could do and how much we could not do. But the ships came in with all sorts of problems and that was really the basic work in the yard, from my point of view.

INTERVIEWER: Moving on now to MIT, as you said, a lot of people went through that program. It was a fundamental qualifying program for naval constructors.

CAPT NICHOLSON: Something on the order of twenty officers a year went there. I think it's a

great course. I'm obviously fond of it, having been there.

INTERVIEWER: What makes it great, according to your standards?

CAPT NICHOLSON: Well, I think that it focuses intensely on ships and it focuses on naval ships. There was a broader course at MIT on merchant ships and things like that, but that one was created for the Navy's interests and supported by the Navy's interests in putting their students in there. The intent was to give them everything that they needed to become engineering officers in the Navy and manage ship procurement, ship repair, ship modification and more than now, the conceptual design of building different ships. They're sort of getting away from that today. Since McNamara came in, they have been pushing it toward civil procurement and contracting it out. All you do is write a good specification and that's it. But we had troubles with that. I'll tell you later on. The course itself was a building block for the Navy construction corps, originally, and it has produced a lot of very outstanding officers.

INTERVIEWER: Remind me, again, at what point in time the designation 'engineering duty only,' or EDO officer, came into play, as opposed to construction corps.

CAPT NICHOLSON: It came in by the end of the war, in those years somewhere. I'm not sure. I was not a party to the big arguments that went on back and forth over what people were called, but by the end of the war, we were EDOs, engineering duty only.

INTERVIEWER: As you mentioned before, when you came out of MIT, you went to sea. You went to the USS *Oregon City*?

CAPT NICHOLSON: That was an interesting bit. That was a summer cruise from MIT. I didn't really get assigned to her. Every summer, again, they were having cruises, and the midshipmen in colleges in various ROTC units would be taken on a summer cruise. I was sent to the *Oregon City* as an officer in charge of a summer deal, the officer in charge of these guys coming from the University of Notre Dame, Ohio State University and various other places. They would be taken on a summer cruise and we went to the Caribbean and stirred around. We put them through the same things we had been through on our cruises. That was fun. There are some interesting stories about that cruise. I remember the senior academic guy. I guess he was a vice president or one of the deans at Ohio State.

He and our commanding officer, MacIntosh, were great drinking buddies. They would go over and disappear for the whole night when we made it into Panama, Venezuela, Trinidad or wherever. They got to be such good buddies that the navigator was assigned to make sure that Dean Stradley did not get his airplane so that he would go with us to the next port. He was supposed to make a short trip. He managed to miss several airplanes.

I was sitting on the forecastle one night, sitting around and talking after dinner. Each group had a dean come along with them. One of the guys said, "You've got to give him a little leeway. His wife was the president of the local WCTU and hasn't allowed any liquor in the house for twenty years."

INTERVIEWER: He was making up for lost time.

CAPT NICHOLSON: We figured up he was making up for lost time. Those kinds of things were fun and games, relief from the summer program.

INTERVIEWER: The first true assignment that you had after MIT was when you went down to Philadelphia?

CAPT NICHOLSON: No. I went to an aircraft carrier. I went from MIT to the USS *Philippine Sea*, CV47. I spent two years on her, cruising and doing all the things aircraft carriers do, like training aircraft and going through shakedown at Guantanamo Bay. I had one tour with the 6th Fleet in the Mediterranean and it was an interesting tour.

INTERVIEWER: Did you not go through damage control school in Philadelphia on your way down?

CAPT NICHOLSON: Before going to the *Philippine Sea*, there was an interim step before they sent me there. I was sent there as a damage control officer and went through the course in Philadelphia.

INTERVIEWER: Can you describe the course in Philadelphia and your duties when you arrived at the carrier?

CAPT NICHOLSON: The course in Philadelphia was fire-fighting school. You fought fires, lit boiler fliers, lit machine fires and go in and put them out. You didn't have so much class work as actually grabbing the hoses, going in and putting out the fire.

INTERVIEWER: It was pretty hot in the hole, right?

CAPT NICHOLSON: Oh, yes. That was interesting. It was a short course. They checked you out on various damage control measures. Then, when I got to the *Philippine Sea*, I was in the engineering department and had charge of the auxiliaries. I had charge of the repair crews and all the auxiliary systems in the engineering plant. That was pretty interesting because we uncovered a few things. For example, we had a plane crash on the flight deck. Everything went normally except that we couldn't get foam. You're familiar with the foam system, fire-fighting foam?

INTERVIEWER: Yes.

CAPT NICHOLSON: We had installed those during the way and I had been a party to developing the system, as a result of war damage. But I discovered in trying to fight this fire on the ship that we'd get a dribble of water out of the end of the hose, but no foam. We rearranged the ship, put portable generators up there and got that fire out. Then, I started negotiating with the Bureau of Ships, my old home, over the fact that the system didn't work. I finally had to get them to come up to Quonset Point, where our homeport was. I put on a show for them. You could start the nozzle on the flight deck and get foam on the hangar deck, but on the flight deck, you couldn't get anything out of it but a little dribble of water. We finally decided that what had happened was that the trials to set up the system originally were run in Norfolk, as I recall. They'd been done in a hangar. They had a big system set up with foam generators, piping and everything. You did not have as many turns in the pipes or as much change in elevation as you had on the ship. The result was that you were getting about half the pressure. The way that worked was that it went from the pump down in the pump room up to the hangar deck through where the proportioners were. That put the chemical in. From there, it went up to the flight deck. The pressure, when it got to the flight deck on the actual ship, was so low that it wouldn't proportion properly.

I finally convinced the bureau, and that meant that eventually, they had to redo all the carriers so as to get better pressure. In the course of doing that, we were running the trial in Quonset. We spewed a lot of stuff over the side and the brown chemical made a patch in the water and floated down the bay. The next thing we knew, we had the fire department, the police and everybody

coming down the dock because some woman down the bay had said that we were polluting the bay. We weren't, actually, because that stuff dissolved and disappeared, but it was kind of an exciting period. I think I was lucky to be able to do that because I had contacts in the bureau and could work back and forth between the ship and the bureau.

INTERVIEWER: Did you find it easier reporting a potential problem like that because you knew the culture in the bureau, you knew the people?

CAPT NICHOLSON: Well, yes. I knew who to talk to and could get the word in. I got people to come up and look. I think it made some difference.

INTERVIEWER: By that time, what rank were you?

CAPT NICHOLSON: At that time, I was a lieutenant commander.

INTERVIEWER: Would the average lieutenant commander in the damage control section of the engineering department of a carrier have received the kind of welcome you did when you reported a problem on these ships, as you did?

CAPT NICHOLSON: I think so. It was pretty clear cut. It was a good experience for me, particularly because I learned a lot more about what the ships faced.

We discovered, for example, that the supply officer was telling the captain that we were at ninety percent on spare parts, which was not true. We dug up all the records. We couldn't get spare parts. We'd go to the supply department to get spare parts for pumps or anything and they wouldn't be there. He had paperwork that covered spare parts, but the paper wasn't much good to us on the ship. We had lots of those kinds of arguments and those were good experiences, I think.

INTERVIEWER: You went back to a yard after that, didn't you?

CAPT NICHOLSON: We came into Boston from the Mediterranean for an overhaul. As an AD and engineering department, I got to put together the whole work package for the ship. That was a good experience. When the ship went into overhaul, I was transferred to the Boston shipyard.

INTERVIEWER: Was the overhaul an exceptional thing for the ship, or was it a normal thing?

CAPT NICHOLSON: No. It was a normal, routine overhaul.

INTERVIEWER: What was a routine overhaul on a carrier? What did you do?

CAPT NICHOLSON: You overhauled the catapults. You rewired them. You overhauled the main engines. You re-bricked boilers. It was a complete conventional. Ships had lots of things go wrong with them over a period of time, like any mechanical system. We'd work out a work list with the shipyard, match budget, jobs, and time. I represented the ship and somebody from the planning department of the shipyard came out and we made up a work list. It did everything. You dry docked the ship, cleaned the bottom, checked vibrations and did things like that.

INTERVIEWER: You were the ship superintendent and docking officer?

CAPT NICHOLSON: I was, in Boston.

INTERVIEWER: What did the ship superintendent do at a shipyard?

CAPT NICHOLSON: He got the work lists. For example, we were converting destroyers to a new configuration. You got plans and all the work lists. Then, you were in charge of getting it done on the waterfront. The ship superintendent supervised all the workmen on the ship and worked through the masters of the shops and the foremen on the job. He was responsible for organizing the work. If there was a conflict between two groups, he had to resolve those conflicts. If the riggers wanted to do something and the electricians wanted to do something, you had to arrange it so that the whole thing got done. You were responsible for that job overall.

INTERVIEWER: For somebody with your background, was that a good job for you?

CAPT NICHOLSON: I enjoyed it. Yes, it was great. It was fun being out in the yard. I especially enjoyed the docking. You kind of felt like you were getting something done. You saw a ship come in with problems. It came in and you fixed the problems. You saw it steam out and felt like you did something, unlike the pushing of paper. Paper just piled up higher. It was a fun job, except in the winter in Boston. Then, the dry docks were not the most pleasant place to be.

INTERVIEWER: Yes, I can imagine. It must have been frigid. Then, they gave you a break, didn't they? They sent you out to California for a while?

CAPT NICHOLSON: I did that for quite a while. Then, I was transferred from there to the design division in the shipyard. I became the design superintendent and was in charge of the design operation. That was an interesting period because in 1948 and 1949, we were just beginning to see

the electronic revolution. One of the things that I was doing in design division was creating an electronic section, separating it out from the rest of the design division and building that up. That was great fun.

The one thing that happened that I think might be of interest was that I had a phone call one day when I was the design superintendent. It was from Admiral Rickover's staff. He was then Captain Rickover. The gist of the remark was, "You're up there at Boston. You're going to get changed soon. Why don't you join the nuclear program? We could send you back to MIT in the nuclear program. You're right there. It would be easy. It would keep us from going out to the fleet and advertising for people to come in." I thought that was fascinating. You could see nuclear power was going to be a big item. I went in to see my boss, who was Captain Cronin, later Admiral Cronin, and he had a lot of people waiting for him. I told him I needed to see him and he invited me right in. I told him that I'd had this call to join Rickover's staff. He said, "Sit down." For half an hour, he regaled me with stories of how he had relieved Rickover on three different occasions, in different jobs, and described to me the conditions that he found when he relieved him. I thought, "I don't really want to go to work for this guy." I'm sitting in Rickover Hall now, so it depends on your point of view. I thought, "I'm involved in reorganizing the design division. I've got a big job here. I'll finish that. Rickover is just a captain. He'll retire pretty soon and there will be somebody else there, and I'll have another whack at the nuclear program later." You know what happened.

INTERVIEWER: Yes.

CAPT NICHOLSON: In any event, I didn't go to work for him. I finished up the job in Boston and was then ordered out to postgraduate school.

INTERVIEWER: Did you enjoy the stint teaching at the postgraduate school?

CAPT NICHOLSON: It was great.

INTERVIEWER: They were different kinds of tasks, though.

CAPT NICHOLSON: Absolutely. It was a complete change of climate. I was ordered out as an assistant to the captain who was in charge of engineering curricula. That job was fun because I got to go to all the colleges where we had students. We had them farmed out to the University of

Pittsburgh, and various commercial colleges that were doing postgraduate work for the Navy. I got to run that program and it gave me a good view of what was happening in postgraduate education around the country. It was an interesting job, from that point of view. I had a finger in what was being taught at the PG school, as well as in universities.

INTERVIEWER: When you described your move to MIT, you said that your academy mathematics and science background needed a slight upgrade, so you could do what MIT demanded of you?

CAPT NICHOLSON: That was a problem all along.

INTERVIEWER: When you were out at Monterey, you were in a situation in which you were working there but also going to other colleges and universities and taking a look at the kind of education naval officers were receiving. Were the standards at Monterey, the training they were receiving there, equal to the things that you were finding in the commercial arena?

CAPT NICHOLSON: As far as I could determine, it was equal. I remember one discussion I had in Pittsburgh. The complaint I was getting was that we got all these kids in from high schools around there and they didn't know English. They didn't understand English and we had to put them through some kind of a course so that they could do college-level work. They were coming in poorly prepared. The Naval Academy wasn't the only place that was having trouble. Everybody had that problem. They still have it. The advantage that our Navy students had was that most of them had applied for postgraduate education. They were interested in it. Teaching a guy who's interested in it is a lot different from teaching a guy who's not interested. They were all career oriented. They were all interested in whatever their specialties were and were all working hard at it. It was a very interesting tour.

INTERVIEWER: Some of the students that you found at the various universities, were they naval officers who, in some cases, were out of the Academy and taking postgraduate work at a private university?

CAPT NICHOLSON: They were all naval officers and that was what they were doing. Only the naval architects were sent to MIT, or later on to Webb, or the University of Michigan, because those were the only three schools. But they were getting ordnance education and chemical engineering.

They were getting the whole spectrum of engineering subjects. There were aeronautical engineers at CalTech. They were getting their postgraduate education and would go back and be aeronautical EDs.

INTERVIEWER: Did you visit CalTech while you were in this job?

CAPT NICHOLSON: No, I didn't.

INTERVIEWER: I was sort of curious, if you saw the contrast. You left the postgraduate school in 1955 and returned to your favorite place in the world, Washington, D.C. Did you dread returning to D.C.?

CAPT NICHOLSON: I regretted it, but I didn't regret it too much because I was having some serious family problems and knew that I could get some help from a minister I knew in Washington. I was looking forward to that change because it would help solve other problems.

When I moved back to Washington, I was assigned to work in the mine sweeping business. I was assigned to the guy who had been my first class man when I was a plebe. He had become a line officer and had had a full tour on the line. He had become an engineering specialist, electronic type, and they had assigned him to be in charge of the mine defense business.

INTERVIEWER: What was his name, again?

CAPT NICHOLSON: He was Harry Mason, a really splendid guy. I found myself working for him. That was a lot of fun. They had a lot of unsolved problems, which they still have. They couldn't find the mines. That was the main thing. How did you find them? We had all these programs going on, like how to sweep pressure mines. One of the jobs I got was not to sweep pressure mines. We did some interesting things, like converting a liberty ship that we got for nothing, filled it with Styrofoam, drove it with aircraft engines, which was kind of a unique idea, and ran it over a mine field to see if it would sweep the mines.

We also built a literally unsinkable ship and drove it with aircraft engines that I procured. They were changing to constellation airplanes and had surplus engines from those constellation airplanes around the country. I got four of those big turboprop engines. That was an engine that was suited to really fairly static effort, not making 150 knots, but low speeds up to eight knots. You could

put the right propellers on it and get a lot of thrust. We mounted these four big turboprop engines on forty-millimeter mounts so that you could swivel them around. We had no rudder or any power on the ship, but we could swivel around those four big turboprop engines. We took that ship down to Panama City and ran trials. Then, we blew it up, or tried to blow it up, in the Chesapeake Bay. We proved that it would work. We got one in the ship building program for a minesweeper, but it fell out in the cost negotiations. It was a solution. We never did get a good solution for pressure mines.

Another thing that we did under that program was building a thing called an 'XMAP.' It was a 300-foot long steel cylinder, weighed about 3,000 tons and made of rings of steel that were about 11 inches thick on the bottom and all welded together. We probably trained more engineers and more welders in Philadelphia than any other place else in the country. We got it all together and then, the question was "How do you handle it?" I got the interesting job of taking it down to Panama City. I hired a commercial towboat, the *Marian Moran*, which towed it from Philadelphia to Panama City and then learned how to tow it in and out to sea. It scared the MSO operators. Minesweepers were supposed to be the ones designated to tow this thing through the minefield. The first time they got hold of it and tried to turn it, it was like a big steel arrow that weighed 3,000 tons and should keep on going, no matter what you did to it. The minesweepers got towed backwards. But we developed techniques for managing it, and I had the fun of doing that. It was really fun.

The skipper of the *Marian Moran* was an old-time tow boat operator and spent his whole life in New York City. His name was Ira George. He ran that tow boat all by himself. I remember that we'd take it in out of the channel at Panama City. That was a narrow channel. Once he got the line caught up, he managed to get that thing swung around. He stopped in the middle of that narrow channel and didn't hit anything. He got it out and did it very nicely.

Once we had spent about a month doing that, we wrote the instructions for the MSOs and I brought an MSO down to actually do it. I got Ira George to go with us. I said, "Come on out. Let's see how this goes. You're the expert." He and I were up on the bridge when we started out the channel. They had the normal bridge complement. The captain was there, as were the officer of the deck, the junior officer of the deck, the navigator, and two or three guys in the signal bags. Ira and I

had been doing it for a month with just the two of us on the bridge. We were going on and I looked around and I couldn't find him. He was sitting by the flag. I said, "Ira, you looked puzzled. What's the matter?" He said, "Jesus, I don't see how the Navy ever gets anywhere." There was a guy who had been running tugboats in New York by himself, engines and everything, and there were the Navy's normal bridge structures and plotters. Everybody was plotting things and checking buoys, and we had been going in there for a month without anybody on the bridge. That was one of the more interesting jobs. I left there without having solved those problems. They still haven't solved them.

One of the things about that that was particularly important to this group that we're with today was that we did a lot of work on mine searching. That was side scan sonar development and developing means of getting underwater and finding what was down there. Much of what you see in these ROVs and things that they're using today were started in that search for mines. We had contracts out to Westinghouse and various people, all for side scan sonar and ways to find mines, and much of that technology came from that work in the 1950s. From that, I was assigned back into the design division.

INTERVIEWER: Was that the design branch for small craft?

CAPT NICHOLSON: I was put in charge of small craft.

INTERVIEWER: Were they drawing on your experience at the landing craft during World War II?

CAPT NICHOLSON: I don't know exactly why I did it. I guess I was just in a vacancy slot.

Somebody wasn't there. It was fun. We did some interesting things there. For example, we shifted all of the Navy small boat procurement from wood to fiberglass. Fiberglass was just coming in during the 1950s. We were just learning how to use it, how to control its quality and a whole bunch of iffy things. But we finally managed to shift the entire program to fiberglass for the small boats.

INTERVIEWER: What did the category of 'small boats' include?

CAPT NICHOLSON: It included motor launches, life rafts, and shore boats that you used to get the guys to shore. It included everything. I had the small boat division, or section, and they did tugboats, for example. They did all kinds of small craft, things that didn't have direct military missions.

Because of that, I acquired the hydrofoil responsibility. That was another upcoming thing. Could we use hydrofoils? That was under the small boat business.

INTERVIEWER: Did you have interaction with the people at the David Taylor Model Basin, working on small boats?

CAPT NICHOLSON: We did, yes. We worked with them.

INTERVIEWER: Did you work with Bill Ellsworth?

CAPT NICHOLSON: Yes. We worked with Bill Ellsworth, in particular. The work had been going on under ONR and the Model Basin had built sea legs. You'll see that term somewhere. Bill Ellsworth will, no doubt, talk about it. I got the job of bringing sea legs from New York to Washington to show it to the brass and try to get a hydrofoil in the program, that being a part of the small boat business. That was fun. I went up to New York and brought it down.

INTERVIEWER: What sorts of missions were envisioned for the hydrofoils?

CAPT NICHOLSON: One of the missions was to fit it with sonar so that it could run quickly, drop sonar in the water and search for a submarine. You could use it as an AWS source. That was the primary one. It then became patrol craft. Eventually, they built some.

INTERVIEWER: I'm trying to remember the name. Was it *High Point*?

CAPT NICHOLSON: *High Point* was the first one that we built. It was a product of the small boat division. We did the plans, the design, and stood with it until the thing was contracted. When it was contracted to Boeing, I went out to Bremerton, by pure circumstance, and was able to continue working with them.

INTERVIEWER: What was the top speed of the hydrofoils that you worked on?

CAPT NICHOLSON: It was 35 or 40 knots in any kind of a sea condition. We came down from New York and they didn't want us to go by ourselves. It was a 36-foot Criscraft conversion cobbled together with spare parts. They said we needed an escort. They got a big aluminum PT boat to escort us. We had, I guess, a straight 3 or 4 sea, and we were running at forty knots with no problems. It was nice and smooth. The PT boat had to drop out. We thought we had proved the point. It was fun. I had a lot of interesting jobs like that.

INTERVIEWER: You had input from the ground up on the way the design should look?

CAPT NICHOLSON: By the time it got to us, it had been through preliminary discussions and everything, and sea legs had been built. The question was, "Can we take sea legs and then jump from that to a bigger boat?" That jump was PCH1.

INTERVIEWER: Was that *High Point*?

CAPT NICHOLSON: It was *High Point*. We made a lot of mistakes with *High Point* because we were in a new field. We were in an area in which we hadn't done anything before. I'll give you an example. One example was the power plant. We decided that we'd go vertical shaft through the strut into a double-ended nasal, a propeller on both ends. It was a great idea for cutting the size of the propeller, keeping the resistance down and so forth. It turned out that the propeller on the forward end caused a tremendous amount of cavitation damage in the pod and they had to redo that. There were things like that. You learned when you did them. It was a fun way to learn. But it was frustrating when the guy on top said, "How come that doesn't work?"

INTERVIEWER: You were diverted from efforts like that in working with Bill Ellsworth at DDTRC. You had to go out to the Puget Sound. Was that something you requested?

CAPT NICHOLSON: It was just time for a change. After a normal three or four year rotation, the shift to Puget Sound was a very timely one for me. I had solved my personal problems by that time. I got divorced from my wife and had custody of two little children. Bremerton was a welcome change to shake down the family. I got quarters at Bremerton and became the management engineer. The Navy goes through cycles. Certain things are glamorous and at that time, 'management' became a buzzword.

INTERVIEWER: Why do you suppose that was the case in the fall of 1959?

CAPT NICHOLSON: Every once in a while, somebody came along with a new idea and it caught fire. Every shipyard had a management engineer. It's kind of an odd title. The shipyard commander was the manager no matter how you sliced it, but we had a manager in the engineering department and that gave me control over the shipyard controller and all of the bookkeeping processes, but not the supply department. We still had a supply officer. As the management engineer, I was looking at

improving management procedures, and the controller's department was a good place to start. When I went out there, they were using punch cards. The punch card system didn't work too well, so the big job that I had was to convert that to a tape computer.

INTERVIEWER: Were you using IBM machines?

CAPT NICHOLSON: We were installing an IBM 650, which, at that time, was the best thing we could get. We got it in. We had some interesting problems.

In order to do something like that, you changed all the paperwork, all of the pieces of paper with which the mechanic on the block had to draw supplies. They hated any change. The mechanics didn't like messing with paper. They would rather go and steal it from under the bench if they could. That was the big hurdle we had to try to overcome. I'm sure they've done that by this time, but it was a slow process.

INTERVIEWER: Was it a positive thing? Did that really help the yard become more efficient?

CAPT NICHOLSON: Yes. You can't run a big shipyard today with the old punch card system that they had. I'm sure they've got much better ones now. Look at the Internet. Look at what you can do with your own computer. It was not available in those good old days. You had a lot of things slip because of it. That was probably the biggest thing I did there.

INTERVIEWER: What were some of the big jobs that Puget Sound undertook while you were there?

CAPT NICHOLSON: We built the first helicopter carrier, the USS *Iwo Jima*. The design division had that problem. I didn't have that problem. The only problem I had was the christening. It was my turn in the box to do the christening. We had a case in which the bottle didn't break, which led to a lot of other things. Believe me, there were some fascinating letters written about that. I'll summarize it for you. She was in dry dock. They had a big stand up there. They had a steel striking plate welded to the bow, and Ms. Schmidt, Marine Major General Schmidt's wife, or widow, I guess, at that point, was the one who got to break the bottle. She took a couple of big swings at it and you could hear it. It sounded like somebody had hit the ship with a sledgehammer, and the bottle didn't break. I was sitting down in the front looking at it. I was the guy responsible for the ceremony. I was thinking,

“Oh, God.”

Finally, Admiral Doland reached over her shoulder, took her hand and made a mighty swing at it. I saw the bottle pop out of the case and go down in the dock. Admiral Doland said to the press, "The bottle broke, definitely. I know it broke." But when we pumped the dock out, I got the master rigger and we went down to the bottom of the dock and there on the grating was the bottle, unbroken.

INTERVIEWER: That was the toughest champagne bottle ever created, right?

CAPT NICHOLSON: If you look at a champagne bottle and look at the base of the bottle, you'll see that it's heavy glass, and she was hitting it right on that glass. There were scratch marks on the bottle, but she was smacking it right square on that heavy part, like a sledgehammer. She hit it so hard that she bent the steel plate over. What actually happened was that the master rigger and I got a skip box, and by that time the ship was way up there somewhere, and we went up. I actually broke the bottle. We didn't advertise that. That was just the kind of stuff in which you got interested. I had a lot of other interesting things. Bremerton was a wonderful place to be. You had outdoor activities, like a lot of skiing and things like that.

INTERVIEWER: I have a colleague at work who could die and go to heaven in Bremerton. He wants to go there to live so badly. The kid is about 27 years old. He's going to end up there, I'm sure, because he loves it so much.

CAPT NICHOLSON: I climbed Mount Ranier when I left. It was a wonderful place to be. I took my kids skiing. I did a lot of fishing. I played golf in Canada. We had an annual shipyard to shipyard golf tournament with the Canadian yard at Esquimalt. It was marvelous. All those shipyard workers would get out there and had bottles in the bottom of their bags. Some of them never made it around the course. It was a great social occasion.

INTERVIEWER: You were what by then? You must have been at least a commander.

CAPT NICHOLSON: I had made captain.

INTERVIEWER: You made captain?

CAPT NICHOLSON: Yes.

INTERVIEWER: When did you make captain, if you recall? 1958?

CAPT NICHOLSON: It was probably 1960. It was 1959 or 1960.

INTERVIEWER: Then, just when you started enjoying it, they moved you again.

CAPT NICHOLSON: Yes. That was normal.

INTERVIEWER: Only then, it was as a professor at MIT.

CAPT NICHOLSON: Yes.

INTERVIEWER: What was it like, being on the other end?

CAPT NICHOLSON: The boss called me. Admiral James called me and said, "How would you like to go to MIT and take the job?" I said, "I'm not sure that's a good career pattern for me. I've already had a couple of tours in education and what you move up on is fleet experience. I'm not sure that's a good job for me, but if you need me up there, I'll be happy to go." What else do you do? The next thing I knew, I had orders and I went up to MIT. That was fun.

INTERVIEWER: Did you run the program from the Navy side?

CAPT NICHOLSON: Yes. I ran it completely. I was what they called a 'Professor of Naval Construction,' like McCord, who is in attendance. You had charge of all of the naval officers in that course, of their programs, working their programs out with them, and of the selection for officers coming in. I taught five courses, and teaching five courses was a pain because I had to create the courses. My predecessor didn't leave me anything. I had to create the courses and I'm sure you guys are familiar with that. I had to teach them. Unlike the professors at MIT, who all had teaching assistants working with them, I had to do the whole works. I had to write the exams.

INTERVIEWER: You had to grade all the papers, too.

CAPT NICHOLSON: I had to grade the exams and do the whole business. Like I was telling McCord the other day, I had never burned as much midnight oil in my life as I did for those three years up there, the first year, in particular.

INTERVIEWER: You had to get it up and running.

CAPT NICHOLSON: While I was at MIT, I was keeping my finger on what was going on and had arranged to go on a dive on the USS *Thresher*, on her test drive. Being close to Portsmouth and

whatnot and having an interest in submarines, I arranged to go up there. I found out at the last minute they were going to have a large crew on board with a lot of extra people and I would not be making any direct contribution. I was just going along to keep up with the state of the art, so I called up and cancelled it.

INTERVIEWER: They never came back.

CAPT NICHOLSON: They never came back. Then, when they were searching for it, I had another finger in the pie. They took the *Trieste* down. They talked about that the other day. The *Trieste* was searching for it and they were having real navigational problems. I sent some of my top students out for the summer to work with the fleet and help them. I understand they did a good job of building patterns for navigation help and things like that.

INTERVIEWER: That was when Don Keach and George Martin were on board the *Trieste*?

CAPT NICHOLSON: Yes. They were doing the diving. Bottom navigation has always been a problem.

INTERVIEWER: The *Trieste I* wasn't that maneuverable. Don Walsh described it to me once as basically an elevator.

CAPT NICHOLSON: Yes. It was very slow.

INTERVIEWER: He said there was little bit of maneuverability on the bottom but nothing to really speak of. It was basically just up and down.

CAPT NICHOLSON: I also brought in guest lecturers for the students quite often. One of the things I did was done without anticipating what was going to happen. I knew SeaLab I going on while I was teaching up there, so I called George Bond and got him to come up and talk to the students. I had no notion that I was eventually going to be his commanding officer.

INTERVIEWER: He was down in Bermuda with SeaLab I at the time?

CAPT NICHOLSON: Yes. He was all over the place. George was hard to put a finger on. But that's background. I was then ordered to design ships in the ship design division.

INTERVIEWER: Did you know Captain Harry Jackson?

CAPT NICHOLSON: He's a very close contemporary of mine. He's a great guy. You ought to talk

to him sometime.

INTERVIEWER: I have, twice.

CAPT NICHOLSON: Good.

INTERVIEWER: Tell me about Harry, from your point of view, as a naval engineer, and any jobs that you've done together.

CAPT NICHOLSON: He was one of the best engineers I know. I've had contact with Harry since he and I retired through the USS *Glomar Explorer*. He worked on that. Again, he probably told you about that.

Then, when I was with the marine board later, I was asked to go out there and look at her with a view, to use her for the mole hole scientific drilling. I took Harry out there with me on that. Harry is a great guy. I like him very much. I haven't seen him for a long time because we have just drifted apart, but if you want to know something about submarines, ask Harry.

INTERVIEWER: He was one of the first people I went to. On the *Glomar Explorer* project, did you run into William 'Bill' Bascomb?

CAPT NICHOLSON: I understand he died recently, which is too bad.

INTERVIEWER: He did.

CAPT NICHOLSON: He was an innovative type of person.

INTERVIEWER: He was a very, very interesting person. He came out of the Colorado School of Mines and worked at the University of California.

CAPT NICHOLSON: Bill was a barrel of ideas, all of which I couldn't buy, but we had a number of conversations.

INTERVIEWER: Can you think of anything in particular that he originated from one of those ideas that were truly significant breakthroughs in engineering?

CAPT NICHOLSON: No. I didn't follow-up with Bill. I met him in other jobs.

INTERVIEWER: You went down to the Bureau of Ships in 1965 and became the director of the design division. They had you drawing plans again.

CAPT NICHOLSON: Yes. I did what I think most anyone would do. I called in the senior engineers

who I had known from previous years. I asked, "What are your problems?" I'd just arrived. I called about what was on the table. Our submarine designer looked at me and he said, "We've got a little problem with something called the *NR-1*." I said, "Tell me about it." He said, "If it's designed the way it is being built at Electric Boat, it will sink and won't come back up."

INTERVIEWER: That was a problem.

CAPT NICHOLSON: I said, "That's a problem." The problem was that Rickover had started that boat with a simple order, "Go build it." The Navy didn't work that way. It had never been through a design process, a preliminary design process or anything else.

INTERVIEWER: Was the *NR-1* designed inside the Navy or by Electric Boat?

CAPT NICHOLSON: It was designed by Electric Boat and Rickover's people. Rickover's people were machinery people and he had an ironclad boundary end of the machinery box. Nobody got inside that. He wouldn't let anybody inside of anything he was doing. He said, "It will sink." I said, "Well, that's a serious problem." But you couldn't talk to Rickover. Rickover wouldn't let our engineers talk to his engineers. He was that strange about that. I considered that terrible because you had to talk to people. He wouldn't even let them talk. We did manage, eventually, to get two individual contacts to get the thing straightened out.

INTERVIEWER: Who were the approachable people in Rickover's outfit in those days? Do you recall?

CAPT NICHOLSON: Nobody was really approachable. They all had little armored boxes around them. I figured, "Well, we got that straightened out. They squared that away." At the time, I didn't realize that I was going to wind up responsible for that boat.

INTERVIEWER: Why was she going to sink? What was the flaw?

CAPT NICHOLSON: The frames were internal and didn't have enough reserve buoyancy to get her back. They had used too much of the space for structure. It didn't have a match between the buoyancy and the problem was a fairly simple one to solve, but you had to get their attention on it.

At that time, I didn't know that I was going to be involved with the *NR-1*. We were more involved with the design of the USS *Eisenhower*, CVN-69. That was the last one I signed off on. I

lost a few arguments on that. McNamara had required the F-111 be on that ship. She was not part of the original design. When you put the F-111 on with a full squadron, you had to have, and I've forgotten the number, twenty or thirty extra people for every airplane and an extra electronics shop for each plane. The cubic content that you had to put on the ship was sizable and had not been included in the design. I wanted to lengthen the ship four feet. I lengthened the ship by four feet, got that extra space inside and we could accommodate all this stuff that was being put on. I went to the ship's characteristics board a couple of times with that and lost the battle. I lost the battle because the Navy had apparently committed to Congress that that it would not be any longer than the last ship. That had nothing to do with naval architecture or ship design but was a political commitment. I ran head on into it, so we didn't get that. If I'd had my way, the *Eisenhower* would be four feet longer, but she's all right. She's in service and working. There are compromises to everything.

INTERVIEWER: If we put the politics aside for a moment, that was an encounter between aircraft technical advances and the ship having to come to terms with those technical advances. You talked about needing so many new people on board the ship for every one of those aircraft.

CAPT NICHOLSON: Every time you changed a plane, you changed its supporting complex. As we got more sophisticated planes with more electronics, we needed more electronics support. Each time you did that, you required more space somewhere. I can make a comment on that. I attended a meeting in the Pentagon with Entoven, who was McNamara's top guy. He was telling us how we were going to buy the next batch of ships. He was expounding on how lousy a job the Navy engineers had done and therefore, they were going to take it out of the Navy's hands and throw it to an industry in which people knew what they were doing.

As an example, he told us at the meeting that he had sent a commercial industrial designer to the Pacific to ride the ships and tell him what was wrong with them. This industrial designer had gone out and been assigned to the USS *Midway*. I suspect that he was probably assigned to the captain's cabin, because they were firing bombs off of Vietnam at that time, loading out more ammunition than they had ever done before. The captain was on the bridge 24 hours a day, so they probably put him in the captain's cabin, which is right under the flight deck. He wrote back a

blistering report, saying that he would never accept accommodations like that on any trip that he had in his business in the United States. It was lousy. The captain of an aircraft carrier has a luxurious cabin. His big gripe was that it was noisy and there were big bombs and things going off all around. It was very uncomfortable.

I couldn't stand it. I was sitting in the audience. I held up my hand. I had Entoven's report and said, "Dr. Entoven, you have to recognize one thing. I was in the Bureau of Ships when the *Midway* was designed, back in the 1940s, for a different war. She has been through three or four generations of aircraft, each one bigger, faster, and heavier than the one before. It's remarkable that the ship is still going. You've got to recognize that she is not the optimum design that we might do today because she has been through all of these new aircraft and systems." The marvelous thing to me is that she was still serving some 25 or 30 years after she'd been conceived. I lost that argument, too.

INTERVIEWER: She could hardly be expected to be the panacea in the middle of Vietnam.

CAPT NICHOLSON: They informed us at that meeting the Navy was going to buy its next fleet of destroyers with a different procedure, a commercial one. They said, "Go out and buy 78 destroyers all at once. The last one won't cost you anything because you will have gotten so smart on the first 65" or whatever. We had never heard about that approach. It hadn't come down to that. That was the decision, though. I took that decision back and told my boss, Admiral Bockett, that it had been done and he was horrified because nobody had ever talked to them about it. The Department of Defense hadn't discussed it with the chief of the Bureau of Ships. That eventually led to his resignation. He and his deputy resigned over that because they took it completely out of bounds.

The interesting thing was that at the same time, I was assigned to a study. Dr. Shay had been hired a couple of years before I got there to do a study of Navy shipbuilding problems and had produced a report. It went to the CNO and the CNO said, "What do we do with this report?" Admiral Gallen assigned me to take a look at the report and do a ship acquisition study based on it. I was still heading the ship design division at that time. The order that I got gave me the authority to get people from all around. I could have put up a big study group and gone on for years on that subject, but I decided to do less.

There was one thing that bothered me about that and it is in those notes I gave you somewhere. I told them that I was an ED. If I looked at the shipbuilding problems and there were a lot of them and I pointed them out to the CNO, it wouldn't carry any weight because I wasn't a line officer. He said, "Well, we'll take care of that." He got Ray Pete, who had just been selected for flag, and got him to be co-author of the report. The two of us worked on it. We finished the report that looked at the Navy's shipbuilding problems. I do know that the report was burned in the Pentagon. Gallen forwarded it over and said, "Here is what we ought to do," but it never got past the Pentagon. They burned it, I was informed.

INTERVIEWER: Why?

CAPT NICHOLSON: It didn't suit their thinking. We pointed out a number of problems in CNO that exacerbated the shipbuilding problem.

INTERVIEWER: What problems did you point out?

CAPT NICHOLSON: We pointed out planning problems and frequent changes, but never had enough time to get anything done.

INTERVIEWER: Were they midstream changes?

CAPT NICHOLSON: They were just sitting still on the thing. What concerned us at that point was the loss of the senior input that used to exist with the ship characteristics board. That had been through several iterations. I even lost track of what happened to it. Our view was that they needed a group of senior officers who could be independent of the day-to-day problems and sit down and ask, "Where are we going?" That is an oversimplified view of it.

We were both anxious to get out of that. We didn't like that study. Ray was sent to sea. He happily got out to sea. He was invited to an assistant SECNAV luncheon, at which he was going to be put in charge of this procurement of 78 ships. It was a big destroyer procurement. The interesting thing to me was that we were in a small office in the old Navy building. He went to the luncheon and told them, "It isn't going to work that way. It won't work." That was on a Thursday, I think. He was out of town, ordered to the fleet, by the next week. They'd made up their minds. They weren't going to listen to us.

In connection with that, they were reorganizing things. One of the things that we did was make a study of how new ordnance and new ships could be worked together. We made an elaborate study of it to be presented to Admiral Gallen. We had our best presenter, Phil Urkenbrack, present it. We drilled him, ran him through on dry runs and whatnot. He got up and made the pitch to Admiral Gallen. We were sitting in the back row, wondering if it was going to come out. Gallen sat there for a little while, for maybe twenty or thirty seconds afterward, and said, "Phil, the trouble with you MIT-trained engineers is that you don't understand that logic does not always prevail." That burned itself in my brain. They had already made the decision. It didn't make any difference what was said in this long pitch on how to put them together. They had decided how they were going to do it. That happened while I was the Director of Ship Design.

INTERVIEWER: It seems that when they were reorganizing part of the Navy command, especially the Material Command, they separated a lot of the design aspects into what they called the 'Naval Ship Engineering Center,' which was where you went next.

CAPT NICHOLSON: Yes. They changed the name. I didn't move anywhere. The ship design group was still there. In Washington, one thing you could do was change the organization. You got a piece of paper and reconnected all the boxes. The people didn't move. The same people talked to each other, disregarding where all those lines went. The latest reorganization usually didn't take effect because the same people were there, talking to the same people.

INTERVIEWER: Were the tasks assigned to the Naval Ship Engineering Center any different?

CAPT NICHOLSON: They were not really any different.

INTERVIEWER: The same shop did the same thing?

CAPT NICHOLSON: The same shop did the same thing, with little changes as you went along.

INTERVIEWER: Who was in the shop besides you?

CAPT NICHOLSON: In the design division, there were 1,100 engineers. I don't remember all of them.

INTERVIEWER: How about the people who were your peers?

CAPT NICHOLSON: Let's see, one of my peers at the time was Dick Miller, who eventually

relieved me. He came in and relieved me when I was moved out. Dick Foster was there. He was the aide to the chief and subsequently had a serious accident and got retired. Phil Urkenbrack, the guy I mentioned, was there. There were a number of people like that there. I'd have to look at the book to see who was there.

INTERVIEWER: Who was in charge of the Naval Ship Engineering Center? Who was at the top?

CAPT NICHOLSON: At the time, it was Admiral Fulton, I think. They were doing a number of changes at the time and I don't remember. I'd have to look back at the record. It's been 30 or 35 years since then. Fulton was my boss for a while, I know. Jack Fee was the vice-chief of new ships. Admiral Brocket was there. He left. I had more direct dealings with Fulton than I did with anyone else.

INTERVIEWER: You said earlier, when we were off camera for a few minutes, one of your contemporaries in the shop was Malcolm Mac Kinnon.

CAPT NICHOLSON: He was in preliminary design at that time, I think. A whole group of young officers were in there.

INTERVIEWER: What were some of the other tasks you remember as being important during the reorganization?

CAPT NICHOLSON: At that time, the most important one that I had was the job as the head of a study group to look at ship acquisition. We produced a thick thing called a 'ship acquisition study.' That was laid over the top of the design work that we were going on. The design work proceeded on its own, pretty much. All I had to do was look at it, approve it and check the workload. We had the USS *Eisenhower* under design, and the *NR-1* was being designed. Ships like that were coming along.

INTERVIEWER: Were you there before Don Kern came in?

CAPT NICHOLSON: Yes. Don was another shining light we had. There was a lot of argument going on at that point about submarine development. We had a relationship with Polaris and that had a number of EDs taken into it, people like Deke Eela, for example, who was working on launching. They had a great staff. We worked with them on a lot of things. We went back and forth on

submarine design and talked about things like, "How do you fit this in the system?" That was a major project that was cooking along. I didn't get directly involved in that. The submarine crew did that and while I knew a lot of the people and sat in some of the arguments, I was not directly involved.

INTERVIEWER: Who were some of the submarine people?

CAPT NICHOLSON: Well, we didn't see many of the fleet submarine people. Don Kern and Harry Jackson were contemporaries and they were both involved in that. In many ways, you'd have to get somebody else to tell you the details, but I always kind of felt like Don Kern was railroaded. He was opposing some of the things that were being said by people like Rickover. They shut him up.

INTERVIEWER: Did you ever discuss concept formulation, or CONFORM, with anybody?

CAPT NICHOLSON: Yes. That was one of the new required procedures. Fundamentally, in my view, with those procedures that came in, CONFORM and a lot of those numbers were really trying to formalize things that we were doing anyway. In engineering, there were a number of steps that you had to go through. Putting fancy names on them and creating new orders and things always frustrated us. The job still had to be done. You still had to get a preliminary look. You had to know what you were doing and had to put down the specifications to the last nut and bolt.

Managers kept coming up with various trick names, but none of them really changed the process. Some of them did, clearly. Years ago, when I was in the small boat business, we got an order to design a tugboat. We were told that we would put it out for commercial design. Tugboat design is not a great feat like designing an aircraft carrier. It's pretty straightforward. We had engineers who could design a tugboat in their sleep, do a contract design and put it out for contract. We were required to put it out for a competitive contract. That was part of the whole change. We had, I think, five proposers. We spent more time trying to analyze which one was the best than we ever would have spent doing the job ourselves, by a factor of five. Every time one of those guys came in with a proposal, we had to go through the whole thing.

One of the great problems with McNamara's process was that you took a small group, and there weren't many real naval architects in the country, and took the group and said, "We're going to

throw this open and let everybody in on it.” You overwhelmed the system. You didn’t have enough people around to even analyze it. Every guy in the country had to build his own naval architecture team and they sucked up all the resources available. It was a losing proposition.

INTERVIEWER: How did you find your way into deep submergence systems from your design work?

CAPT NICHOLSON: After I had been there a little while, I knew about the deep submergence review group and all the problems with that. They had a setup in which Captain Eela, who was then the director of the Model Basin, was going to move over and they were going to create a project. The project was under PM-1, under the Polaris program as a subset, and John Craven was put in charge of it. They needed, by some agreement that had been reached with Gallen and everybody else, to have an ED in charge of it, to direct the deep submergence project. Eela was designated to do that. He failed the selection to admiral and elected to retire. He was a great guy. I'm sorry he didn't get selected because he was really one of the better people. When he elected to retire, it left a vacancy for deep submergence. It also left a vacancy for the Model Basin because I had been slated to go to the Model Basin and take it over.

In fact, we went through the public relations business, got all the public relations lined up and everything else for a change of command at the Model Basin. When Eela retired, they shifted me to take his position at deep submergence. I don't know how all that came about, but that was what happened.

Then I went from new ships to CNM as the project manager, PM-11. That's why I say that I kind of backed into it. If he hadn't retired, he would have had the job. It was one of those things.

INTERVIEWER: Administratively speaking, what relationship did you have with Craven?

CAPT NICHOLSON: John was, at that time, the acting program manager for PM-11, and I came in as the program manager because that agreement had been made. John can probably tell you more about it than I can because the thing started up in Polaris, PM-1. It had been formulated and John had done a great job of selecting people to make it work. He had pretty much set the organization and I then came in as the program manager and he became the chief scientist.

INTERVIEWER: As the program manager of PM-11, what were your jobs? What tasks did you have in front of you?

CAPT NICHOLSON: First of all, I had the *NR-1*.

INTERVIEWER: It was still afloat?

CAPT NICHOLSON: Yes. It was growing. It was still a problem. With the SeaLab program, the operational requirement was to get diving to 600 feet. That was what we were charged to do. The SeaLab program was a part of that. Submarine escape was one part. Submarine rescue and the Deep Submergence Rescue Vehicle (DSRV) was another. The DSRV, the submarine rescue question, was the thing that had really set it up in the first place. Those other things were all added to it to make a program package.

INTERVIEWER: In the case of SeaLab, what was driving what? Had SeaLab II come to a conclusion by that time?

CAPT NICHOLSON: Sea Lab II had been finished successfully. It was a successful operation.

INTERVIEWER: In the case of SeaLabs I and II, Bond and company, as the scientists and medical people, were pretty much in charge of the entire operation?

CAPT NICHOLSON: Yes, they were. In a sense, they were doing it outside the system. It got formally approved. When the PM-11 office was set up, that became an official goal. We had the goal to get to 600 feet. The operational goal was to get diving to 600 feet. The SeaLab program melded into that.

INTERVIEWER: Were the SeaLab people really aware of what they were being melded into?

CAPT NICHOLSON: Yes. They were a bright bunch. They understood what was happening. Jack Tomsy had been selected to head that part of the program.

INTERVIEWER: Tomsy reported to you?

CAPT NICHOLSON: Tomsy reported to me. We were going to do an operation at sea. That thing was pointed toward a habitat in the ocean. In the Navy structure, you couldn't have an ED in charge of that. You had to have a line officer and John chose Tomsy for that job. As I said, the basic structure was in place. John did a good job of that. Tomsy was the officer in charge of SeaLab as a

diver, line officer, and ship commander qualified.

INTERVIEWER: Do you have any idea why Craven picked Tomsky, in particular?

CAPT NICHOLSON: I wasn't there, but he's a good man. I'm sure Craven had interviewed Tomsky. He had commanded salvage ships. He was a diver. He had all the qualifications for the program and was a dynamic, forceful guy. I'm sure that John had interviewed a lot of people, but he picked Tomsky.

INTERVIEWER: I'm drawing on SeaLab because it's so important to the conference. When the deep submergence people, that is, you, took over the SeaLab project, were there some cultural clashes between a project that had been basically scientific, medical, and diving and a new organization of which, for all intent and purpose, you were in charge? There was a set of operational goals in place.

CAPT NICHOLSON: No. I don't think so. We were so heavily involved in funding problems. They had been operating with ONR money and we were still operating, to a very high degree, with ONR money, which was limited. We were getting into an operation in which we were picking up fleet operating requirements so that there was a big fight over money. I was always involved in that. The big question was, "Can we get money enough to do it right?" I think those guys were happy that we got a little bit more money. We were not doing it under the table. We were doing it out in the open. What we wanted to do was to make it correctly.

INTERVIEWER: One of the operational goals was to go to 600 feet. Why was that?

CAPT NICHOLSON: I can't tell you who chose 600 feet because that was a goal before I got there, but it seemed reasonable. It was something that they had demonstrated, saturation diving capability. George Bond had done that very effectively with SeaLabs II and I. It was clearly possible to do it. The science said to go and that 600 feet was a reasonable limit. I suspect that had a lot to do with it. You could have picked 700 or 500 or some other number, but 600 looked reasonable. It had been proven in tank diving. All the signs were 'go' when I got there.

INTERVIEWER: When the accident took place on SeaLab III, when the diver was lost, for all intent and purpose, the project was scrubbed.

CAPT NICHOLSON: Let me say a few words on that. Then, you can ask me. We were in a bitter fight for money. I think the total Man in the Sea program was running on about five million dollars a year. At that time, the National Aeronautics and Space Administration (NASA) was getting five billion dollars a year. That was a real thorn in our collective side.

We cut a lot of corners in order to try to get it done on the money we had available. Reprogramming money, or taking money from one pocket and putting it in another, was something we did quite regularly. There were other requirements that I think John Craven can probably tell you about when you talk to him, fringe requirements that were developing in the classified area. We were building a capability to support that. It was not apparent with the SeaLab program or anywhere in ours because it was classified. The training of divers and the building of the whole system fed into some other classified programs.

We cut corners, no question about it. One of the corners we cut, for example, when we had the SeaLab habitat ready to test, was flooding it in a dry dock and putting it under pressure. We did not pressurize it with helium, and I fault our management for that. We pressurized it with air and it passed the tests. I think that if we had pressurized that with helium, we might have found that the fittings were not working. I don't know. When we took it out and put it down on the bottom and pressurized it with helium, we started losing gas in large quantities and couldn't sustain it.

The reason we didn't test it with helium was because helium was expensive and hard to get, so it was one of the corners we shaved. We didn't know that those packings weren't going to work. The packings may not have worked because it was colder. I don't know. When you dropped it down 600 feet and you were in cold water, it was different than doing it in a dry dock, where it was warm. Ideally, we would have found that out earlier, but the real cause of that fiasco was the packings. Obviously, we didn't test them well enough. In hindsight, we probably should have bit the bullet, gotten the helium, and tested it with helium both in the dry dock and at a low temperature, but we didn't do that. That was one of the things that Rickover was always trying to do. We fought him on many occasions. He insisted on getting everything tested, retested, and retested completely, and he was right on that. He was absolutely correct.

When the habitat went down, we were unaware that the helium leak was going to take place, and I don't know. I asked myself frequently, "If we had insisted on testing it with helium in the dry dock, would we have found the problem?" There was a problem in the packing and we didn't find it until it was too late.

INTERVIEWER: When the project was essentially scrubbed, at least the public aspect of the project, did most of the R&D continue in support of the classified programs, to have the circumstances of a habitat?

CAPT NICHOLSON: We scrubbed the habitat but the divers were all trained. We had a separate classified program, toward which the divers were aimed. John can probably tell you more about that because he was in on the classified portion more than I was. Let me put it this way. I think enough of it has been declassified, because they sold the thing to the Russians. Are you familiar with the USS *Halibut* and the *Nautilus*? Am I bringing you new names?

INTERVIEWER: I know about the votes.

CAPT NICHOLSON: You know about the *Halibut*?

INTERVIEWER: Yes.

CAPT NICHOLSON: Do you know how she was fitted out for diving?

INTERVIEWER: No.

CAPT NICHOLSON: That's the classified portion of it. That was another part of our program that was not in the public light. They were fitted for putting a saturation diving outfit in the submarine so that the guys could exit from the bottom of the boat and do work outside. That gets into some highly classified areas. Along with the *Glomar Explorer*, we were the cover for a lot of that. Testing, for example, for the stuff that went into the *Glomar Explorer*, was all done under our umbrella to keep it from surfacing.

INTERVIEWER: Is there anything you could talk about with regard to the *Glomar Explorer* and what went on there?

CAPT NICHOLSON: That was interesting. When that started to surface, we heard about the Soviet submarine out there. They asked me to talk about that. The idea came up to go get it. I talked to

Admiral Gallen about it and asked, "Do you want us to do it?" It fits within our deep search and recovery program. It's clearly part of our charter." We had quite a big discussion about it and he said no. They decided that we were too visible to the public. There was so much 'everybody was going to go live under the ocean kind of *Popular Mechanics*' thing that that visibility would have been hard to handle with the Central Intelligence Agency's approach. They took that whole thing off into a separate project, which, I think, was probably a good idea. I don't think we could have kept it quiet. We had the press looking over our shoulder all the time.

INTERVIEWER: What tests did you perform with the *NR-1*?

CAPT NICHOLSON: I was the program manager. I had to fight for money. The biggest thing I had was the *NR-1*. Rickover started that with thirty million dollars of available cash in the management fund from Polaris. They had that as a surplus. He went to Congress and told them, "I want to build a little research submarine and it'll cost thirty million dollars. I've already got the money and won't have to come back to you for anything else. Is that okay?" His congressional buddies approved it and he started on it. The Chief of Naval Operations read about it in the paper. That was how it got started. But that 'I've got thirty million and I'm not coming back to you for more money' bedeviled me to the end. I had to fight that battle. The eventual cost, I guess, was around \$96 million, and we couldn't account for Rickover's cost. That was my job, keeping the thing going, justifying the money.

INTERVIEWER: What was she used for?

CAPT NICHOLSON: She was used for all sorts of things. She's been used as a research vessel and to search. She searched for the *Challenger* parts, for example. She has been used for some very interesting tectonics research. Geologists have gone down and spent a lot of time on her. They'd go down and look and do all sorts of things with her. Apparently, they've been quite successful. I haven't tracked it all. I'm not on the operational circuit, so I don't know, but she has been successful and I'm impressed. It's now thirty years since she was put to sea. That's long-term.

INTERVIEWER: Yes. Who were some of the characters, the more important people, who stand out vividly in your mind, while you were at deep submergence? Who were the people you dealt with the most, the people who were most significant?

CAPT NICHOLSON: George Bond is at the top of that list. George Bond and John Craven were two very, very eminent, right, personable people. I would say those two were the most eminent.

INTERVIEWER: How were they different?

CAPT NICHOLSON: Well, George was a doctor. That was the first thing. John is a scientist. But John is a real man of many parts. He's a real renaissance man, and bright. He's got an idea for everything, as you'll find when you talk to him. I would put those two at the very top of the list.

INTERVIEWER: Were there any Navy flag officers who were particularly sensitive to how important some of this work was and buttressed support when you needed it? You mentioned a number of times the constant battle for funds.

CAPT NICHOLSON: Mike Renskoff was one. He was from the Navy's intelligence office and is here in town. In fact, he's here, at this meeting. Mike was in OPNAV. I guess he was the most sensitive to the whole thing because his office was the office I went to for funding.

INTERVIEWER: I assume he also hoped that their collection efforts directly benefited by the kinds of technologies that you were developing.

CAPT NICHOLSON: A lot of people benefited, I'm sure. Mike was in Office of Naval Intelligence and was directly responsible for the funds for much of the 'black' stuff.

INTERVIEWER: How long did you stay at deep submergence? You arrived in August of 1966.

CAPT NICHOLSON: I stayed until I retired, in February of 1971.

INTERVIEWER: You retired in February of 1971, as a captain.

CAPT NICHOLSON: I was in the Navy for thirty years.

INTERVIEWER: What made you to decide to call it quits then?

CAPT NICHOLSON: Well, failure of selection was one reason. I wasn't selected for a flag rank and didn't want to stay on as a captain. I could have stayed one more year under the law but decided that it was a good quitting point. I'd gotten far enough so that the DSRVs were clearly going to finish up, the *NR-1* had been launched, and all those key jobs had been done. SeaLab had slowed down. We were training divers and doing other things for it, but it was a transition point at which I felt I might as well back out and let somebody else do it.

INTERVIEWER: Did you have a post-Navy career lined up by the time you were ready to retire?

CAPT NICHOLSON: No. I didn't have anything lined up but did talk to Dr. White, who had just been appointed to be head of the new National Oceanic and Atmospheric Association (NOAA) organization. I wrote him a letter before he took over.

INTERVIEWER: Do you remember Dr. White's first name, by any chance?

CAPT NICHOLSON: There were two of them, two Dr. Whites. Bob White was the one I wrote. I wrote him a letter while I was working on the DSRV. I wrote, "You have an opportunity in creating this new organization to carry on a lot of work that's being dropped in the Navy." Our budget was going into the cellar. *NR-1* was off. The jobs had been done, essentially. We had demonstrated at 600 feet. We had finished the DSRV, the first one, and I decided that was a good place for me to quit, as the budget was disappearing.

We'd been moved out of CNM back into the Ship Systems Command, so I decided that was the time for me to leave. I wrote, "the Navy is dropping a lot of this work, dropping the development of diving materials, development of diving techniques, and the things that we had been pushing. You have an opportunity to pick this up in the new NOAA organization."

When I quit, I got in touch with him and they picked me up. There were two or three places they wanted to put me, but they put me in the National Ocean Survey. I became the Associate Director of the National Ocean Survey for Marine Technology or Technical Development. We worked on a lot of things like side-look sonar and improved mapping techniques. We worked mostly in technology. Then, I also had the national data buoy program, which was in Mississippi.

INTERVIEWER: You worked with a lot of oceanographers.

CAPT NICHOLSON: Yes. That was interesting.

INTERVIEWER: In that case, who were the people that stand out, the oceanographers who played a role in the kind of work you were doing with technology and in the buoy data collection? Who comes to mind?

CAPT NICHOLSON: There were the people I had been dealing with at Scripps.

INTERVIEWER: Ravel was at Harvard by then.

CAPT NICHOLSON: He had gone. Spece was one.

INTERVIEWER: Fred Spece?

CAPT NICHOLSON: Yes. He was a great guy. I knew him. I did quite a bit of work with them. When I say 'them,' I mean I had contact with people at Woods Hole, but nobody comes to mind as special.

INTERVIEWER: What about Brackett Hursey or Al Vine?

CAPT NICHOLSON: Al Vine, of course, I knew from the deep submergence work. Everybody knew him. There were a lot of innovative, great people in that business. Anyway, I spent time fighting for the data buoy program. One of the interesting things we had was trying to renew the tidal gauge system for the whole country. They were using old technology and I tried to bring new stuff in.

I think the single biggest thing that we did was with bottom mapping, the introduction of sonar techniques for improved bottom mapping. We had another interesting program, which ran jointly with NASA, using lasers in a fly-over in an airplane, using a laser beam. You got a reflection from the surface and a reflection from the bottom. You measured the difference and could tell how deep the water was. That had the potential of saving a lot of wet ship time in shallow water. That was only good in shallow water.

INTERVIEWER: It had the potential. Was it developed successfully?

CAPT NICHOLSON: It was in development. We ran with NASA help, but I don't think that it ever really came to pass. It worked. We proved it worked, but it got lost in the budget process.

INTERVIEWER: Perhaps it was shifted to satellites instead of airplanes.

CAPT NICHOLSON: No. Satellites can't do that. We're talking about developing hydrographic maps, navigation maps, and the depth of water. You can tell a lot from satellites. You can tell much about the surface of the water, but you can't tell much about the bottom because the penetration isn't there. A laser beam can penetrate. We actually worked with it and proved it worked. From proving that it worked to buying airplanes and setting up crews was difficult, given the things that already existed, and it disappeared. It did not become operational. Those were the kinds of things we were

working on. They were very, very fascinating. I stayed with NOAA until it became obvious that the office I was in was going to be dropped out of the budget process. I then elected to retire.

INTERVIEWER: When was that?

CAPT NICHOLSON: That was in 1981. I stayed there for ten years. I retired, bought a sailboat and went and sailed the Caribbean.

INTERVIEWER: That's not bad.

CAPT NICHOLSON: That was a decision I made when I was a midshipman there. Looking at all that beautiful water, I thought, "Some day, I'm going to come down here and spend some time."

INTERVIEWER: That sounds good. We were jealous because in the pouring rain the other day, Malcolm McKinnon told us that after he left us, he was headed on a vacation on Bermuda to outfit a ship or boat and do some of those same things. We had to stay in the rain. Are there any questions you thought I would ask but didn't?

CAPT NICHOLSON: No. I can't think of anything in particular, other than little incidents, but nothing that is of great significance. The only thing I can say is that it's been a lot of fun and a real challenge to keep even with it. The people with whom you dealt, people like John Craven and George Bond mad it so much fun. George was a rare character. They keep you alive.

INTERVIEWER: Yes. Do you have any special memories of George Bond?

CAPT NICHOLSON: George had a bad back. I can remember occasions on which he would try to fly back from the west coast and almost had to be helped off the airplane. He had some real physical problems. He didn't let it bother him. He was a fascinating guy. I remember his one goal was to go back to Bat Cave. He came from Bat Cave, North Carolina, I guess. He wanted to go back there and make a little hospital to take care of the folks after he retired from the Navy and he did that. He was a rare bird.

INTERVIEWER: Thanks for your time. We appreciate it.

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UNDERSEA & HYPERBARIC MEDICAL SOCIETY

**ORAL HISTORY OF THE MAJOR PARTICIPANTS
IN U.S. NAVY UNDERSEA TECHNICAL DEVELOPMENTS**

**INTERVIEW OF
WOODY WOODWARD**

Panama City, Florida
Thursday, April 10, 2003

PROCEEDINGS

MR. WOODWARD: For my first tour in Vietnam, I was sent to an EOD Training Unit Team as the element leader for the advisor to the Vietnamese EODs. My assignment was near Vung Tau. I was to relieve Garrin. He was a young W-1, as was I.

I had been in country exactly four days when we got word that a young SEAL, who had just made chief, had been killed the previous day. I knew him. His name was Bomar. Anyway, it was bad, bad country. The Viet Cong (VC) controlled it heavily. The SEAL team detachment there had requested EOD because they knew the area was going to be booby trapped fairly well, and they requested assistance. My element was elected to go.

The guy I was relieving had seven tours in Vietnam at the time, and it was my first. He was almost out the door and I said, "Wait a minute. I don't think I want you to go just yet. How about a little bit more turnover? How about you go on this last operation?" That turned to be a wise move, because I don't know if I could have handled it myself, frankly.

We got there and reported to Lieutenant Mack Collins, who was later killed in another ambush. The deal was that we were going to go into the same area in which they had just been wiped out and take care of this bunch of bad actors. There was a bunker right off the bank. It was just one of those bunkers with SEALs and enough room to stick out the muzzle of an automatic weapon. They had wiped out the SEAL team from that bunker. We inserted.

INTERVIEWER: How did you insert?

MR. WOODWARD: We did so by fast boat, the Navy medium SEAL support craft. One of those boats would run sixty knots. It had a manny gun on it. We eliminated any bad apples coming down the river. Nobody could live through that, and we came down the river firing

away. We inserted and it was completely quiet. There were booby traps, though. In fact, one of my guys hit one of the booby traps.

The policy for tearing up bunkers was to put a haversack in them. To keep them from being redone right away or ever again, we also put some willie peter and CS gas on the haversack. The sun baked the mud out and it became hard as fired clay.

INTERVIEWER: It became a brick.

MR. WOODWARD: Yes. It was like a brick. They liked to re-dig those while they were still fresh and moist. Often, you could see a guy doing it. He was the friendly rice paddy worker waving at you all the time and smiling at you with his beetlenut black teeth. In that particular area, the SEAL team told me they would see those guys. The next day, they'd see them and their legs were all burned up. He had gotten a little willie peter during the night, so he was a VC.

INTERVIEWER: He was trying to excavate the bunkers you just destroyed.

MR. WOODWARD: He was a rice paddy worker by day and a VC by night. Anyway, they'd give him a zipper stitch with a stone and take all the piss and vinegar out of him.

We had a haversack in a bunker, and just about the time we were going to go away and wait for the charge, which only had a short fuse, a tree line about a hundred yards away opened up on us, and it was the bad guys. We were all diving for cover and knowing that we had a really short fuse on it and that the thing was going to go off at any minute.

INTERVIEWER: You were between a rock and a hard place.

MR. WOODWARD: Globbs of heavy dirt the size of trashcans were going to be coming through the air any second. We were all hiding, and one of my guys hit a booby trap. He stepped on one of their booby traps. I saw him in my peripheral vision going through the air doing a couple of cartwheels and then he landed. Norm Garrin, whom I had relieved, came along and with just one

swoop picked the guy up and threw him over his shoulder. Norm ran another twenty or thirty yards, counting, "A thousand two, a thousand three," and boom, it went off. The guy's name was Len. Norm threw him down, covered him up and waited for all the clods of dirt to hit.

Then, the smoke cleared and we were still being fired upon. The first class, Norm, said we were taking over. He radioed for air support, told them blah, blah, blah, and fired a grenade over the smoke and said that the bad guys were in that tree line over there. The next thing I knew, OB-10s were coming and the trees were going down. Someone fired the five-inch zuni and that tree line went away and it was really quiet. That was my first experience in Vietnam.

Our responsibility in Vietnam basically was port security. We had EOD teams from Da Nang a place in Vietnam called 'Solid Anchor.' We had EOD teams at all those and elements as advisors. We had U.S. teams and advisor teams.

INTERVIEWER: You were on an advisor team?

MR. WOODWARD: Yes. We would just answer calls. We did port security every night at Vung Tau. We did swims around the ships. They had two huge generator ships anchored out of there supplying power, and it was a highly sought after prize for the VC to mine one or both of them and sink them.

Every night we performed port security swims around the ships for mines and what have you, checking anchor chains and all that and responding to routine EOD calls. For example, one time, someone called and said there was a mine on a bridge. They had just finished building this bridge that would give us better access to Saigon, and it was a major artery between Vung Tau and Saigon. We went over, and sure enough, there was a mine the size of a Volkswagen. It was tied to the bridge piers and the tide had gone out. We were looking up at it from our boat.

INTERVIEWER: What was it made out of?

MR. WOODWARD: It was made out of bamboo and stuff, but it was also made out of Chicom explosives. It was red. It was kind of a pinkish C-4. It wasn't nearly as good as our C-4, but it would have taken that bridge out. It didn't go off, though. It was a dud, and most of their crude, jungle-made VC ordnance was. We found it in a dud-fired condition. We gingerly arranged to support the thing. We cut it away and did everything we could, remotely, of course, and lowered it away and it floated. We floated it off to a safe area and blew it up.

There were other experiences in which we'd just get calls, as EOD did anywhere, and we responded to explosives, duds fired or booby traps here and there. We'd just respond to whatever situation. Our area covered from far south of Vung Tau up north toward Cat By. We were kind of roving circuit riders on the second tour. I had three EOD teams under my advisory.

INTERVIEWER: Were they U.S. or Vietnamese teams?

MR. WOODWARD: They were Vietnamese. They were five or six-man teams that each had a petty officer, officer in charge or chief in charge, generally, and there were guys down to the rank of seaman. We were centrally located in one spot, but we went wherever was necessary, visited the team, and whenever they went on a mission, they could choose to have us go along or stay behind. Normally, they wanted us to go, and we were there mainly as advisors and were admonished to not take over. As badly as you wanted to, you had to bite your lip and say, "Huh?"

INTERVIEWER: Were they any good?

MR. WOODWARD: Yes. Some of them were darn good. Most of them were good. The type of guy who was with the Vietnamese underwater folks, the SEALs, EOD and diving, were the kinds of guys you liked to have. They had to want to be in that program, like we have to want to be in our Navy. They were a little bit above the average Vietnamese Navy person.

INTERVIEWER: Did you train them from scratch or did they have their own school?

MR. WOODWARD: We trained them. The U.S. Navy trained them.

INTERVIEWER: They were trained in the country?

MR. WOODWARD: Yes.

INTERVIEWER: You ran an EOD school that they went through?

MR. WOODWARD: I didn't.

INTERVIEWER: There was one, though?

MR. WOODWARD: There was one, yes. They were there before I was.

INTERVIEWER: You'd mentioned the generator ships and that they were the focus of swimmer attacks.

MR. WOODWARD: They were the focus of sappers.

INTERVIEWER: What type of experiences did you have with that, with the other ships?

MR. WOODWARD: We actually made out pretty well in Vung Tau. We didn't have any problems with sappers there. We had security that really took it seriously, and routinely, but not with a pattern that you could set your clock by. The security would run by and randomly throw out concussion grenades around the nests. The two ships were nested together. They were old Kaiser coffin-type vessels. I forget the names.

INTERVIEWER: Were they liberty ships?

MR. WOODWARD: They were liberty ships, but they were those like the USS *Luzon*. They were converted ships. They were just full of generators.

INTERVIEWER: They didn't get in the way? They were permanently anchored?

MR. WOODWARD: They were permanently anchored. They were chained to moorings there. Our security folks would keep the sappers away by throwing concussion grenades in the water

out of a really fast boat, circling around the ships. But there were several instances in which we had all of our supplies come into the country by contracted companies like Champion and Likes Lines, and those were prized targets. They sunk one in Saigon Harbor. It was the *Card*. They sunk it with a mine, and that raised heck when it clogged up the harbor and things like that.

We would frequently find mines that had been placed on a ship or alongside a ship. It might have been a floating mine or another crudely made mine from the jungle with a bladder. I forget the name of it, but Bart Bartelson will be able to tell you the name of that type of mine. It was quite common. It was kind of a limpet, but they would attach it to the ships. They wouldn't even attach it themselves, actually. They'd con some South Vietnamese friendly into doing it through intimidation, and he'd reluctantly swim down and tell him how to work it. Their fuse lighters weren't like ours, you know.

INTERVIEWER: Do you mean like an M-60 smoke?

MR. WOODWARD: They're not like that. There was just a piece of string and you'd pull it and there was some Quickmatch in there. Often, when they got wet, they were useless.

INTERVIEWER: That was how the grenades functioned, too, right?

MR. WOODWARD: Yes. Someone would see a mine alongside a ship when the sun came up, and it had been tied to the anchor chain. They'd tell a South Vietnamese farmer to swim down and put this on, or two of them would straddle the anchor chain and pull the two strings. Then the thing would go alongside the ship on both sides and they would just swim away. Our naval intelligence folks would find that out and go interview the old rice paddy worker. Sometimes we'd find the mines and the fuse hadn't even been pulled. As Nuge would say as he was floating down the river, "Now, look, these people didn't care about me. They don't give a darn about me. If I pull these strings, one of these things is going to go off, maybe. But if I don't, they're not

going to come check, so I just won't do it and say that I did." Sometimes we'd find them and they weren't even pulled. That was how we knew that the bad guy hadn't put them on.

INTERVIEWER: A lot of the farmers who were coerced or intimidated into doing it were pretty neutral, then.

MR. WOODWARD: Yes.

INTERVIEWER: They didn't want to be involved with the war either way.

MR. WOODWARD: No. They were the South Vietnamese. The North Vietnamese guys were the VC.

INTERVIEWER: But the South Vietnamese farmer wasn't a sympathizer. He was just arm-twisted into doing something.

MR. WOODWARD: That's right. Everybody was taxing him. The North Vietnamese would come along and tax him, and then the South Vietnamese military got bad, and they started taxing them. The poor guy was getting taxed from everywhere.

We collected explosives until we had enough to make up a decent-sized shot, and I had access to a mike boat. We lived right next door to the harbor clearance folks. They had all kinds of boats. The Army at Vung Tau called and said that they had a bunch of explosives to get rid of, knowing that I was going to have a clean up shot soon. We went over. Good Lord, they had more explosives. We calculated it was 144 tons.

INTERVIEWER: Holy cow.

MR. WOODWARD: I have some pictures of that at home. You'd love to see those.

INTERVIEWER: I'd love to see them.

MR. WOODWARD: There were some guys at CU playing volleyball. One guy was just about to serve, and he saw a mushroom cloud going up and said, "My God, they dropped it."

INTERVIEWER: You let off 144 tons all at once?

MR. WOODWARD: We did it all at one time.

INTERVIEWER: That was a 280,000-pound shot. That's unbelievable.

MR. WOODWARD: I shot 52 tons underwater once.

INTERVIEWER: Really? Where was that?

MR. WOODWARD: That was in Subic Bay. I'll tell you about that. That was out of necessity.

Anyway, there were a lot of Chicom explosives in that shot. There were all sorts of rounds that had been captured. There were rocket-propelled grenades (RPG) and cases and cases of AK-47 ordnance, which made up much of the 144 tons. Anything the North Vietnamese had, we'd blow up, and that was stuff we found in caches they had that were meant to re-supply the north.

They'd have a guy on a bicycle bring a bullet or an RPG round all the way from the North Vietnamese down the Ho Chi Minh Trail and stash it in a cache. It might have been underwater or well-camouflaged some place, and they'd say, "Thanks. Go back and get another one." Off he'd ride.

INTERVIEWER: When you discovered the caches, were they typically booby-trapped?

MR. WOODWARD: Yes. Someone watching from a distance also typically guarded them. He was camouflaged, as well. We wouldn't find them. The Navy NILO officer, or Navy intelligence Liaison Officer, would give us word on those, and we got to go blow them up. That was a rare enjoyment we got.

INTERVIEWER: Why would a cache of booby trapped weapons be a rare enjoyment?

MR. WOODWARD: It was because you got a big boom out of it, and sometimes you got the bad guy, too. One time, we actually spent the night waiting. There was a curfew on the river at night

in Vietnam. Anybody who was on the river at night was considered fair game, and the VC would move at night.

In those days, we did have night vision equipment. It wasn't nearly as advanced as it is today, but we could see. Once we had it all wired up and decided to wait, it got close to dark and we decided to spend the night. We had enough rations to do that. Sure enough, there was a little activity around the cache at night. We said, "Hey nutes, bye." and cranked it all off. That was great fun.

INTERVIEWER: It wasn't fun for nutes, though.

MR. WOODWARD: It was not for nutes, no.

INTERVIEWER: Go ahead and tell us about Subic Bay.

MR. WOODWARD: Well, I wasn't even on the list to go to Subic, and it wasn't even on my list of the places I wanted to go. But the kid who was going there had made warrant the same year I had and he had had his wife there. She was a Filipino. He was all set to go and was killed four days before he was supposed to report and relieve the officer in charge at Subic. I got a call.

Betty Shivley was sitting at our dining room table. Betty Shivley is the wife of an old, old friend of ours. I worked for him five times in the Navy. He was COMSPECWAR, but he was our boss in Vietnam, Dave Shivley, who was a commander then. Betty had gone out to see him, to visit him during rest and relaxation in Hong Kong, and he said, "Heck, Betty, I'll take you to Saigon." He took her to Saigon and to Cat Lie. Anyway, she was on her way back, and I got a call from the commanding officer, who said that he had a job for me. He's another guy you need to interview, Commander Dave Ussery. Shivley is dead, by the way. Dave Ussery is in politics in Tennessee. Anyway, I got to go to replace the guy who was going to Subic. Subic Bay, as you might know, is the closest Navy base to Vietnam. It's two hours away by plane. All the

retrograde ordnance that was coming out of Vietnam would be necessarily dropped at NAVMAG Subic. The EOD officer before me hadn't done anything.

INTERVIEWER: He just let it stockpile?

MR. WOODWARD: He had let it stockpile. The team's morale was at the bottom of the bucket. They were not allowed to do anything but camshaw work for things that he had going on. His name is Bud Brown, by the way.

INTERVIEWER: We ought to interview him.

MR. WOODWARD: Piece of shit, pardon my French. On the pier was 1,900 tons of ordnance to be disposed of retrograde. There was no more room in the magazines to put another mortar round. You never saw so much ordnance in your life. It had several huge magazines. I forget the square footage, but they were full, clear up to the ceilings.

INTERVIEWER: Was that U.S. ordnance?

MR. WOODWARD: It was U.S. ordnance coming out of Vietnam, ready for disposal. Master Chief Hannigan was his name. I re-enlisted him in free fall.

INTERVIEWER: That was at the end of the Vietnam War, right?

MR. WOODWARD: That was at the end of the Vietnam War, and in Vietnam, ordnance was still coming out daily, or every AE or AOE that came out of there brought retrograde ordnance. There was more coming every day. We were pecking away at it, and down at the range, we had three areas in which we could blow fifty pounds per shot. That was our range limit. We had 2,000 bombs. We couldn't get rid of those there.

One day, I finally got some help out of Dave McNulty, actually, who was a commodore then. I asked and asked for help and finally he sent me some. During the rainy season, we were blowing up ordnance. That was another thing. The guy before me never did anything during the

rainy season. He kept giving his reasons for not working then. In the summertime, he came up with other reasons.

INTERVIEWER: It was too hot, maybe?

MR. WOODWARD: Yes. Anyway, during the rainy season, we were there pumping out fifty pounds of shot. We'd prime up three holds and get back to the bunker. It would go Boom, boom, boom, and we'd start all over again. We could burn up to fifty caliber rounds in my oven. We'd burn that, and we did that during the rainy season.

We were sitting at my bar. I lived in SOQ. Being the OIC, I rated that, and it came complete with a bar. The master chief and I were sitting at the bar one afternoon, having a beer and talking about how we were going to get from here to there. We did a little arithmetic and reckoned that we'd be there until the year 2031 at fifty pounds a shot, getting rid of what we already had on board, without any more coming.

INTERVIEWER: It was still coming.

MR. WOODWARD: It was still coming. We had to come up with some plan. At that time, some help came from the group. The commodore sent two more people. I wrote him that if he didn't open his shirt, his heart was liable to fall out. The two guys were great guys.

INTERVIEWER: What were their names?

MR. WOODWARD: One was named Ruttman, The other guy is dead,.he was the DK-1. Ruttman is still alive and well. He's another one you need to interview. Jim Ruttman is his name. He's a retired civil servant at the moment.

INTERVIEWER: The guys showed up?

MR. WOODWARD: The guys showed up.

INTERVIEWER: You had 1,900 tons of ordnance on the pier.

MR. WOODWARD: Then, I had six people working for me. We started to peck away it during the rainy season. It got so muddy down at the range. It rained so much that year. It was 1972. The Philippines gets its annual rainfall during July. All that fresh water coming off the mountains into the ocean killed the reef across the bay from us. We started looking how we could blow the stuff up underwater. Fifty pounds of shot and it starts throwing fragments out at the people working in the SAG area. They got a little excited about that. We poked some holes through some. We fudged a whole lot and found base plates from five-inch rounds and 155 howitzer rounds and whatever. The base plate of that was thick. It would poke a hole in the roof of a building outside the area, and I got in a little trouble there. We started doing it underwater. I looked at ways of doing it. There was an instruction. There was a procedure for shooting off huge quantities of explosives underwater. You had to send a message to the world.

The top info person was the chief naval officer. Let's say that you were expected to shoot this off or blow that up at so and so latitude and longitude at so and so time on so and so day, and fire it off to the world. If you got nothing back in five days, consider the answer was to go do it, and we did. We did two 2,000 bombs at first. We just strapped them onto the side of my mike boat. I had my own mike boat there. We just strapped them on the side and packed the nose and tail fusewells with C4. We went out and found the area we wanted, which was sixty feet deep. We cut the lines and let them fall to the bottom. Then, we put two guys in the water. They swam down and capped in, put in the electric and blew them up. They backed off first, of course. It was great fun. Everybody got some good pictures.

Everybody was at my bar, congratulating ourselves and having a beer. One of the guys, Ruttman actually, asked, "Gunner, why can't we do all of it that way?" I said, "I don't know. Why can't we? Let's think about that." We brainstormed around the table. One of the magazines I

had that was full of explosives for disposal was full of C3. That was the predecessor to C4, and it was bad, bad stuff. You could get a really bad headache from that stuff.

INTERVIEWER: You got a headache from just playing with it or touching it?

MR. WOODWARD: Well, the stuff was so bad and it had so much of it that you could get a headache just driving by. Yes, it was bad stuff. We had to get rid of that. We lined a skip box. A skip box was a box with metal sides, metal corners and wood flats in between with great big wire lifting slings to the four corners. We lined the walls and floor of the skip box with C3, filled it up with 81-millimeter mortars and a few other odds and ends and lined the top of it with old haversacks. We put a cherry-picker in the boat, took it out, lowered it to the bottom, swam down and put a C4 charge on it. We already had that in there. We just capped in, ran the fuse to the surface and capped it off. It was a non-electric. We ran the wire to the surface and had a non-electric floating on a piece of Styrofoam.

We pulled it and backed away. It was beautiful. We waited until the current cleared and we went down. All we could find was some twisted-up metal from the skip box. Realizing that the commanding officer of the magazine would get really mad if I blew up all of his skip boxes, we decided we had to build some boxes, and we built boxes. I've got photographs of all that stuff.

INTERVIEWER: I'd love to see them.

MR. WOODWARD: We built boxes out of the donuts that we used for shoring up the ships that came over. They were throwing donuts out in the dump and burning them, so we just went down and got them and built boxes. Then I hired a 14-man stevedore, a Filipino stevedore crew, to build boxes for me. We got away from the cherry-picker. We got to where we could pick them up with a forklift.

We limited them to 5,000 pounds and stacked them because the forklift capacity was 6,000 pounds. We stacked them on the boat and then drove the forklift onto the boat, got underway, went over, sent a message, dutifully, and waited. Only once did I ever get a request to postpone, and that was from SUBLANT. I reckon a submarine was going to be in the area. We postponed until they sent a message.

Then, we would put the boxes out and slowly made our hole on the bottom, much, much deeper. I'd moor the mike boat by the stern. I'd have the forklift pick a box up, take it to the rail and just dump it overboard. We had holes cut in four sides and C4 crossed across the bottom, top, and all sides, so no matter how the box hit the bottom, it was capped in two places.

Right after that, the master chief and I would go underwater with a spool full of detonation cord and a piece of pipe. We'd swim a circle around the whole lot and the kids would come along behind with sensitized detonation cord, and that was the cap on the detonation cord. They'd cap in and tie it off to the to the ring main. You couldn't get a girth into the hole, so we used what we called 'underwater tape.' It was electrician's tape.

INTERVIEWER: You used it to maintain contact.

MR. WOODWARD: Yes. We had the Marines believing it was real underwater tape.

INTERVIEWER: God bless the Marines.

MR. WOODWARD: By then, we'd graduated from the non-electric, because we didn't have any control over that. We almost blew a helicopter out of the air once. He was coming along the beach and I had to inform the QV tower and security. I had everything out there. All the world knew it, except this helicopter pilot didn't get the word, and he was coming right along the beach just as a plume of water shot 3,000 feet in the air, and he was screaming like a rat eating red onions.

INTERVIEWER: I've got to remember that phrase.

MR. WOODWARD: He was crying to the QV tower about it. Anyway, we got rid of a lot of ordnance that way, about 300+ tons. My biggest shot was 52 tons. But we did that routinely. Every two weeks, we'd shoot a shot off.

The commodore called out and sent a message that read that I had to come out and visit. He said, "You're disposing of more ordnance every month than all of my 16 detachments combined." I said, "Oh well, I reckon they ought to go to work. But commodore, remember, I've been asking you for help." I was getting help from the Marines. A good friend of mine, a gunner, had been in charge of the Okinawa Marine detachment. The Japanese had them right there. They couldn't do any ordnance disposal. The Japanese would harass them. They would say, "You can blow up twenty pounds on Sunday at two o'clock. That's it."

INTERVIEWER: Was that at Camp Fuji?

MR. WOODWARD: I don't know where it was. All I know is that they came out of Okinawa. They came down one time TAD, just fooling around, and I asked, "Do you all want help?" They said, "Yes. Man, we'd love to help." I could use some help. I was really fortunate. There were about ten of them. I'd send some to burn 18,000 pounds of powder in the morning.

We had a parachute jump we had to do. We were a PIC detachment. I had to maintain parachute proficiency. That was great fun, too. We'd go do the jump. We had a MINEX one afternoon, and maybe we were getting ready for an underwater shot. I'd have two or three guys go there and pack boxes. We were really rolling. That was when the commodore wanted to know how I was managing to do that.

INTERVIEWER: Did you draw upon the underwater demolition teams (UDT) at Subic at all?

MR. WOODWARD: I did. Thank you for mentioning that. Those clowns would come out, and they knew that because I'd sent the message to the world. Dennis Baber was an ensign, and Master Chief Gallagher was the master chief. They would come out with their cameras, just waiting, and they'd take pictures when the shot went off, and off they'd go.

I called over one day and said, "I want the UDT officer to come see me." His name was Dennis. I said, "I know what you're going to do now. You're going to go back to the Strand and say, 'look here what we did in WESTPAC.' That's a bunch of horse crap. If you really want to do this, I need some help. Send me three or six or ten of your best guys and my master chief and first class will train them in what they need to do. In return, you can help us out, because I really need the help. I'm running out of bottom time here and we're doing this thing at sixty and seventy feet and with a four-man detachment. You can figure it out. Run the numbers." I got him to send us some help. Then, the rest of them would come and take pictures, too.

SPEAKER: That was what we always did at UDT.

INTERVIEWER: How long were you at Subic?

MR. WOODWARD: I was there for two and a half years.

INTERVIEWER: How close did you come to getting rid of all 1,900 tons?

MR. WOODWARD: We came pretty close. We got rid of over 300 tons, I believe. Remember that there was more coming every day and plenty in the magazine. I don't even know how much was in the magazine, but that was a good tour.

I did a lot of jumping. We did a lot of diving. We did a lot of diving on plane crashes, picking up the pieces, basically. Once in a while, we found a piece of a body. Once we got both bodies out of the plane, it just went off the end of the runway and right in the water for some reason. We didn't know why. The divers looked for the plane but couldn't find it. Parpinski, the

old master diver, who lives here in Panama City, called me. We went out with our hand-held sonar and found it right away. We went to the aircraft and got the bodies, safety seat, and all the EOD stuff.

INTERVIEWER: What type of aircraft was it?

MR. WOODWARD: It was a fighter. I forget what kind. It was one of those two-seaters. But nobody got out of it.

INTERVIEWER: Gunner, can you tell me about some of your Vietnamese counterparts in the LD&N?

MR. WOODWARD: Yes. The most colorful one in the whole lot was 'Whisky' Tom. His name is Tom Nguyen. Tom was quite a character in EOD in his own right. He had been in several of my friends' teams prior to my entry to Vietnam and I was fortunate enough to have him. He was a seaman in the Vietnamese navy. The way it worked in Vietnam was that when everybody got paid, someone had to go to Saigon to get the money for everybody, and that person would bring it back and pay everybody. When Tom got his money, he was just like a seaman second class on liberty. He'd spend all his money that same day and wanted to take everybody out for dinner. We'd try to tell him, "No, Tom, you don't need to do that." If we were traveling down the river on a boat, and we got transportation however we could, and more often than not, it would be in a PVR or a swift boat that was going from point A to point B.

We'd stop off wherever they would stop in our support base along the river and spend the night. We'd go out to a little town nearby and eat Chinese soup, or what Tom called Chinese soup. It was just noodles, a little meat, some green stuff and boiling water, and that was a meal in Vietnam. Tom would order Chinese soup for everybody like he was the admiral and in charge. The mamasan wanted to get paid and he would say, "No, mamasan. You don't understand. We

keep the VC away from you. You pay for us.” She said, “No, no. That's not the way it works.”

He had a .45 that someone had given him. I think Jerry Taylor gave it to him.

The mamasan would have a Sanyo fan that she had paid dearly for, and that was her only prized possession. She'd have a light and a Sanyo fan and some really crude tables and chairs on a dirt floor. He'd say, “Mamasan, do you like your fan?” She would say yes. Boom, he'd blow the fan away. She would say, “Okay, you eat free.” Once, Tom did that in the wrong place. It was while I was between tours, I guess. I remember it was at Binh Samoy and Tom, the story goes, had pulled one of these tricks.

The QC, the Vietnamese military's equivalent to the Military Police, was called and Tom was thrown in the monkey house, or jail. That particular jail was a Conex box, and in Vietnam, when you got thrown in jail, in the monkey house, that was where you were. You lived, ate, slept and did everything in there. It got to be rather smelly after a while.

Everybody tried to get him out, even Commander Ronan. Our team leader and officer in charge in Saigon finally went down and was finally successful in getting him out. Whisky Tom was a real cocky son of a gun up until then, but as the way Commander Ronan told it, Tom was humbled when he came out of that box after about five days.

INTERVIEWER: He was in it for five days?

MR. WOODWARD: Yes. At the end of the Vietnam War, Tom was back in our detachment.

(Whereupon, the INTERVIEW was concluded.)

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