



An anatomy of a diving lawsuit

**Accelerating no-fly time: the
final chapter**

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**Diving Pioneers & Innovators: A Series
of In Depth Interviews (Bob Hollis)**

Issue 4 – September 2011

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Front cover image © Justin Branam.

Editorial

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Welcome to the fourth issue of Tech Diving Mag.

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In this issue, the contributors have brought together some unique, first-hand experiences. The contributors for this issue are world renowned industry professional Bret Gilliam, accomplished diver, instructor trainer and book author Steve Lewis and technical diving instructor and explorer Massimiliano Canossa. Read their full bio at www.techdivingmag.com/contributors.html.

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Moreover, the piece of software I've been working on for over a year is finally ready to ship! [Ultimate Planner](http://www.techdivingmag.com/ultimateplanner.html) is a decompression planning tool incorporating both VPM-B and Buhlmann-GF algorithms for OC and CCR dives. It also has some distinctive capabilities like calculating the no-fly time acceleration and utilizing asymmetric gas kinetics. For more info visit www.techdivingmag.com/ultimateplanner.html.

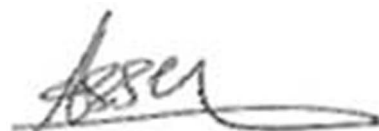
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Tech Diving Mag is very much your magazine and I am keen to have your input. If you have any interesting articles, photos or just want to share your views, drop me a line at asser@techdivingmag.com.

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Asser Salama
Editor, Tech Diving Mag

An anatomy of a diving lawsuit

By Bret Gilliam



Most readers would probably find an analysis of a lawsuit about as enjoyable as a root canal. But I think this case will prove interesting to divers since it involves issues that directly affect how experienced divers will be allowed to enjoy some of the most exciting and challenging sites without being relegated to a policy of supervised “lowest common denominator” status that would virtually halt the exploration of places like Cocos Island, the Galapagos, Palau, the Solomon Islands, Papua New Guinea, and most of Indonesia.

What do they all have in common? Strong currents and liveaboards that let divers dive independently without supervision or in confined groups led by divemasters.

It’s a complicated case that I worked on for over four years as an expert witness and litigation consultant before finally getting into court for trial in April 2009. The accident summary sets the stage for the lawsuit that followed. (The names of the plaintiffs have been changed; all other details are exactly related.) Here are undisputed objective facts followed by excerpts from my opinion as the lead maritime and diving expert for the defense:

FACTS

On May 16, 2003 nine sport divers took part in a dive at Dos Amigos Pequeno, a pinnacle arising from deep water off the west end of Cocos Island located approximately 400 miles offshore from the Costa Rican mainland. Cocos Island is a designated National Park and World Heritage Site. As such, it enjoys certain marine and terrestrial conservation restrictions and protections. The area is famous for its profusion of large marine species particularly sharks, rays, whales, turtles, and schooling fish. It is considered one of the best diving locations in the world and attracts approximately 1200 sport divers annually who come to see the marine life underwater from four

primary diving vessels.

The divers were participating in a paid trip aboard the *Okeanos Aggressor*, a 120-ft., 130-ton diving vessel of Costa Rican flag and registry. The vessel accommodates up to 18 divers and its operational and diving crew. The vessel was operated by Aventuras Maritimas Okeanos (AMO), which was a franchisee of Aggressor Fleet Franchising Inc. Aggressor Fleet Ltd. was a company handling reservations for Aggressor Fleet Franchising Inc. and also marketed and advertised all of the franchised vessels/destinations worldwide.



Cocos Island is famed for its schools of thousands of hammerhead sharks and other species

At the outset of the trip, Randy Wright, an AMO divemaster and instructor, conducted a thorough dive briefing encompassing all matters regarding dive activities and procedures including instructions that all passenger divers would be required to observe and adhere to the diving buddy system. Prior to departing the *Okeanos Aggressor* on May 16th,

a site briefing was conducted on board by divemaster Wright. This previewed what to expect at Dos Amigos Pequeno including strong currents, marine life to be seen and their behavior, water entries and exits, personal safety equipment, etc. All guests attended the briefing. The divers then boarded a dive launch, commonly known in Costa Rica as a “panga”. A subsequent re-cap briefing was covered at the site prior to commencing the dive.

The dive was not a supervised or guided dive due to current activity and variances to entry times by the diver buddy teams. Divers were briefed to observe the procedures for independent buddy dives and to surface upon reaching a minimum air supply but not to exceed 55 minutes in run time.

The nine divers entered the water from the panga. Jim Smith, age 56, and other divers preceded Wright into the water and descended with no apparent difficulty or problems. Wright entered the water just before John Brown, age 56, and his dive buddy, daughter Jane Brown. He never saw either diver on the dive.

During the dive, Smith became separated from his buddy. Jane Brown entered the water just before her father, John Brown, and never made contact with him at all. She continued her dive in spite of losing contact with her father and later surfaced without incident after a 35-minute bottom time with other divers.

No other divers have any specific remembrances of Brown or Smith, saw no signs from them indicating distress or problems, and never saw them again. The seven divers and Wright all surfaced from their dives and were picked up by the panga driver. It is unknown what happened to Brown and Smith.

When they did not surface with the rest of the group, Wright and the panga driver initiated a search for approximately an hour within a two-mile radius of the site. No sign of the missing divers was found. The panga then returned to the *Okeanos Aggressor* and a wider search was initiated from that vessel after contacting the Costa Rican Coast Guard. Subsequently, the U. S. Coast Guard also joined the search that spanned several days including additional surface vessels and aircraft. The divers were never found.

INJURIES

John Brown and Jim Smith most likely never surfaced from the dive, went missing, and were later declared dead.

DISCUSSION

The circumstances that precipitated the disappearance of Brown and Smith are unknown and thusly subject to conjecture and speculation. However, the various issues brought forward in the plaintiffs’ complaint (and the opinions of their experts) failed to focus on the most probable causes of the men’s disappearance and the circumstances that most likely led to their deaths.

An overview is succinctly provided:

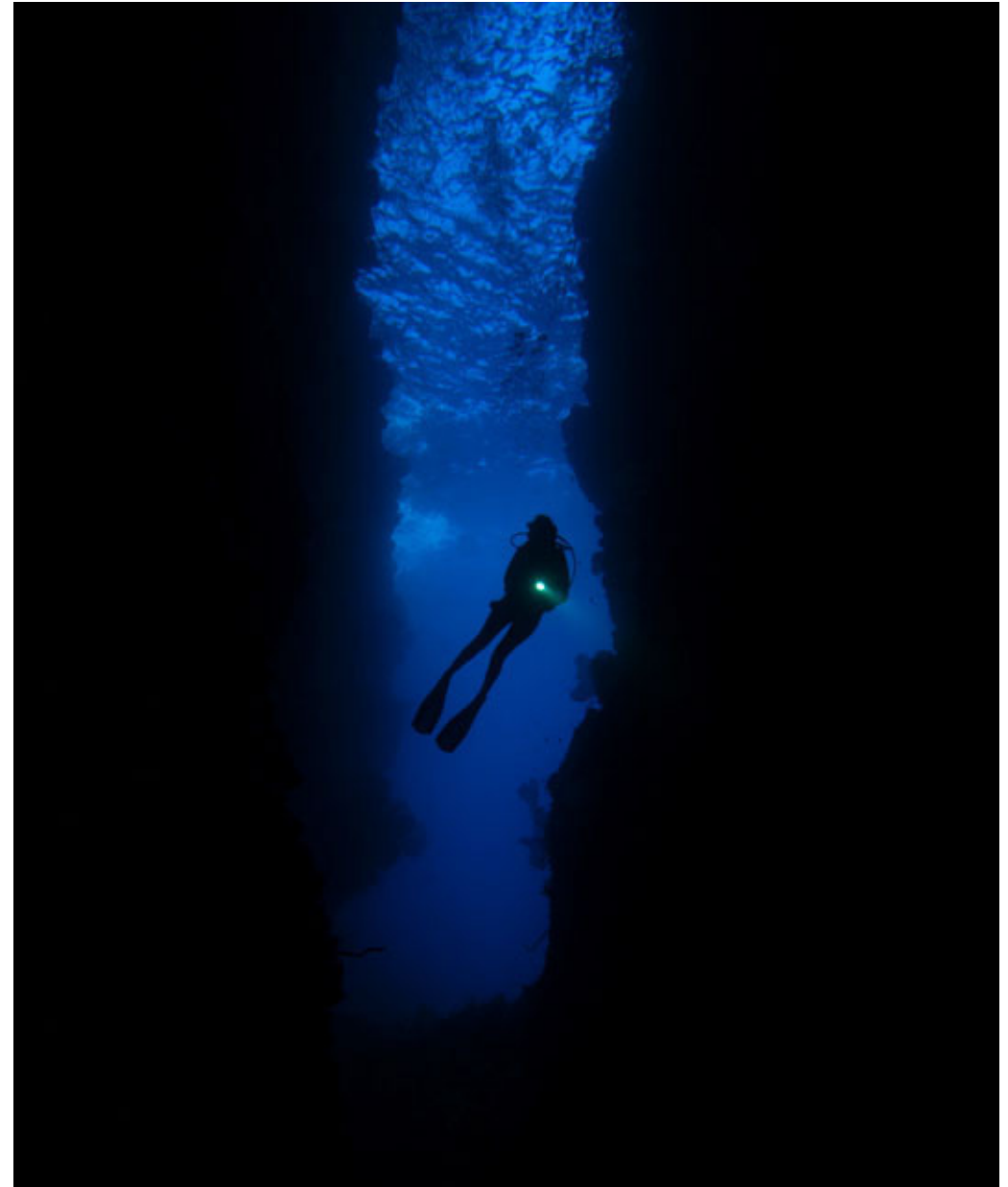
Both men were qualified experienced divers with hundreds of dives in various sites around the world. Both men had experience in current dives and with “live boating” procedures wherein a dive boat is not anchored or moored to a fixed position. They were aware in advance that Cocos Island had the potential to present challenging conditions by virtue of waves, currents, rain, and stormy weather conditions. Both were aware of the potential for marine life threats including attack by predator sharks in large numbers.

They were also aware of the fact that Cocos Island was located a substantial distance from the mainland and beyond any reasonable expectation of timely Costa Rican or other national search and rescue teams. Both men were aware that they could choose to not participate in any dives that they felt were beyond their level of expertise or comfort. Full and adequate briefings were performed by the *Okeanos* staff before each dive and the two men participated in those briefings.

Both were aware that the vessel's policy was that all divers would observe the accepted buddy system including returning to the surface if separated. Finally, each man clearly understood that their diving activities required them to exercise independent skills and problem solving since the dive activities were not directly supervised or led.

On the day of their disappearance, the dive was conducted at Dos Amigos Pequeno. Previously that morning, they had dived (without incident) the immediately adjacent site known as Dos Amigos Grande that is less than a hundred yards away and features nearly identical conditions. All divers that day were equipped with open circuit scuba systems and 80 cubic foot aluminum cylinders. Each wore a diver's buoyancy compensator device (BCD) that provided up to 50-60 pounds of buoyant lift via either low-pressure inflation from their scuba regulators or via oral mouthpiece. For the depths of the planned dive, the scuba system would have provided life support not exceeding one hour, or less.

There is no credible evidence that either man ever surfaced from the dive. Two pieces of equipment were located in the subsequent search: an empty scuba tank and a signaling device known as a "safety sausage."



Caves and tunnels are common on the pinnacles and surrounding smaller island sites

If the men surfaced, whether independently or together, such an act had to have happened within a window of not more than 60 minutes from the time of initial descent. Throughout that time frame, the panga driver was on-station helping other divers into and out of the water and observing the ocean surface for divers at all times. It is beyond credible belief that either man could have surfaced and failed to be detected by the panga driver, the other divers, or divemaster Wright. The men were equipped with “safety sausage” surface signaling devices that recent independent tests (*Scuba Diving* magazine, October 2007) have shown to be visible up to one mile. Both men had either a low-pressure sonic signaling device or a whistle. The same independent tests have shown these devices to be effective at up to one mile.

Only a handful of probable scenarios can be presented based on the known facts and the predictable behavior of the divers if they surfaced:

If the divers aborted the dive early due to comfort issues, equipment considerations, or failure to reach the bottom ledges due to current, it is overwhelmingly likely that they would have been seen by the panga driver or other occupants of the launch. Other divers *did* surface soon after beginning the dive and were seen and swiftly recovered. Both men had effective signaling devices to make their location known. As no one saw them surface within the first 55 minutes, it is highly unlikely that they did so.

If the divers had no difficulty on the dive and felt no imperative to ascend following separation from their buddies, then they would have been forced to surface within the 60-minute window of life support afforded by the volume capacity in their scuba tanks. Absent anything to breathe, it is obviously impossible to remain submerged. They would likely have surfaced within the immediate vicinity of

the pinnacle and been seen by all observers. However, *they were not* seen by the remaining seven guests and two professional crew... and this reinforces the conclusion that neither diver ever successfully completed the dive and surfaced.

Several facts support this conclusion. Divers adrift on the surface have every motivation to make themselves visible and detectable and will aggressively employ all methods in attracting attention to their location. In spite of safety sausages, sonic devices and whistles no one heard or saw them in spite of the fact that they would have surfaced within sight and sound ranges. It is inconceivable that either diver would intentionally jettison his tank or safety sausage. The empty tank had approximately six to eight pounds of positive buoyancy and was a contrasting color to the ocean making detection from a search vessel or aircraft more likely. The same logic applies to the safety sausage. Further, both men were equipped with large capacity BCDs capable of floating them indefinitely with no swimming effort. It is beyond credible belief that any person would deliberately abandon such a primary life-saving device. Finally, the prevailing current's set and drift would have tended to move the diver's on the surface directly toward the southwest corner of Cocos Island and then wrap around to the east. This would have placed them in calm protected water and only about a hundred yard from a sandy beach that they could easily have climbed out on. A thorough check of the island was done by the USCG team and no trace was found of either man on land.

The plaintiffs and their experts opined that the two men came to the surface and were simply not found by the liveboard's crew or by the Costa Rican Coast Guard and U. S. Coast Guard.

The subsequent exhaustive searches included an unprecedented effort



Thousands of schooling fish can actually reduce a diver's visibility at times

by the USCG that included surface ships, aircraft, helicopters, high speed search inflatable boats, searches of the island itself, sophisticated computer-modeling to predict current drift patterns, deployed current monitors by USCG search crews, and over four days of intensive search pattern grids spanning over 1200 square miles of area. With all these resources engaged, then their bodies would have undoubtedly been found eventually floating in their equipment. Again, this did not happen.

This leads to the inevitable and only logical conclusion: that both men did not surface at all due to some event that occurred underwater. The scenarios then can include an idiosyncratic medical or health event that incapacitated them such as heart attack, syncope, air embolism, or sudden drowning due to impact with the pinnacle, equipment failure that introduced water into the breathing system, etc. It is also possible that a marine life attack could have occurred. This site is known to be populated by several shark species known to attack man such as Silky, Galapagos, Bull, Tiger, Oceanic Whitetip, and other species.

OPINIONS & CONCLUSIONS

The plaintiffs' expert Walter "Butch" Hendrick offered a series of opinions that the various defendants are somehow at fault for the deaths of Brown and Smith. However, there was nothing in his CV or submitted life experience that suggested that he qualified as an expert in marine procedures, shipping, or professional diving in international expedition operations. He had never been to Cocos Island, never been aboard the vessel, never held a license to operate such a vessel, and never been involved in an open ocean search for missing divers. His opinions reflected his lack of expertise in these areas and drew him to completely incorrect assumptions and conclusions.

Mr. Hendrick also claimed that Wright was not properly taught "to

serve as a dive leader at Cocos Island” in spite of his three-month training curriculum at Hall’s Diving Institute, an approved Florida vocational school for professional diving training. The training that Wright received there would have qualified him to act as an instructor, divemaster or guide in any subsequent venue and Hall’s had trained hundreds of instructors that were placed in professional positions on liveaboards worldwide. (Wright also worked for two years aboard the *Cayman Aggressor* and for eight months prior to the accident aboard the *Okeanos Aggressor* in Costa Rica.) Hendrick also claimed that all divers should have been required to dive as one supervised group including using “down lines” from the drifting panga in spite of the presence of a two knot current that was rapidly pushing the dive launch toward the pinnacle and afforded no possibility to anchor at the site.

Neither Aggressor Fleet Franchising Inc. nor Aggressor Fleet Ltd. had direct involvement in the operation of the *Okeanos Aggressor* but they did provide a proper Operations Manual supplemented by periodic inspections and other training. If during those inspections any deficiencies were noted, they were communicated to the vessel’s owners and Aggressor Fleet Franchising Inc. and Aggressor Fleet Ltd. had every reasonable expectation that they would be remedied. The handful of recommendations and requirements on the “do list” had no bearing on either the way the diving operation was conducted or the subsequent search.

Aggressor Fleet Franchising Inc. had many franchises operating in most of the world’s top diving locations and enjoyed a record of successful professionalism for more than twenty years.

In my filed opinion, neither Aggressor Fleet Franchising Inc., Aggressor Fleet Ltd., Randy Wright, the vessel captain or crew did

anything wrong and met all applicable standards of care. My opinion concluded that, while regrettable, the deaths of Brown and Smith couldn’t be attributed to the actions or inactions of these defendants.

The above synopsis lays out the primary facts and opinions that I provided as part of the “discovery” process that preceded the trial. This requires both sides to disclose witnesses, opinions, and all evidence for review in advance.

The survivors of the two missing men filed a multi-million dollar claim against the various defendants named above. In spite of the fact that the accident occurred in Costa Rica, the trial venue was established as New Orleans since the Aggressor Fleet was headquartered in the state of Louisiana and the plaintiffs wanted a jury trial in the U.S.

The ground was now laid for an epic battle of legal drama. We’ll now get continue into the actual trial events, issues of liability contested, and the outcome.

THE TRIAL

Publisher’s Note: Bret Gilliam, who wrote this piece, was retained by the defendants, essentially the *Aggressor* fleet, as an expert witness. No one can match his credentials or credibility. For over 35 years he has held USCG Merchant Marine Master’s License. He has logged more than a thousand dives at Cocos Island, including 43 dives logged at the site of the tragedy, Dos Amigos Pequenos site; he had dived there just the week after the disappearance in more extreme conditions. In the last decade, he has certified more than 3000 divers and instructors, including scores at Cocos Island itself. He served as NAUI board chairman and founded TDI and SDI training agencies. He’s logged more than 18,000 dives and has been on virtually every top liveaboard in the world. That experience has led him to be hired

as an expert witness in more than 245 cases. He has never lost a case. He's somebody you'd want on your side.

* * * * *



Bret Gilliam prepares for a dive

I was retained in March of 2005 by the defense as an expert witness to offer opinions as a diving industry professional and licensed maritime master. I would also provide limited expert opinions about medical aspects including the effects of hypothermia and the likely period of survival to persons drifting at sea in water temperatures of approximately 82 degrees F. and in the existing sea conditions. By hiring one person who could qualify in multiple areas of expertise, it simplified the defense and could possibly lead to a judge's ruling that the plaintiffs' had to proceed with only one expert as well. Since there are few people with actual professional credentials and field experience in multiple roles, it proved to be a shrewd move for the defense.

The families (plaintiffs) of the two divers who disappeared filed wrongful death claims in Louisiana against various defendants including the vessel *Okeanos Aggressor*, Aggressor Fleet, Aggressor Fleet Franchising, AMO (the Costa Rican company owning the vessel), and the divemaster Randy Wright who was aboard the dive launch that took the divers to the site that morning, May 16, 2003. The plaintiffs alleged a litany of actions or failures by the vessel staff that contributed to, or caused, the deaths of the two men, Smith and Brown (the names have been changed for this article.)

The complaint affixed blame for the small dive launch not having direct contact by VHF radio to the mother ship anchored in a protected bay about six miles away. It also alleged that the ocean conditions were too rough, the current too strong, that no descent lines were used at the site, and that the nine divers should have been required to dive together at all times supervised by the divemaster. They argued that when divers surfaced at various times over the course of approximately 55 minutes -- but Smith and Brown did not -- that an improper search took place. They blamed all the defendants for the

divers' disappearance and alleged that the vessel's search procedures did not find them, causing Smith and Brown to drift away to a lingering death.

The Lloyds of London insurers had placed a \$15 million reserve on the case as a possible payout.

EXPERT WITNESSES

A tremendous amount of maneuvering by the lawyers on both sides occurred in the first phase as motions were filed trying to uphold waivers and releases signed by the deceased as the bases for case dismissal, motions as to venue and whether state or federal court would hear the case. During the discovery phase a seemingly endless lists of questions were formally exchanged. Witnesses were deposed to provide their version of events. Reports from Costa Rican and U. S. Coast Guard search teams were submitted and oceanographic "hind-casting" was done to establish actual conditions at the time of the dive. A variety of diving industry standards, procedures, training methodology and practice were introduced into evidence.

This process went on longer than it takes a diamond to form from a hunk of coal --it was nearly six years from the accident to trial, which finally began on April 6, 2009. Hurricanes forced trial postponements twice.

But eventually some real light began to emerge from the clouds of obscuring posturing. Expert witnesses are usually the most experienced professionals that the jury or judge will hear from. Based on their professional credentials and licenses, expertise, and experience in similar situations, it's their job to objectively evaluate the facts, allegations, witness statements, conditions, and conclude whether fault can be assigned to any party. A credible expert witness

with the ability to face a jury and explain his opinions under cross-examination by a hostile opposing lawyer is tossed into an "intellectual gladiator" pit of confrontation.

Walt "Butch" Hendrick was hired by the plaintiffs' as their expert witness. He was offered as an expert in diving, liveaboard operations, ocean search and rescue, maritime procedures, and general diving safety in places like Cocos Island, located nearly 400 miles offshore of the mainland of Costa Rica. In his written opinion and subsequent live deposition, Hendrick agreed with all the plaintiffs' allegations of fault and laid the blame for the men's deaths squarely on all the defendants.

Since the primary defense attorney had little experience in diving or shipping technicalities, I was asked to "script" the deposition questions that Hendrick would have to answer extemporaneously. I prepared a series of questions to determine his actual qualifications and have him explain his conclusions that the defendants were to blame for the divers' disappearance and subsequent deaths. Problems arose almost immediately for the plaintiffs at Hendrick's deposition.

Hendrick revealed that he had never held a captain's license larger than for a 15-ton vessel and that this license, which had expired 40 years ago, was restricted to only six passengers or less in the protected waters of Vieques Sound off Puerto Rico. He also could not answer questions about navigation, ship operation, safety regulations, rules of the road, etc. Finally, he admitted that he did not even know where Vieques Sound was located from Puerto Rico and that he did not even know what ocean Cocos Island was located in. (It's the Pacific, by the way.) He had never been a professional crew member on any liveaboard diving vessel, had never seen the 120-ft., 130 ton, 22 passenger vessel *Okeanos Aggressor*, had never been to Costa Rica,

and never dived at Cocos Island. He had never conducted an actual ocean search for a lost diver at sea. His primary career was in public safety team training for bodies lost in cars that went off roads and piers near protected waterways, people that drowned at the beach, or other “close to shore” searches for dead bodies, not live persons who might be adrift and employing signaling devices to make their location known.

He also initially claimed to have trained “thousands” of divers in the last decade but the records from his primary sport diving agency where he held an instructor rating revealed only two diving certifications issued by him... in the preceding ten years!

The site of the accident, Dos Amigos Pequeños, was a small pinnacle of rock that extended about 70 feet above the ocean surface and was swept by a 2-4 knot current. All dives were conducted from a small launch that dropped divers in buddy teams over the steep front slope. Hendrick insisted that the launch should have anchored, deployed both descent lines and “tag lines” for the whole group to hang on to before descending together with the divemaster. As any professional boat operator would have known, this was impossible due the current, the steep-sided pinnacle that offered no place to anchor, and that a drifting boat cannot be towing divers on a “tag line” around in a two-knot current.

THE DISAPPEARANCE

The divemaster had provided a thorough briefing as to site conditions including expected waves and current, the area to descend to at 75-100 feet and establish position to observe the schooling hammerheads that came into the cleaning stations there, The divers had to observe the “buddy system” since they would be dropped in pairs and no supervision was possible since the divemaster would be assisting

divers into their gear throughout the entry process and probably be one of the last to enter the water. The divers were also advised to abort the dive if separated from their buddy and return to the surface. They were also told to abort the dive if any circumstance made them uncomfortable with conditions. The launch remained on station the entire time and would immediately pick them up.



Bait ball in beginning stages

One diver did abort and was retrieved within minutes. Smith and Brown were not diving together. Each entered the water with his assigned buddy and each immediately became separated from his

buddy. Neither surfaced as instructed and they were never seen again by any person on the dive, including their buddies. All other divers completed the dive without incident, drifted to the lee side of the pinnacle, and were picked up.

When Smith and Brown did not surface, an immediate search was initiated in the area of the pinnacle and down current. Both divers were equipped with BCDs, whistles or low-pressure sonic alerts, high visibility safety sausages, and flashlights. The search was conducted according to established search protocols for over an hour and then the launch returned to the mother ship to refuel and enlist their assistance.

A nearly 2100-foot mountain was between the dive site and the ship's anchorage, so radio transmissions were blocked since VHF signals are "line of sight." Once in radio range again, the launch called ahead to activate the *Okeanos Aggressor's* emergency plan and the *Aggressor* got underway immediately. The second launch also joined the search and the three vessels looked for the missing divers until nearly 2:00 a.m., approximately 14 hours. At that point, they were ordered back to the primary anchorage by the Costa Rican Coast Guard and the primary search was taken over by the U. S. Coast Guard with aircraft, surface ships, small craft, helicopters, and computer generated current drift predictions from experts. The search continued more than three days and covered more than 1200 square miles. The only trace of the men found was a safety sausage and a single scuba tank not attached to a BCD. Smith reportedly had more than 500 logged dives while Brown had more than 200 dives including in areas with strong currents such as Palau, Cozumel, and the Red Sea. By any measure, they both were well-experienced divers who were specifically briefed on the *Aggressor's* buddy system policy that they would be diving independently, and both were well equipped with all necessary safety tools.

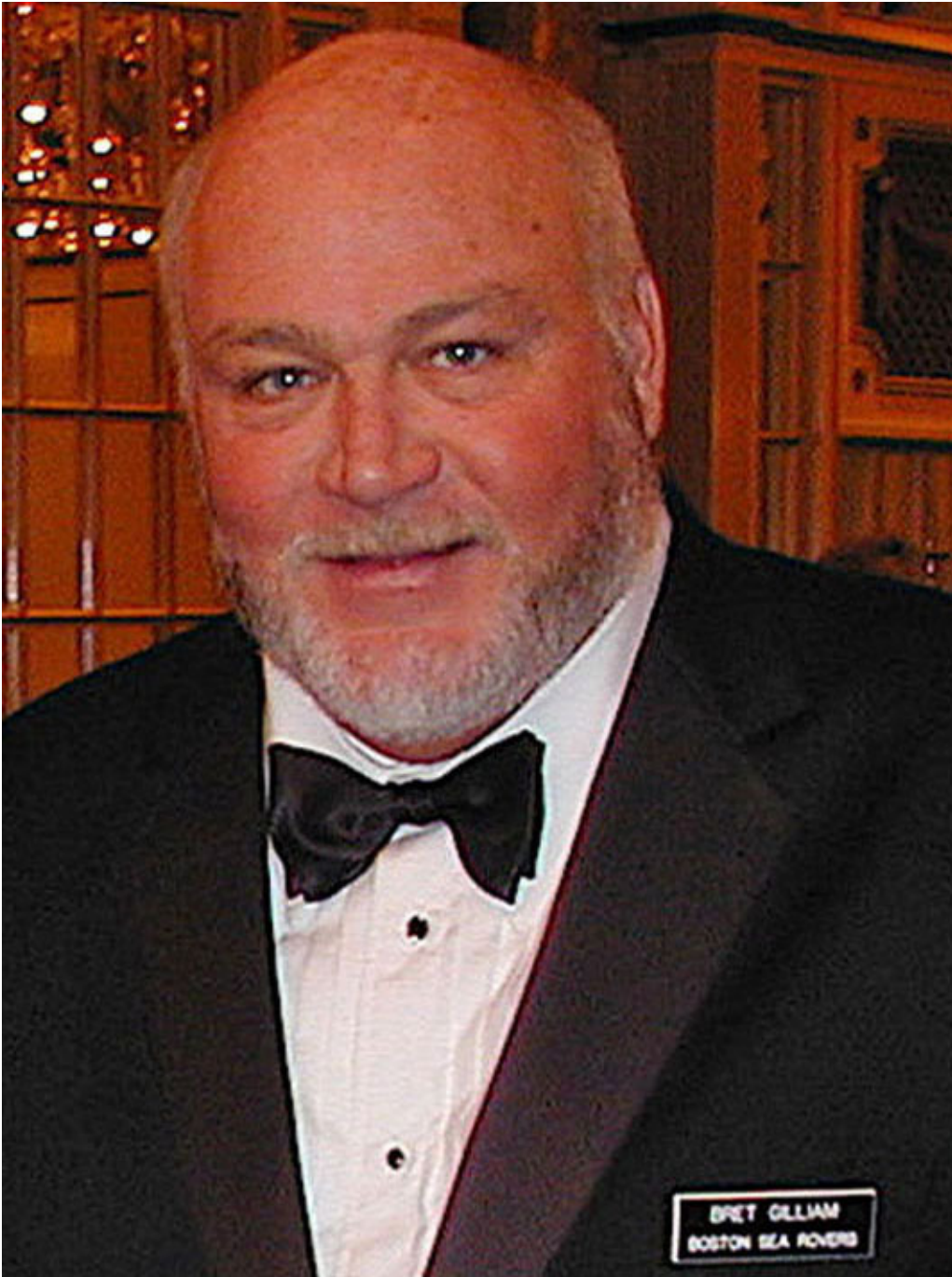
MY TESTIMONY

I had very different opinions from Hendrick about the allegations of fault. I explained that it was beyond credible belief that two men could have surfaced from the site and not been found with the safety equipment they had at their disposal. I also explained that experienced divers are routinely allowed to dive independently, and in fact, expect to be allowed to do so. Further, I cited the USCG's own analysis of the ocean and current conditions that day that reflected a 1.8-knot current and Sea State 3, only 3-4 foot waves. This was about as good as it gets at Cocos and certainly within the skill capabilities of the two divers. The prevailing current would have tended to carry the men to the southwest corner of Cocos Island. Even if they did nothing but drift, they would have ended up within a hundred yards of the protected beach and could have simply gone ashore where they would have been found.

The more likely scenario (as explained in the first part of this article) is that some unknown event took place underwater and that neither ever surfaced making it impossible to affix any blame to the *Aggressor's* crew or search a rescue efforts. This was further supported by the extraordinary and unprecedented search efforts by the USCG.

The fact that a safety sausage and unattached tank were found only reinforced my theory that these items became detached underwater since no diver would abandon his primary life support and rescue equipment deliberately.

Following Hendrick's deposition, the judge disqualified him as a maritime expert and restricted his opinions to a minimum of search procedures with which he had experience and let the jury decide if they were applicable to this site.



Bret Gilliam at public speaking conference

Before the trial began, the Smith plaintiffs made a confidential settlement and withdrew from the case. That left only the Brown plaintiffs and the two-week trial began on April 6th in New Orleans Federal Court. All divers on the launch on the day the two divers disappeared testified that the crew did provide full briefings and found no fault with the conduct of the divemaster or subsequent search effort.

I testified for nearly seven hours on the last day of the trial. At times, there were some heated exchanges between opposing counsel and me, but the jury of non-divers seemed to understand my explanations of how diving actually was conducted at Cocos. The next day closing arguments were made. I was the last witness they heard... sort of like batting last in the bottom of the final inning of the baseball game with the game on the line.

The next day, after deliberations that went until almost midnight, the jury came back with a complete “no fault, no monetary award” defense verdict. It was a complete victory after more than four years of grueling work and acrimonious exchanges between both sides.

THE BOTTOM LINE

This case had tremendous potential to affect how resorts and liveaboards allow divers to conduct themselves. Had the plaintiffs won their case, the verdict would have been pointed to as a possible precedent in which all divers, regardless of experience, would be relegated to the lowest common denominator theory that all dives will be conducted in accordance with the weakest and least experienced member of the dive team setting the bar for everyone.

It would have probably eliminated the practice of independent buddy teams (and forget about solo diving completely!), diving in currents,

in rough water, or from launches without deployed descent lines. In short, it would have essentially eliminated the diving practices that exist in Cocos Island, the Galapagos, Palau, Fiji, the Solomon Islands, Indonesia, PNG... just about anywhere that currents exist and boats can't anchor to deploy divers.

No one will ever know what happened to the two divers who disappeared in May of 2003. But the facts point to events that happened while underwater and conducting their dives independently. Diving is not a "safe" sport. It has hazards and divers are warned about the litany of things that can quickly turn against them including running out of air, decompression sickness, up and down current drafts, dangerous marine life, personal physical hazards as divers age, or simply panicking due to stress, holding your breath and suffering an embolism.

Whatever did happen, although tragic and distressing to both the families of the deceased and the other divers and crew present on the *Aggressor*, their disappearance was not the fault of the dive operation. A jury came to that conclusion based on common sense and an independent deliberative process based on the evidence presented and their perception of the credibility of the experts' testimony. The verdict supports the continued practice of letting experienced divers pursue exciting diving independently, using their own best judgment as to their skills and ability to participate.

For every diver, that's a personal call. It's your decision. Make an informed choice: be properly equipped, never overstate your experience, and abort a dive that you are not comfortable with. After all, it's your butt on the line and nobody can make that decision except you. Choose wisely.

Accelerating no-fly time: the final chapter

By Asser Salama



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In my “Accelerating no-fly time using surface oxygen” article featured in the first issue of Tech Diving Mag, I ran interviews with some of the world’s most experienced technical divers. Some of them mentioned that they do use surface oxygen to accelerate their no-fly obligation. Others didn’t quite like the idea. Research-related personnel have been contacted as well. They illustrated that some efforts were done in this field, yet the result was just a test of concept with very little empirical data (that is, no measures of subclinical stress).

I tried to calculate the no-fly time using both dual phase and dissolved gas models. The results, in comparison to DAN’s recommendations, were not hopeful. I then changed the approach so that the program loops to match DAN’s recommendation, or whatever the user inputs as his/her preferred no-fly time, and came up with a gradient factor. This gradient factor was then re-used to schedule a surface “dive” on oxygen and the no-fly time was calculated accordingly. The difference was the gain of using surface oxygen. Obviously this was a dissolved gas model approach. One “interesting” observation throughout the study was that having a “normal” air surface interval before breathing the rich mix seems to always enhance the no-fly time savings. This was what the models tested in the study indicate, not necessarily reality.

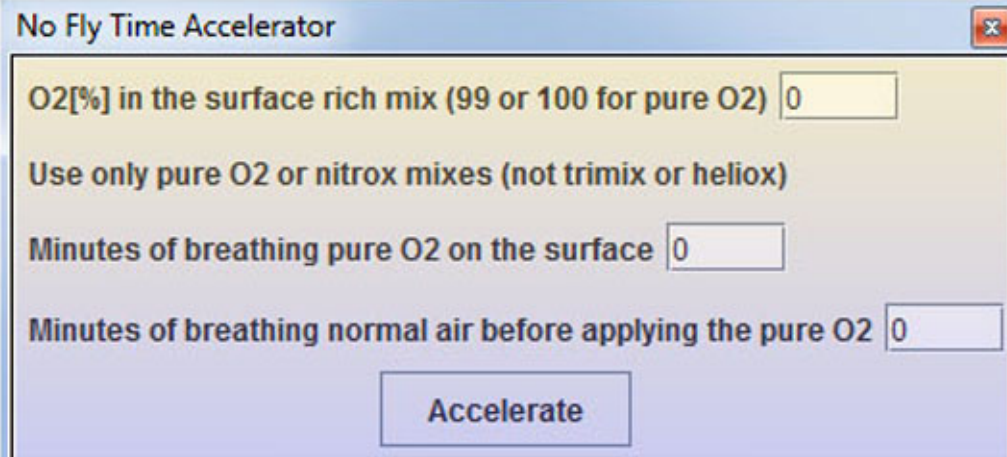
Yet another approach

I’ve been looking at the no-fly time as a mandatory deco stop. Now why not simply consider it as a surface interval? A surface interval we want to accelerate, regardless to its duration. This way the software program needs not to be fed with the no-fly time, neither to attempt at calculating it.

After any dive, we surface with some residual inert gas in our tissues. To plan for a second dive, any software planning tool will ask for the

surface interval. Software programs capable of planning repetitive dives must predict the inert gas loading (on-gassing/off-gassing) for each tissue compartment during this surface interval. The method used to predict the inert gas loading during surface intervals is the same for both dual phase and dissolved gas models.

Now the new approach I’m taking is to calculate the different tissue compartment gas loadings directly after the last dive, re-calculate them after a surface interval on a rich mix (rather than air) and finally loop back to see how much time would be needed to reach the same loading levels if the surface interval have been done on air. This way I don’t need to calculate or assume a no-fly time. I don’t need to assume a surface “dive” either. More importantly, the method of calculating the surface interval effect on tissue compartment gas loadings is not one of the controversial issues. If you plan repetitive dives using a software program, your planning tool is already using this method.



No Fly Time Accelerator

O2[%] in the surface rich mix (99 or 100 for pure O2) 0

Use only pure O2 or nitrox mixes (not trimix or heliox)

Minutes of breathing pure O2 on the surface 0

Minutes of breathing normal air before applying the pure O2 0

Accelerate

Results

Now let’s try a 55m (180ft) open circuit dive for 30 minutes. Descent rate is 20m/min (66ft/min), ascent rate is 10m/min (33ft/min) till

9m (30ft) depth then a slower ascent rate of 3m/min (10ft/min) is assumed. The decompression gasses are Nx32 at 39m (130ft) and Nx70 at 12m (40ft). Last deco stop is taken at 6m (20ft). Regarding the bottom mix, we'll try both air and Tx21/31 (END 30m – 100ft). First we'll try breathing pure oxygen on the surface for 60 minutes directly after the dive then we'll see the effect of having a "normal" surface interval before breathing oxygen. We'll try different levels of conservatism as well.

Air – 0% conservatism:

Total run time: 77 minutes.

No-fly time saving (breathing pure oxygen for 1 hour directly after surfacing): 20 minutes.

No-fly time saving (breathing pure oxygen for 1 hour 12 hours after surfacing): 80 minutes.

No-fly time saving (breathing pure oxygen for 1 hour 18 hours after surfacing): 158 minutes.

Air – 22% conservatism:

Total run time: 87 minutes.

No-fly time saving (breathing pure oxygen for 1 hour directly after surfacing): 20 minutes.

No-fly time saving (breathing pure oxygen for 1 hour 12 hours after surfacing): 80 minutes.

No-fly time saving (breathing pure oxygen for 1 hour 18 hours after surfacing): 158 minutes.

Air – 50% conservatism:

Total run time: 96 minutes.

No-fly time saving (breathing pure oxygen for 1 hour directly after surfacing): 20 minutes.

No-fly time saving (breathing pure oxygen for 1 hour 12 hours after

surfacing): 80 minutes.

No-fly time saving (breathing pure oxygen for 1 hour 18 hours after surfacing): 158 minutes.

Tx21/31 – 0% conservatism:

Total run time: 68 minutes.

No-fly time saving (breathing pure oxygen for 1 hour directly after surfacing): 23 minutes.

No-fly time saving (breathing pure oxygen for 1 hour 12 hours after surfacing): 89 minutes.

No-fly time saving (breathing pure oxygen for 1 hour 18 hours after surfacing): 182 minutes.

Tx21/31 – 22% conservatism:

Total run time: 74 minutes.

No-fly time saving (breathing pure oxygen for 1 hour directly after surfacing): 23 minutes.

No-fly time saving (breathing pure oxygen for 1 hour 12 hours after surfacing): 89 minutes.

No-fly time saving (breathing pure oxygen for 1 hour 18 hours after surfacing): 182 minutes.

Tx21/31 – 50% conservatism:

Total run time: 83 minutes.


No-fly time saving (breathing pure oxygen for 1 hour directly after surfacing): 23 minutes.

No-fly time saving (breathing pure oxygen for 1 hour 12 hours after surfacing): 89 minutes.


No-fly time saving (breathing pure oxygen for 1 hour 18 hours after surfacing): 182 minutes.

Configuration

Units
 Depth ☒ Meters ☐ Ft. SAC (RMV) ☒ Liters ☐ Cubic ft.

VPM-B/U and Buhlmann-GF/U
 Symmetry [%] ☒ 100 ☐ 95 ☐ 88 ☐ 78 ☐ 67 

VPM-B conservatism [%] ☒ 0 ☐ 5 ☐ 12 ☐ 22 ☐ 35 ☐ 50

VPM-B tissue compartment set ☒ Dec-12 ☐ ZHL-16 

Buhlmann's model ☒ ZHL-16B ☐ ZHL-16C

Buhlmann's gradient factors Lo [%] Hi [%]

Descent rate m/min

Ascent rate - deep part m/min

Ascent rate - shallow part m/min starting at m

Deco step size m

Bottom SAC (RMV) ltr/min

Deco SAC (RMV) ltr/min

Minimum gas switch stop time (extended stops) min

☒ Last stop at double deco step size

☒ ICD warnings for dives deeper than m

☐ O2 narcotic in END calculations

CCR set points ☒ Atm ☐ Bar

Asymmetric gas kinetics

In my "Asymmetric gas kinetics and conservatism" article featured in the third issue of Tech Diving Mag, I've explored the possibility of implementing the asymmetry concept in VPM-B to allow using two dimensions of conservatism with multiple levels each. This new variation, which I call VPM-B/U, is particularly helpful when longer and/or deeper dives are considered. Now let's see its effect on the no-fly time savings.

Air – 0% conservatism – 88% symmetry:

Total run time: 84 minutes (was 77).

No-fly time saving (breathing pure oxygen for 1 hour directly after surfacing): 19 minutes (was 20).

No-fly time saving (breathing pure oxygen for 1 hour 12 hours after surfacing): 67 minutes (was 80).

No-fly time saving (breathing pure oxygen for 1 hour 18 hours after surfacing): 120 minutes (was 158).

Tx21/31 – 0% conservatism – 88% symmetry:

Total run time: 73 minutes (was 68).

No-fly time saving (breathing pure oxygen for 1 hour directly after surfacing): 22 minutes (was 23).

No-fly time saving (breathing pure oxygen for 1 hour 12 hours after surfacing): 74 minutes (was 89).

No-fly time saving (breathing pure oxygen for 1 hour 18 hours after surfacing): 136 minutes (was 182).

Air – 0% conservatism – 67% symmetry:

Total run time: 100 minutes.

No-fly time saving (breathing pure oxygen for 1 hour directly after surfacing): 17 minutes.

No-fly time saving (breathing pure oxygen for 1 hour 12 hours after surfacing): 49 minutes.

No-fly time saving (breathing pure oxygen for 1 hour 18 hours after surfacing): 76 minutes.

Tx21/31 – 0% conservatism – 67% symmetry:

Total run time: 85 minutes.

No-fly time saving (breathing pure oxygen for 1 hour directly after surfacing): 22 minutes.

No-fly time saving (breathing pure oxygen for 1 hour 12 hours after surfacing): 54 minutes.

No-fly time saving (breathing pure oxygen for 1 hour 18 hours after surfacing): 84 minutes.

Compartment halftimes

In my “Golden compartments” article featured in the second issue of Tech Diving Mag, I concluded that the number of tissue compartments and their distribution over a particular range do not seem to make a tangible difference to the decompression profiles generated by VPM-B algorithm. Now let’s see their effect on the no-fly time savings.

The no-fly gains illustrated above were the result of using a special set of halftimes I call Dec-12 with slower compartments (up to 995 minutes for nitrogen). On using the very popular ZHL-16 compartment halftimes rather than my Dec-12 specially calibrated set, we got:

Air – 0% conservatism:

Total run time: 78 minutes (was 77).

No-fly time saving (breathing pure oxygen for 1 hour directly after surfacing): 20 minutes (same).

No-fly time saving (breathing pure oxygen for 1 hour 12 hours after surfacing): 172 minutes (was 80).

No-fly time saving (breathing pure oxygen for 1 hour 18 hours after surfacing): 601 minutes (was 158).

Tx21/31 – 0% conservatism:

Total run time: 68 minutes (same).

No-fly time saving (breathing pure oxygen for 1 hour directly after surfacing): 23 minutes (same).

No-fly time saving (breathing pure oxygen for 1 hour 12 hours after surfacing): 218 minutes (was 89).

No-fly time saving (breathing pure oxygen for 1 hour 18 hours after surfacing): 1407 minutes (was 182).

Conclusion

The results indicate that, for this range of dives, the no-fly time savings are slightly higher when using trimix as a bottom mix rather than air. VPM-B conservatism (based on the initial critical radii) seems to have no significant effect on these savings. However, asymmetry could be used as a conservatism parameter when calculating them.

Moreover, the results further confirm the “interesting” observation from the previous study; having a “normal” air surface interval before breathing the rich mix seems to always enhance the no-fly time saving. This observation is at odds with the current understanding of off-gassing gradients. That’s why it is very important to keep in mind the fact that models are predictions of complex physical/physiological systems, not proof or “truth”.

Finally, although the number of tissue compartments and their distribution over a particular range do not seem to make a tangible difference to the decompression profiles generated by VPM-B algorithm, they do have a significant effect on the no-fly time saving. Halftime sets with slower compartments seem to result in more conservative no-fly time gains.

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Making the case for support divers

By Steve Lewis



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During the period of time that has passed since a few brave souls admitted publicly – on the fledgling internet and in print – that recreational divers are capable of venturing below 40 metres (130 feet), and that staged decompression dives breathing something other than compressed air are not only possible but enjoyable, the scope of recreational diving has broadened exponentially. A few years back, you could count on the fingers of one hand the number of recreational divers who were capable of, trained for, and armed with the equipment to dive beyond the 300-foot threshold successfully.

While not perhaps fully mainstream, a dive to 100 metres (330 feet; a little beyond that theoretical threshold) is hardly noteworthy today; and indeed the agency I teach for has courses on its curriculum allowing us to take student divers to that depth. Even a superficial scan of the blogosphere and various online diving forums will turn up news of dive teams pulling off stunts every weekend, which a decade ago would have been candidates for the feature article in National Geographic.

Oh yes, the scene has changed – which is fantastic, inspiring even – but isn't there something missing?

I do not hear much about support divers these days. Have they gone out of favor? Have our kit, our expertise, and our skills become so reliable that in-water support has become passé? I do not believe so.

I recently surveyed approximately 900 divers from around the world. The “study” was unscientific, self-administered and probably totally biased; however, the majority of folks who responded expressed an interest in learning more about how to use support divers in their own dive adventures, and more than half of them mentioned interest in getting trained as a support diver. This indicates perhaps that the

absence of support divers and their limited use in technical diving is more predicated on lack of knowledge and awareness rather than apathy and lack of interest. Based on diver feedback, support divers seem to have the potential as a workable option on some of our more complicated dives.

For the record, some of my most enjoyable dives have been when playing the role of support diver, and certainly some of my notable dives have been rendered way more enjoyable by the presence of a couple of good friends as support divers. Truly, the logistics of putting a support team in the water at the right time to be of use can be a challenge; but the benefits far out-weigh the costs.

SO THAT'S WHAT YOU MEAN BY SUPPORT DIVERS

In the context of general recreational diving, a support diver is someone who rendezvous with a dive team which is on its way back to the surface after conducting a “push” dive. The rendezvous is normally made at some critical point during the push team's ascent, and support divers usually work in pairs.

I am sure most of you can all imagine a scenario to explain the role of a support diver. For instance, a 20 minute dive to 120 metres (390 feet or so) would earn open-circuit divers about a two and three-quarter hour ascent time using volumes and flavors of gases that it would be difficult for them to carry themselves. Support divers would be able to help by carrying contingency gas and perhaps additional mixes that would optimize decompression.

Support divers also supply push divers with reassurance – and perhaps physical aid as well as physiological aid – when the push has been particularly tough.

Ultimate Planner 1.0 by Asser Salama.

Warning: This software is intended for demonstration purpose only. The author accepts absolutely no responsibility for the schedules generated by this software. Use it at your own risk.

Buhlmann-GF/U: ON - Symmetry: 95%

Model: ZHL-16B

GF Low: 30% - GF High: 85%

Altitude: 0.0m

Leading compartment enters the decompression zone at 103.4m

Run time includes the ascent time required to reach the stop depth

Depth	Seg. Time	Run Time	Mix	ppO2
60.0m	0.0	(3)	Tx20/25	0.20 - 1.40
120.0m	14.0	(20)	Tx10/60	1.40 - 1.30
78.0m	1.0	(25)	Tx10/60	1.30 - 0.88
75.0m	1.0	(26)	Tx10/60	0.88 - 0.85
72.0m	1.0	(27)	Tx10/60	0.85 - 0.82
69.0m	1.0	(28)	Tx20/25	0.82 - 1.58
66.0m	1.0	(29)	Tx20/25	1.58 - 1.52
63.0m	1.0	(30)	Tx20/25	1.52 - 1.46
60.0m	1.0	(31)	Tx20/25	1.46 - 1.40
57.0m	1.0	(32)	Tx20/25	1.40 - 1.34
54.0m	1.0	(33)	Tx20/25	1.34 - 1.28
51.0m	1.0	(34)	Tx20/25	1.28 - 1.22
48.0m	1.0	(35)	Tx20/25	1.22 - 1.16
45.0m	1.0	(36)	Tx20/25	1.16 - 1.10
42.0m	1.0	(37)	Tx20/25	1.10 - 1.04
39.0m	2.0	(39)	Tx20/25	1.04 - 0.98
36.0m	2.0	(41)	Tx20/25	0.98 - 0.92
33.0m	3.0	(44)	Tx20/25	0.92 - 0.86
30.0m	3.0	(47)	Nx40	0.86 - 1.60
27.0m	3.0	(50)	Nx40	1.60 - 1.48
24.0m	4.0	(54)	Nx40	1.48 - 1.36
21.0m	6.0	(60)	Nx40	1.36 - 1.24
18.0m	6.0	(66)	Nx40	1.24 - 1.12
15.0m	10.0	(76)	Nx40	1.12 - 1.00
12.0m	13.0	(89)	Nx40	1.00 - 0.88
9.0m	16.0	(105)	Nx80	0.88 - 1.52
6.0m	79.0	(184)	Nx80	1.52 - 1.28

A 20 minute dive to 120 metres (394 feet) would earn open-circuit divers about a two and three-quarter hour ascent time using different gases

WHEN AND WHY

When and how support divers are used is entirely up to the divers involved. There are no set depth limits, no specific length of dive that automatically call for support divers to be part of the dive team. In my experience, there are two general indicators for their use: when the push team members are diving at or near the limits of their comfort zone, or when the push team is close to the limits of the equipment package called for by their dive.

The example of a dive to 120 metres (394 feet) is a good illustration, but there is nothing wrong or “wimpy” planning the use of support divers on much shallower dives, and on dives that are relatively simple logistically.

Every technical diver has – or should have – a sense of the operational limits of her kit and her experience. The depth and duration of the actual dive representing these limits is going to vary wildly from diver to diver and dive site to dive site. But these limits exist and a dive that approaches these limits is a very good candidate for employing the services of a support team.

SOME GENERAL RULES

The fine print on the support diver guidelines will vary depending on environment, gear used, dive goals, the number of people in the water, and a long list of other factors; but there are some general tenets that are common in the vast majority of cases.

Support Divers should:

Work with a buddy.

Be assigned a specific push diver as their responsibility.

Be given authority and responsibility to control the push diver's ascent (following preset behaviors) and be knowledgeable enough to make appropriate modifications according to push diver input, environment, and other internal and external factors.

Be capable divers with experience diving deeper and longer than their planned exposure as a support team member. (In a perfect world, support divers should be capable of doing the push dive.)

Have experience / familiarity with the gear they will be wearing as a support diver. (For example, if asked to carry four or five stages, they should have prior experience doing so.)

Have experience / familiarity with the gear the push divers will be wearing.

Need to be familiar with and understand the diving style of the members of the push and support teams.

Be a team player.

Plan dives with the minimum of decompression obligation possible, which essentially means they have helped develop and are able to follow a tight ascent schedule.

Be prepared to make in-water assessments, determine best options, and follow through.

Once they have made contact with the push team, be prepared to stay with them until they surface or until they hand over the push team to fresh support divers.

Have superior leadership skills and in-water control.

Most of the technical divers I know will use in-water support at some point in their diving. For most, that support will come from our dive buddy. But as the boundaries of technical diving are pushed outwards, the magnitude of support needed can easily exceed the capabilities of that buddy. I honestly believe that one simple answer is to develop the skills to train, drill, and deploy support divers. It just makes sense.



Steve Lewis is an accomplished diver and instructor-rainer. He has written several textbooks, articles on technical diving and maintains a blog. His latest book was released in February (The Six Skills and Other Discussions), and is about to go into its second printing. He is currently working on what he calls "a squinty-eyed sequel" which will be about expedition and support diving. He can be contacted through his website: www.techdivertraining.org.

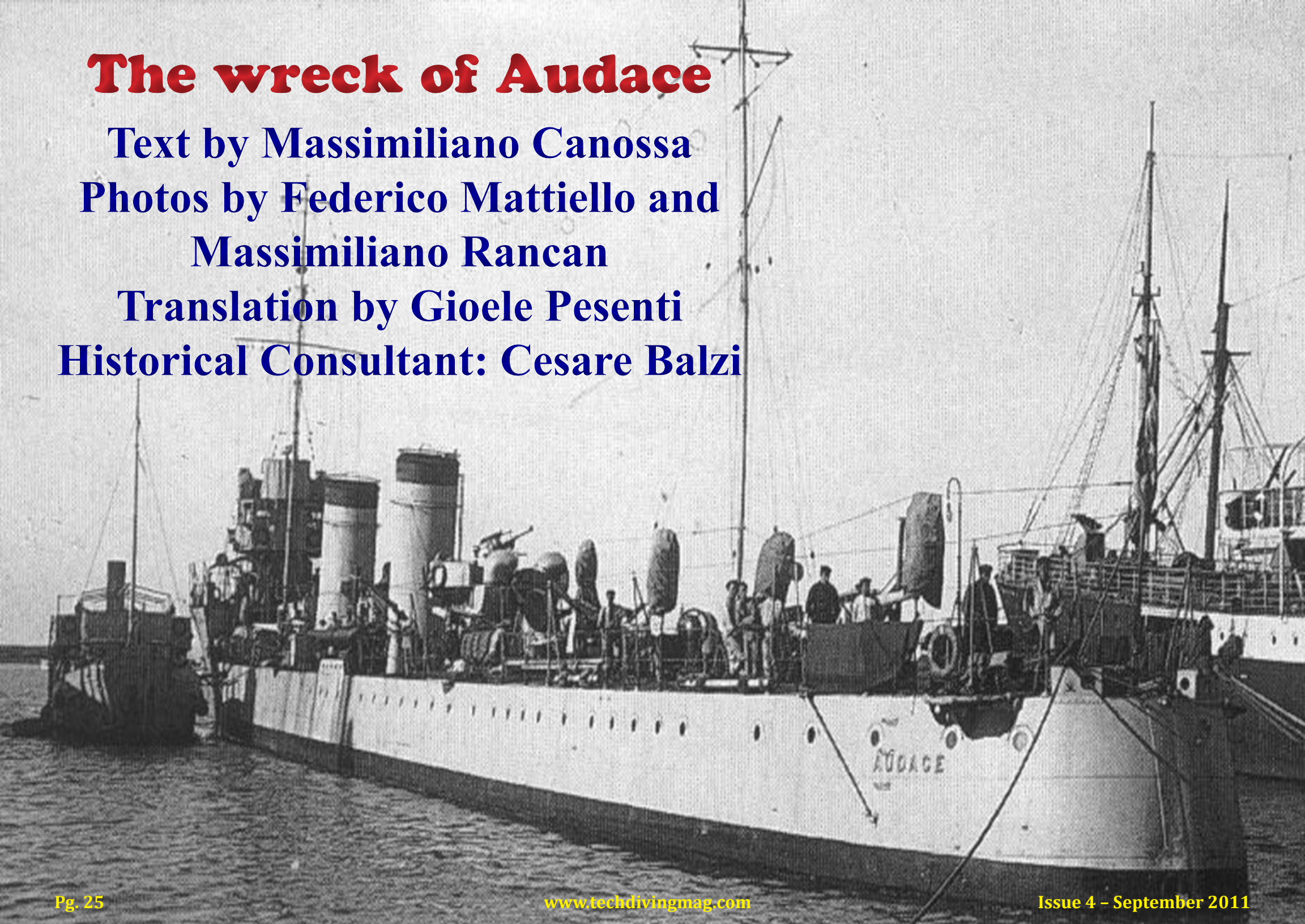
The wreck of Audace

Text by Massimiliano Canossa

**Photos by Federico Mattiello and
Massimiliano Rancan**

Translation by Gioele Pesenti

Historical Consultant: Cesare Balzi



The Audace was captured in Venice by the Germans in September 1943 and renamed TA20. She sank near the north of Zara on the first of November in a battle against the British units. She was found during an exploration mission carried out by NMDT, where many images have been shot and important information have been gathered.

Groundwork

It was August 1999 when, for the first time, I read an article written by Pietro Spirito on “Il piccolo” of Trieste. The article was talking about the discovery of a wreck done from a group of local divers. She was the torpedo boat Audace. I kept the page carefully with the intent to go deeper in the story of this ship.

Ten years later in 2008 during the Adriatic Exploration project, I was in Croatia to explore some wrecks. The target was the Austro-Hungarian steamships Albanian and Euterpe, both off the Pag island. A local fisherman informed me that there's a German wreck called TA20 sitting at a depth of 80 meters (262 feet). The wreck is not famous and the diving spot is not visited by local diving centre. We still had a couple of days to spend so we started to search for the TA20 without success.

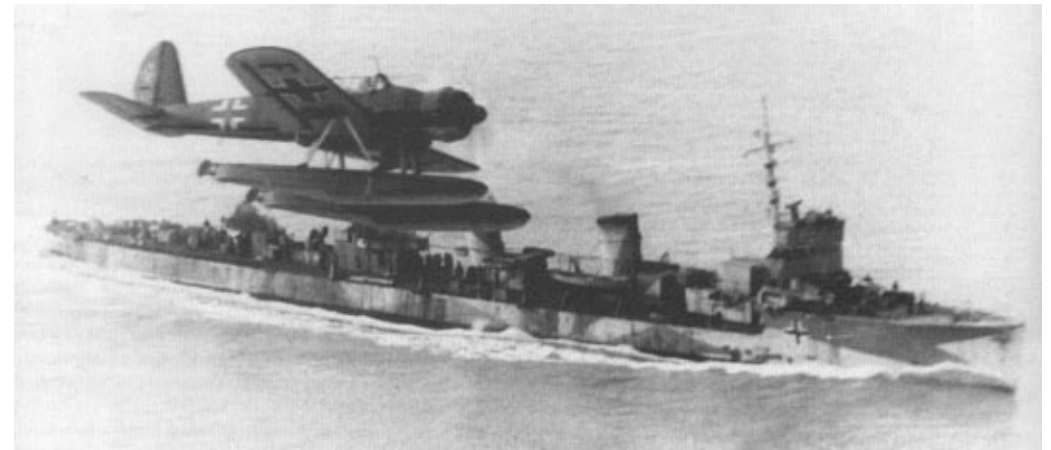
On the second day, the echo-sounder showed something. We tried to go down to check it out, but at the bottom the conditions were very bad: poor visibility and strong currents. We saw a wreck crust over, armed and laying on the left side. She's the TA20! We took a few snaps and after ten minutes we decided to ascent. The weather conditions were not so good so we returned back to Italy with a bad taste in our mouth.

I started immediately a historical research that led me to realizing that the TA20 is simply the Italian torpedo boat Audace. The article

of Petro Spirito ten years before confirms my results. There's no underwater image for this wreck, I informed the NMDT guys and in a few days we had a team of 8 divers ready for this new adventure.

History

Audace's history is second to none. During WWI, the Japanese Navy ordered ships from foreign countries to get new technologies. One order issued to the shipyard Yarrow in Glasgow (UK) was two torpedo boats called Kawakaze and Urakaze. The construction was delayed due to problems with the furniture of the propeller (made in Germany). Also the shipyard's first priority was the British ships.



Aerial view of the ship with an Arado 196 at the top foreground

In 1916 the Regia Marina did not have enough torpedo boats, so it took the project of Japanese Navy over. Kawakaze was renamed to “Intrepido”. On August 30th of 1916, torpedo boat Audace sank and the Intrepido taken the name of Audace.

This new ship was completely different from all the other ships under service of Regia Marina, both as dimensions and as features. At a total cost of 4,600,000 Italian Lira, it was very fast (about 30 knots)

with 898 tons of displacement, 90 meters (295 feet) of steel hull and 19 water tight bulkhead, 12 of them extended to upper deck. She was equipped with two mine sweeper C kind, 8 bombs and one tow-torpedo called “Ginocchio” fixed on the stern of the ship. She was a very competent battle ship with a large cruising range and a good nautical quality.

On June 9, 1917 Audace was in Naples getting armed. In March of the next year she was in Brindisi with the navigation convoy submarines H1 and H2 (from Canada). She was operative in the Adriatic Sea during WWI. Her most important activities were done in November 1918. In fact she was the first ship to land in Trieste on the 3rd of November 1918. On the 7th she was in Zara with the Italian Army delivering food for civil. On November 10th she landed in Trieste with King Vittorio Emanuele III onboard and the field marshals Armando Diaz and Pietro Badoglio. The quay she landed on is still called the Audace quay.

In Seberica on the 23rd of December 1918, the unit rescued the British steamship queen Elizabeth, which was damaged from a mine in the area of Punta Maestra. From 1919 to 1921 the Audance was operative in the north Adriatic. In 1923 she serviced in Tripoli, and in August of the same year she was employed for a secret mission with a crew of the allied forces onboard.

In 1928 Audace came back to Taranto and as flagship, she was used for training courses in Greece area. During the civil war in Spain Audace made some offensive action. From 1940 to 1943 Audace was assigned as school ship in Pola. During this time she was also used as anti-submarine and escort ship, especially in 1942.

At the time of armistice promulgation, Audace was in Trieste and

leaved to Venice. She should have moved then to south Italy, but it had to go back because of an engine failure. During the German occupation of Venice, she was captured and renamed TA20.

The expedition

Departure was due on the first week of July. Meanwhile I try to understand the actual wreck condition. With no underwater images on the web, I’m yet more worried. Also because I know that in this area there’s big trawling activity, the visibility is very poor, close to zero I would say.



Expedition boat

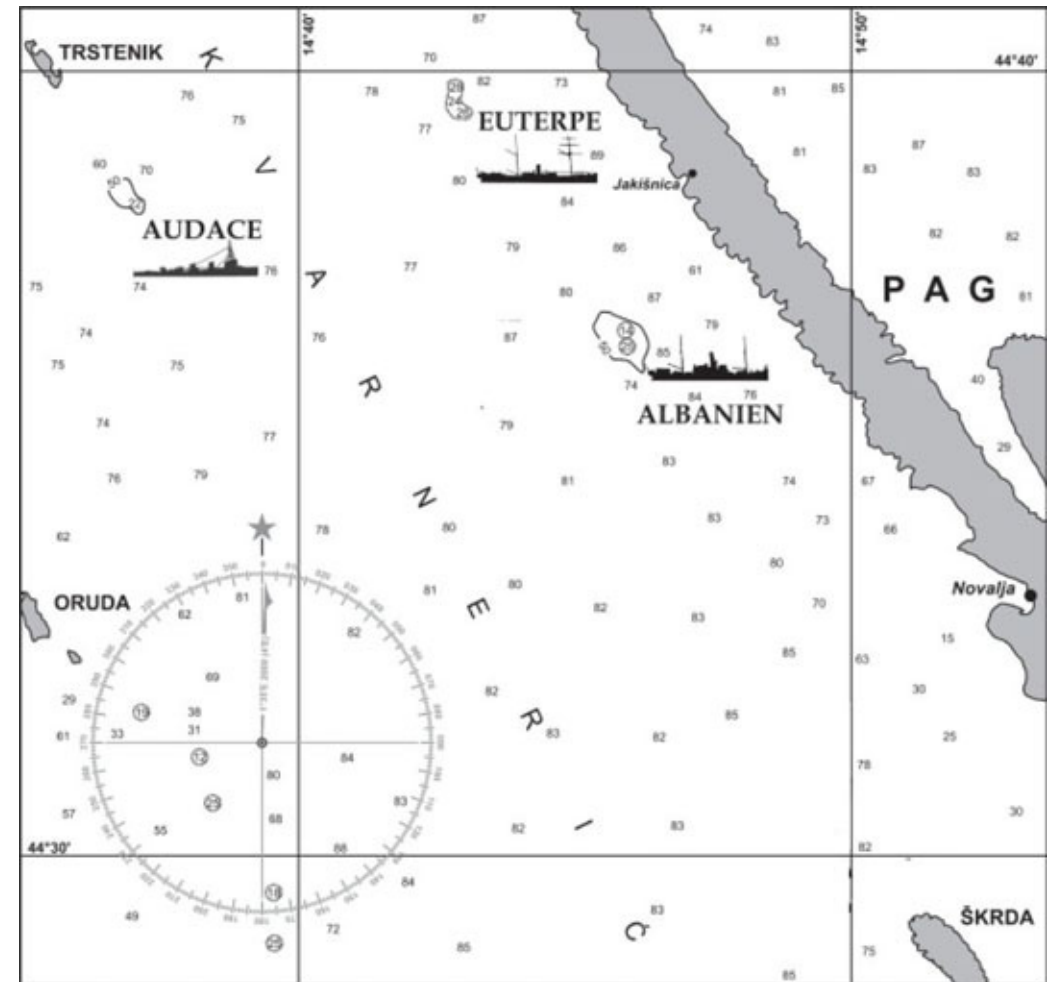
The team is composed of three photographers, two video-operators, two security divers and I. Our base will be Rab island. There’s a good

diving centre there. We left Italy with 15 50 liter cylinders charged with helium and oxygen, since it's hard to get gases on the island. The divers are equipped with 18 liter twin-cylinders and 3 deco bottles each. As a team we decided to bring also our deco station, which will be big enough for all the divers in case of emergency. Composed of 3 bars and 4 poly-form bags, it can recover 8 divers simultaneously. Nitrox and oxygen bottles at 21 and 6 meters (70 and 20 feet) can be placed as well.

June 28th we're in Kompar, a little fishermen hamlet on Rab island. The rest of the day is used to set the equipment and dive planning. The day after we will dive only two dives. Our task is to locate the wreck point, mark it with a buoy and get as much information on the dive condition (current, visibility, wreck state, nets etc...). The boat we used for the expedition was very conformable. We can arrange all our stuff nicely. After few hours of sailing we're at the alleged dive spot. The fish finder shows 80 meter (262 foot) depth.

We drop a dead weight with the hope to hitting the wreck. Federico and I were the divers. The current was strong and the visibility is less than 2 meters (6.5 feet). The dive mix is trimix 15/55 and the deco mixes are nitrox 50, O2 and trimix 20/30 used for ascent from 57 meters (190 feet). We were not lucky, though. The dead weight landed on the muddy bottom, so we knotted the reel line to main string and search started. After ten minute I seemed to see a dark shape. I contacted Federico and with a large grin on his face, I realize he has seen it. The plan was to lift a yellow buoy if everything was fine, but the conditions were very bad so I decided not to lift anything. We used the rest of the bottom time to bring and tie the dead weight to the wreck. I saw a big cannon (102 mm) so I lined also from it to the ship's stern. Federico placed some direction marker for return and next dives then we started our ascent. Before leaving the water

we fixed a big buoy at 5 meter (16.5 foot) depth and another little one on the water's surface, hoping for better weather conditions over the next days.



Wreck position on the map

Torpedoboote TA20

TA stands for Torpedoboote Ausland, which means foreign torpedo. TA was then followed by an ID number to identify the ship. All these ships, whether big or small, destroyer or torpedo boat, were captured

by the Germans during war and incorporated in Kriesgarine. Most of them came from the Regia Marina captured after the armistice of the 8th of September 1943 and used in the Adriatic Sea. The Audace was renamed to TA20. She was used as a coverage ship and as a minelayer. She performed some missions until the end of 1944 against the Yugoslavian partisans, flanked with Niobe (ex Dalmazia) and torpedo boat TA21 Wildfang (ex Insidioso) and TA22 (ex Giuseppe Missori).

On October 26th 1943 the Italian partisans informed the British commander Morgan Gilles of Royal Navy about some German dispatch moving from Zara to Rab island transporting troops. On the 1st of November 1944 two British destroyers Hunt class, HMS Wheatland and HMS Avon Vale, were patrolling the area off Losjini, when they received the information of enemy presence. At 19:50 two big ships, sub-hunters UJ 202 (ex Melpomene) and UJ 208 (ex Spilgarda) sailed to the south. The British destroyers stopped the patrol action and targeted the German convoy. After 20 minutes the German ships were within the range and the British opened fire from 3,600 meter (11,800 foot) distance. The Germans answered back but in less than 10 minutes they were seriously damaged.

When the first corvette sank, the Avon started to rescue the German sailors still alive. Suddenly the TA20 appeared on the battle field opening fire against the British ship, which quickly answered back. The TA20 crew understood their badness so decided to retreat, but after only a few minutes of fighting, she was seriously damaged and sank.

Last hour of TA20

The information hereunder has been provided by Mr. Michael Brezze, whose father was on the TA20 as chief engineer.

“At the time of the attack my father was in the engine room, so he could not see what was happening. But he realized that shots hit the main deck first killing all commanders and officers. The second blast hit the engine room and hurt my father seriously. After sinking the Britannic picked up 71 survivors and the day after the Germans picked up another 20. The last operation of the TA20 before sinking was an action against a liquor factory in Seberico and Zara.”

The dive

On the second day the conditions and weather were perfect. The deco station was installed correctly by Luca, Leonardo and Nicola. Massimiliano, Federico and Livio wore the equipment and started the dive. Maurizio and I jumped in after the first group.



Installing the deco station

At the beginning the conditions seemed good; good visibility but after 40 meters (130 feet), water started to get turbid. We arrived on the wreck and I started filming. I saw the cannon of 102 mm lined the day before and moved out to the starboard. Arms are still in position and completely rusted, including six 20 mm cannons.

We descent to the propeller in poor visibility (about 5 meters – 16.5 feet). The idea of a free ascent in this visibility and current made me pensive. With this strong current the boat will have serious problems to onboard us, I thought. I checked the bottom time and my buddy... it's time to go. On the ascent I tried to count and identify the lateral army to confirm our "dry" research. We arrived at the ascent rope, and that's when I decided to go for a quick exploration on the forward area. There's only one point to go inside: the sub construction on the main deck. It's fantastic that I could see the basement of the compass. Maurizio pointed me that time was over, so we started our ascent.

During decompression we met the other team, which was engaged on exploring the bow area. At the harbor a hard job of boat unloading and gas refilling was waiting us. I arrived in my room exhausted but happy to be among the first who document the Audace wreck. The day after ran quickly and photographer collected good pictures. The night before the last day I noted in Livio's video a couple of slides probably used to place mines or depth bombs. We planned a dive aiming at documenting this device that is not mentioned in available books or documents. We came up with a 35 minute bottom time dive. Although we were on the limit of safety with the gas supply, it was necessary to find the ordinances and document them. My job in this last dive was to find details and evidence to help reconstruct that tragic event, since the gash that caused the sinking is still missing.

I patrolled the entire starboard from bow to stern, but nothing I could

find. There's a little hole found by Leonardo but it's too little to sink a torpedo boat like this. We concluded that the ship has been hit on her left side that now lies on the muddy bottom. Luckily the other team escorted by Massimiliano and Federico snapped the depth bombs. They almost cover the bottom. These bombs were lowered in to the sea with the stern slides and a timer was fitted to take them to the required depth.



Compass basement of the main deck

Nicola's team was waiting me at the ascent rope. This team is in charge of releasing it. The Audace went off-sight quickly below us. Her shape first became a shadow then just an illusion in the blue. This image made me think about all the sailors who passed away and probably many of them are still trapped inside the Audace. On the other hand, we were glad because of the good job we've done. It was time to celebrate.









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- Rivista “Storia Militare” n. 36

NAUTICA MARE DIVE TEAM

Expedition organizer: Massimiliano Canossa (IANTD trimix and wreck instructor).

Photographers: Federico Matiello, Nicola Boninsegna and Massimiliano Racan.

Video operators: Leonardo Belloni and Livio Loniti.

Safety divers: Maurizio Maiocchi and Luca Preazzolo.

NMDT is composed of passionate technical wreck divers. More info at www.nmdt.it



Bob Hollis

FOUNDER OF OCEANIC,
ANDREA DORIA PIONEER
AND RESORT INNOVATOR

BY BRET GILLIAM

Bob Hollis is decidedly old school. He built underwater camera housings and strobes out of necessity... there were none in the mid-1950s that met his needs. He created the most popular underwater strobe light of all time and over 30 years later scores of photographers are still using the Oceanic 2001 series without a glitch. »

He designs equipment for divers and tests it on himself. He builds the finest eco-resort in the middle of the remote Papua New Guinea jungle because he liked the diving so much on his frequent visits and thought the area deserved a proper facility. He buys a 120-ft. liveaboard vessel to add diversity to the resort without ever even seeing the ship himself firsthand. And he's spent more time on the infamous wreck of the *Andrea Doria* than any diver in history.

He's a throwback to another era when his peers have long since retired or passed away. There are none of the original manufacturing founders left running diving companies except him and Oceanic has continued to set new marks for cutting edge products. It might have something to do with the fact that he still dives when most companies are run by tight-assed accountants whose hair only gets wet in the shower. And he lives life with a passionate wild abandon that belies turning the corner on his 70th birthday. Motorcycles, fine wine, semi-religious herbs, crazy diving: bring it on!

Bob is one of the great personalities of diving. Last to leave the party, first to explore the new dive site, and not afraid to step across the line into the wild side... with a deadpan sense of humor that catches a lot of folks off guard. In short, he's my kind of guy and we've spent more than a few rollicking nights out on the edge of the envelope over the years.

I met him back in the early 1970s when I took on the Oceanic line in

my diving operation in the Virgin Islands. Bob was barely dry from saturating on the *Andrea Doria* in the most challenging exploration of the wreck ever attempted. His expedition stunned the industry and their adventures became the stuff of legend. He followed the first saturation mission with another on an even larger scale in 1981 when he teamed up with *Blue Water, White Death's* Peter Gimbel and penetrated the interior to recover the First Class purser's safe and other key artifacts.

He released the best selling professional camera housing of all time called the Hydro-35 in the early 1970s. In 1975 he introduced the Oceanic 2001 strobe and just about every underwater pro photographer embraced it as the most durable product ever built. The list of shooters included Chris Newbert, Howard & Michele Hall, Carl Roessler, Marty Snyderman, Paul Tzimoulis, Jack McKenney, Doug Faulkner, Dave Doublilet, Al Giddings, Geri Murphy, Phillipe Cousteau, and countless others who made a living counting on Hollis's product in the field. The damn things were bulletproof. I even fended off a shark that bit one right off my camera housing metal arm and swam away with it. I recovered it six days later and it worked fine. I've still got it, teeth marks and all... and 22 more carefully hoarded in my equipment locker. No one ever built a better strobe.

At a time when most men his age are considering retirement, he turned his attention in a whole new direction and built the Tawali Resort in Milne Bay, Papua New Guinea. Following on that success, he has just introduced a new luxury liveaboard to the area called *Spirit Of Niugini* that started operations in March 2007. Because PNG is isolated and far flung between islands, he's now contemplating a seaplane to simplify access. Never mind that he's not a pilot. He'll probably build it himself anyway and like the Wright brothers, he'll figure out how to fly when he's finished.



On the beach
Rolleimarine,
1961

I'm crazy enough to fly with him. Because I know if he built it, it will work. And, no matter what happens, we'll have a good time along the way.

Diving wasn't a part of your youth. I understand that you didn't get into the sport until you dropped out of college and moved to the Bay area around San Francisco. Tell us about the early days for you.» I was born in Chico, (northern) California. Later I lived in Orland, 20 miles west until I moved to the bay area in 1955. It was a small town of

3,000 people with 400 students enrolled in high school. Growing up in a small town has merit, especially one that is close to creeks, rivers, mountains. You learn about the outdoors, hunting, fishing and girls.

I graduated from high school and got married two months later. I was working in the summer saving money for college and was injured on a job. We were harvesting English walnuts. To do this you use a tractor with a spool of cable with a hook on the end. You run out the cable, put the hook in major areas of the tree high up, the tractor makes the cable taut. I'm in the process of putting the hook in a crotch of the tree 14 feet up, and this clown is operating the tractor screws up and he yanks me out of the fucking tree. I fall face down onto a branch, knock my front teeth loose. The impact flips me over and I land flat on my back. Split two vertebrae, crushed a disk. I'd had enough of the farm life.

We were expecting a child in December. I'm 18, out of cash, without a job, a back injury, and a baby due. A good friend from school had moved to the bay area and said I could stay in his apartment if I came down. So I filled my tank with gas, packed a few shirts, jeans, and left Orland. My wife moved in with my parents while I looked for a job.

I landed a job working nights, got a little apartment in Point Richmond with a small view of the bay, moved Joann and our new daughter, Debbie, in and started attending classes at Contra Costa Junior College.

So what sparked your interest in diving?» During high school I came across *Diving to Adventure* by Hans Hass. The memories remained with me and one evening in the early part of 1956 I was reading *Popular Mechanics* and came across an article on how to build an underwater scooter. I was intrigued by the design and the thought of using a vehicle underwater. A couple of weeks later I was reading the "for sale" section in the newspaper and there was an ad selling a two-hose regulator, twin tanks and other equipment. I called this guy, set up a time to see the equipment. As it turned out, he had bought the equipment and never used it. It was a Healthways two-hose regulator, converted 38 cubic foot military cylinders with bushings to accept tank valves. So I bought the equipment.

He told me about Steele's Sporting Goods in Berkeley. I went there the next weekend, met Howard Steel, and proceeded to buy everything else... mask, fins, a wetsuit. Howard also told me that I should start by learning to free dive and then move onto SCUBA. I followed his advice and took up spearfishing and diving for abalone on the northern California coast. I was up there every weekend. There were damn few divers then but I met some others and developed some great friendships. Within a few months I started scuba diving in Monterey.

I had yet to take any classes. One guy said, “Diving is easy; you need to see, breathe and move.” How true it is.

After the initial dives you headed off to Mexico, right?» In the fall of 1956, a couple of friends and I drove to Guaymas, Mexico and dove in the Sea of Cortez. It was my first dive trip beyond Monterey and Carmel. We went there in a pickup with a camper and stayed at the bay of San Carlos. There was a small compressor to fill tanks and small boats for rent. For the trip I built a housing for my first 8mm movie camera.

I lucked out to meet Ken Smith, a contractor from Santa Rosa. Ken spent three months every year at San Carlos. He had a 26-ft. boat for fishing and he was a free diver. He offered to take me diving. The following morning we traveled north to San Jose Island. Ken had several large Nemrod spear guns and told me to use one of his, telling me that the small single band gun I had was not enough for the fish here. My free diving skills were good, but I had never speared a big fish or a game fish. My spearfishing was for Ling Cod and other bottom fish on the northern California coastline.

We jumped off the boat and I was in the clearest water that I had ever experienced. And there were lots of fish. Ken said to follow him down. I did, and at 40 feet, I saw my first Yellowtail. Ken speared one and we swam back to the boat. He told me, “We will spear only a few fish, therefore take your time, wait for the bigger ones.” We made many free dives that day, to depths up to 70 feet, and I speared three nice fish. After that I made dives with my new 8mm camera in its housing. This was a decision-making day... I thought then about being professionally involved in diving.

When did your interest in underwater photography take hold?»

After my first dive I started reading any book or magazine on diving. Hans Hass’s books continued to be the inspiration for underwater photography, adventure, and he steered us to develop rebreathers. I thought about taking pictures of the adventures, the animal life I was seeing to share with others. Everyone wanted to hear the stories but I wanted to show them what I was seeing.

Who was shooting underwater then in your area that influenced you?» I started diving with Helmut and Karl Stellrecht from San Jose. Helmut was still in college and Karl worked in a camera repair center. Both were avid underwater photographers, they designed and built all of their underwater housings, flash bulb units and other accessories. We continued to develop newer equipment; it was an exciting period of time for me.

Considering the primitive underwater systems available then, how long did it take to realize that you were going to have build a lot of the equipment yourself?» The early issues of *Skin Diver* magazine had articles about building housings for cameras. I started to learn about o-rings, and how to work with Plexiglas. In the early part of 1956 I began working for Standard Oil. I was offered the opportunity to go into an apprenticeship program, learning to be a Boilermaker Welder. This was a three-year program providing classroom education half days and the other half you worked the trades. These shops were huge and had tools allowing you to build anything. Personal projects were called “government jobs”. During the nine years I worked at Standard Oil, I had a continuing stream of “government jobs” building underwater photographic and diving equipment. That’s where it all started.

My first camera was an Argus C-3 35 mm with a 50mm lens. I don’t know why I picked this camera. It was difficult to use above the water,

let alone the controls needed to operate it underwater. But it worked. I built a flash bulb unit, started to learn about open water connections and the difficulty to make electrical things work consistently in salt water.

Did you have any engineering training then?» I had natural mechanical skills. I built my first motorbike when I was 12, bought my first car when I was fourteen. You could get a driver's license at 14 in those years. My father was an engineer and during my Boy Scout years he helped me with a lot of the merit badge projects; the more you learn... the more you want to learn. In high school I developed skills to do custom work on cars, rebuilding the engines, making hot rods. I bought my first Triumph motorcycle in my senior year.

How did the early designs you tried out work?» There were many trips back to the Sea of Cortez and I continued to spear fish, but my focus was on exploring and taking pictures. We were doing a lot of diving at Point Lobos State Park at the south end of Carmel. This park is famous in that it has the oldest protected marine reserve in the USA. In 1958 we housed the first commercially available electronic strobe lights. Developing connectors for strobes was far more difficult than connectors for flashbulbs. We used Amphenol connectors and filled them with grease. We would then enter Whalers Cove in Point Lobos, swim on our floats to the outer edge of the cove or over into Blue Fish cove, tie off the floats to a piece of kelp and make our dives hoping that the strobe connection would work. It did on most occasions but there were many times that I would need to swim back in, re-grease, and swim out again. We would swim out a minimum of two times per day.

There were few divers but those that came as well as normal tourists that were visiting the park would marvel at the various pieces of

Working on camera and strobe housings, 1960



underwater photographic equipment we had on the tables, changing film or greasing up connectors. Divers that were interested started asking where they could buy camera housings and flash units. A diving buddy, Helmut Stellrecht, was excellent at building housings. I began to take on work building housings or other pieces of equipment. My “government jobs” at Standard Oil were increasing. It’s funny how word spreads. I started getting calls from people that I never met asking me if I would build this housing or that.

There were no commercial dive boats in those days. How did you access the dive sites?» Back in 1961, I’m on 60-ft. fishing boat called *Privateer*, heading out for a dive trip. There were 18 divers on board and we were heading to the Farallon Islands, 26 miles off the coast of San Francisco. Some of us were members of the Littoral Society, an environmental organization concerned about the issues in the littoral zone, that area on the beach between low and high tides. The group in northern California was affiliated with the department of Fish & Game. I’m not sure how I got involved, but I knew there was going to be some trips to the Farallons and other places, and I wanted to be there.

The diver makeup was from all over. I knew Dan Gotchall from the Department of Fish & Game, Ed Kelly a good diving buddy and still a good friend today, a few people from the Central California Council of Diving Clubs, and a person that had defining influence on my future, Dewey Bergman.

We anchored on a reef off the main island. The assignment on the first dive was a fish count. We did our count and then spent the balance of the dive exploring. We had heard stories of Great Whites but I can’t remember it being a concern to us then. Back on board we started to talk about the dive, fish life and I then discovered that Dewey had brought back a good-sized octopus. I asked what he was going to do

with it and he said eat it. That was something different for me.

We moved the boat for the second dive, a large bay on the west side. During this dive some of us discovered what appeared to be a cave or an opening of sorts. Two divers discovered two small amphorae among other debris and it was reported by one diver that he saw a large encrusted chest in the area. The six of us that were involved in this discovery did not talk about our find on the way back. Those involved had visions of treasure, riches... and we were not going to discuss it with anyone, even ourselves.

A month went by and one by one we started talking about what our plans were to go out again, to find the chest. We got together and chartered a boat to take our smaller group out. The seas to the Farallons can be treacherous; that’s why wrecks are there. We spent two rough days trying to rediscover the area where the others found the amphora. With seas picking up we pulled anchor on the second day and headed for home empty-handed. We made 13 trips looking for the mystery location where the amphora were found and the reported site of the chest. But sand had covered the opening to what could have been an old ship. Never did find anything.

Then I purchased a converted double-ended lifeboat equipped with a DA Buda diesel and a small cabin. A very seaworthy boat, small, 26-feet long, but adequate space for four to five divers and numerous tanks. It was fine to travel to the Farallon Islands. I also owned a 12-man UDT rubber boat. Our normal trip to the islands was to leave Richmond around 10:00 PM at night, towing the rubber raft. A four-hour trip for my boat, getting there early morning, allowing for a couple of hours of sleep prior to our first dive. We always anchored in Fisherman’s Bay; this was protected most of the time by prevailing winds and currents. It’s a habitat for the hundreds of sea lions and



Testing camera system, 1955

elephant seals. And, we found out, the lurking White sharks.

On the last trip we made with this small boat we arrived at the islands under fog. The sea conditions were picking up and I was concerned that we could slip anchor at night and wind up on shore. So I chose to move out of the cove and tie up to the main buoy on the south end of the main island. That was a very large buoy used by the Coast Guard and anchored by chain to a thirty-ton cement block on the ocean floor. I put out our anchor and tied the stern off to the buoy. Our little boat was like a cork in a rolling

sea, five of us were wedged into this small cabin. During the early morning, the seas calmed, and we woke to discover that our anchor had broken during the night, but we were still tied to the buoy. We saw another boat on the horizon. We recognized the other boat as being from Sausalito and it had a group of divers on board. We suited up and made our first dive. The water was exceptionally clear. We were diving on a solid granite ocean floor, a good number of fish in the water.

On surfacing we saw that the other boat had pulled anchor and moved past us to the small island south of the main island. We noticed that the divers had spear guns and this was a concern. They anchored and were preparing to make a dive. We were starting to get ready for our

second dive, I told everyone then to be careful and be in eye contact with others. During our second dive, I was swimming along the edge of a shelf at 90 feet. At one point I swam out over the edge to look down. Below me was a Great White shark... so large his dorsal fin seemed to list to one side. Must have been nearly 20 feet long.

I immediately backed onto the shelf like a schmoo looking for the other divers. When I came in contact visually, I motioned that we were to ascend to the boat "now". We didn't really have shark signals; the only signal was to go up. When we got onboard, the other boat was gone. It was strange... how did this boat pull anchor and leave so quickly? I told the guys about the big shark. They laughed. I pulled out a bottle of whiskey and said, "We're not diving again today!"

We had no radio on board and the compass worked some of the time. It was our practice to pull up a crab pot on the way home, fill the boat with enough for a good neighborhood feed, and head for port. No exception this trip. Pulling into the harbor, I noticed more lights than normal. Then we saw a large group of people on the end of the wharf. As we approached they yelled, "Is everyone OK, who was hit by the shark?" I didn't need the harbormaster to see the hundred or so crabs on board so I yelled that all was okay. We off-loaded the crabs under the cover of darkness and headed for home.

The following morning we learned that one of the divers on board the other boat was attacked by a Great White on the second dive and it took over six hundred stitches to sew him up. He was in the hospital for six months. I suspect that the shark that swam under me was the one that attacked this diver. This was the second diver in two years to be hit by a White shark at the Farallons. Leroy French was severely attacked the year prior and Al Giddings, his partner, pulled Leroy back to the boat and saved his life.

We made a few more trips to the Farallons, for fishing and a few dives, a great place for diving but we had our fill and it was time to move onto other adventures. On the way back in one time, Dewey and I struck up a conversation and he told me about his shark experiences diving in the Tuamotu Islands, specifically Rangiroa and diving the pass. Dewey, an ex-naval officer, had dove all over the world. He was one of the first divers to dive Bikini after the atom bomb tests and had spent most of the last three years diving the south pacific including the Tuamotu Archipelago. His zeal for exotic diving would affect both of us profoundly in the near future.

Al Giddings is one of your old friends. How did you guys hook up originally?» I met Al in the early 1960s. We became good friends. We worked together on some early films about diving. We have other common interests like riding motorcycles. That's one of my passions. I was very much into off-road, hill climbing in my early years. I remember Al coming along on his bike one weekend. He had lights, mirrors, all of the bells and whistles. My bike was built for off-road terrain. On one run I was coming back down a hill and here comes Al up this steep face and all of sudden the front end of the bike goes up in the air and he begins to summersault to the bottom. Now Al is a very aggressive competitor. He doesn't want to be beaten in anything and it was so funny to watch his look at all of the broken lights and bent mirrors knowing that he was finished for the day. We're still riding bikes together. In 2002 my wife Ronda and I, Bill & Bee Mitchell rode up through Wyoming, through Yellowstone and to Al's ranch that is 40 miles from one end of the park. He joined us and we rode to Sturgis in South Dakota and spent a week exploring.

You were one of the founders of the Underwater Photography Society of Northern California. What sort of activities did that spark?» Ed Cummins and I formed the Northern California Chapter

of the Underwater Photographic Society in 1962. Dewey became a member, others joined including Giddings and Leroy French. We had a great group of underwater photographers, a lot of egos. Some of the meetings were held in Dewey's home overlooking San Francisco Bay. This was during a time when Philippe Cousteau traveled through the bay area and he was always invited to Dewey's home. The NCUPS is a very active group today.

At some point you were involved with leading early trips for See & Sea Travel. Where were you headed?» While attending UC Berkeley, Dewey did a thesis on how to start a travel agency. The professor gave him a low grade but he used his plan to start Eur-Cal travel and later owned Don's Travel Service in Berkeley. He managed a very successful travel business. Dewey had connections and dive friends everywhere. He set me up with passes on airlines to destinations I had only read about and I met many of his friends who took me diving in the Bahamas, Andros, Cozumel, and the Virgin Islands. These trips were in the very early 1960s.

In 1964, I organized a group of 14 divers to take a trip to Cozumel. To the best of my knowledge this was the first organized dive group to go there. This was also the first and founding trip for See & Sea Travel. The tickets were issued by Don's Travel but Dewey's intent was to sell Don's and to specialize in dive travel from then on. The following year I led both See & Sea trips to Cozumel. One of the divers on the trip in the second year was a paying guest, Carl Roessler, a computer expert from Yale University.

We stayed at the Cabana's Del Caribe, one of three hotels then in Cozumel. On the first trip we brought with us a compressor for the hotel, 80 dive cylinders, and lots of equipment for the resort. I look back and remember this staggering amount of equipment sitting in the

San Francisco airport along with our diving baggage and photographic equipment. It was unbelievable.

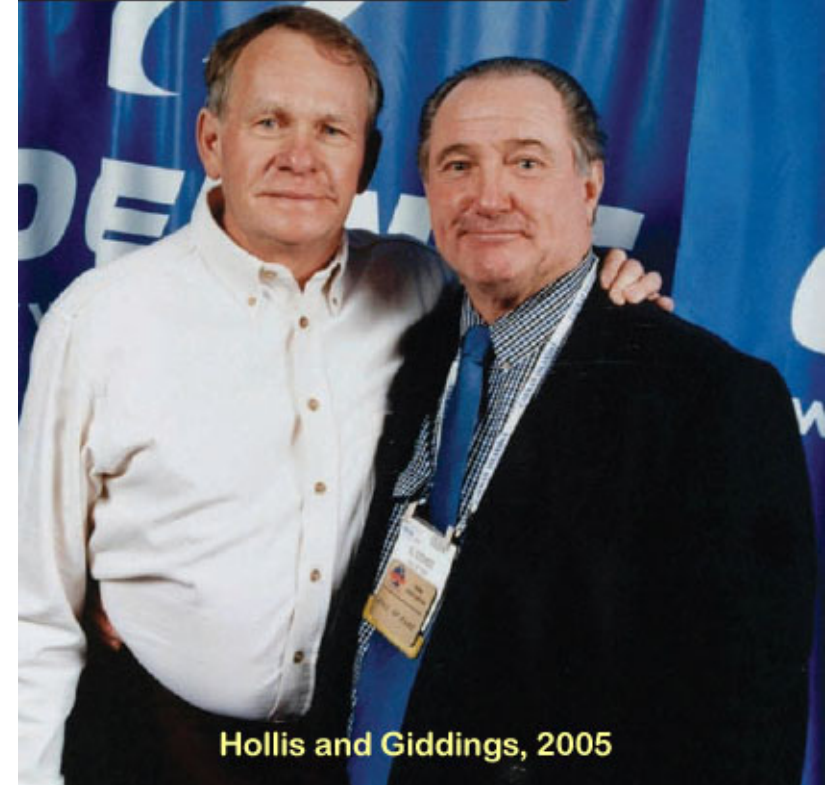
Our dive boat to Palancar was the *Pez Vela*, a 36-ft. boat with a small cabin that could carry eight divers maximum with tanks. Captain Melisio became our favorite guy. There were no diving rules... a beer following a dive was the norm. We used two more boats, equally enjoyable. From Cozumel we started doing trips to the Yucatan, overnight in the bay of Chalau, diving the wreck of the *Manticerous*. Then on to Akumal and the ancient grounds of Tulum. We were the first diving group to do this. Akumal then was nothing but a copal plantation. On our second trip there, I negotiated with the manager of the plantation to take us to a ceynote that we learned about from the locals. Using a tractor and a flat bed trailer, we traveled north to access the site. The local people told us that the inland cave connected to the sea. When we dove in the ceynote, we discovered a tunnel and swam this connection to the ocean.

Didn't you have some sort of run-in with the Mexican government over cannons on the Chinchorro Banks?» Exploring the Yucatan was a great experience; I was intrigued by the charts and the offshore islands. I started to ask fishermen in town about Bank of Chinchorro, a long archipelago with three islands inside the reef. Rumors were that modern day pirates were in the area, ships were running aground, and importantly, there were ancient shipwrecks to be found. I was interested and negotiated with the harbormaster in Cozumel to allow one boat in our group to explore Chinchorro. The other two boats of divers would do the trip to the mainland. Dewey was upset about my decision to split the group and he led the group to the mainland while six of us went to Chinchorro.

When we were exploring the shores of Monterey, Carmel, and down

to Big Sur in the late 1950s, we used a planning board built by Karl Stellrecht. The board had handles with a viewing window and a chart on the side. We towed the board using signal corps wire from World War II. The wire towed us and allowed us to communicate using our own Morse code system to identify reefs, fish, pinnacles, wrecks, interesting sites. We had 20 different signals listed including "help!" This was our first underwater vehicle. It was fantastic. During the early years we explored almost every part of Monterey Bay, Carmel and south to Big Sur.

We used this method to locate the best dive sites on Palancar. Some of the sites we named and the locations became favorites from then on. We took the planning board with us to Chinchorro. Prior to the trip we were told about a potential area on the outside of Cayo Norte where remains from a wreck were found by fisherman. We spent a day trolling the area; there were lots of sharks following or nearby. While I was being towed, I spotted something in shallow water that appeared to be man-made. I signaled for a stop to look closer and within the next 30 minutes we discovered six breach loader cannons



Hollis and Giddings, 2005

from the 15th century. Time was against us to really explore the area, so we loaded the cannons on the stern of the *Pez Vela* and then spent another day of tourist diving before heading for Cozumel.

Back on the island I arranged to have the cannons boxed up and planned to take them on the plane home. I knew nothing about preservation of artifacts, nothing about taking antiquities from foreign waters. As far as I was concerned, I found 'em, so they were mine. Dewey was reluctant, but said, "okay, go for it". Rumors from the crew were running rampant in town and the word spread fast. The house next to the Cabanas del Caribe was owned by Pablo Bush Romero, the President of CEDAM, a new organization dedicated to conservation and protecting the environment. I knew Pablo... I was interested in what he was doing, but not interested in talking to him about our find.

Well, Pablo heard about the cannons and our intent. He came to my room asking about our trip, where we had gone, and if we found anything. I was vague about everything but he persisted. He told me that the laws of Mexico were strict about taking any antiquities out of the country. I quickly deduced that he knew something. In the end we negotiated a reasonable deal. He agreed to take possession of the cannons and give Dewey and I credit for finding them on a CEDAM Expedition. He, in turn, would preserve them, put them in his museum or others, and we would be free to leave Mexico. I later heard that two of the cannons wound up in Smithsonian and CEDAM received a nice grant for a future expedition. I didn't get squat, but I didn't go to jail either.

You finally got into the retail dive store business in the mid-1960s. How did that come about and was this a successful path?» In the latter part of 1964 I made the decision to open a retail dive store and surf shop, the Anchor Shack. I had done a little surfing and thought

this would be a nice addition to diving equipment. My partner was Ray Collins, a neighbor who was a non-diver at that time, but a great guy. We rented a building in Hayward, designed the interior, and opened in March of 1965. We obtained a line of products from US Divers, White Stag, and a couple of others. I set up a small machine shop in the back end of the store to maintain the production of custom built photographic equipment. The dollar volume on custom photo work was sufficient enough to cover the overhead and pay us a meager salary until the retail store developed a clientele.

What were the training programs you ran back then like?» I hired instructors to teach. I did very little teaching myself although I wrote a couple of instructional programs for the local communities and the store. We offered NAUI and NASDS certifications. We also wrote our own advanced course, along with courses on underwater photography, marine biology, spearfishing, and gold dredging. The gold panning and dredging classes were held on the American and other rivers in the Sierras. By year three we were teaching two classes every night of the week and on Saturday with Sunday for ocean checkouts.

During the Anchor Shack days, you started selling underwater photography equipment. Tell us about those products.» I developed a metal housing for the Honeywell strobe lights in 1967. The Hydro Strobe was an immediate success. I put advertising in *Skin Diver* magazine to promote the stuff. With articles by editor Paul Tzimoulis, more interest was generated and established a growing market for our product line. I continued to expand and built our travel department. We were selling three trips a year by the end of 1968. In 1969 we opened our second location in Concord. Another product we introduced that evolved over time was the ball joint arms to connect strobes, flash bulb units and movie lights to all types of camera housings. We started building metal housings for the Kodak K-100



16mm camera; this was the most popular system for several years.

When did you transition from shooting stills to movies?» Actually I was into shooting film early on with my first attempt in

the Sea of Cortez in 1956. I have always been into stills and film and thought about producing films or publishing books. I developed a large collection of stills in my early years. The collection was lost in a fire in 1974 and this event had an effect on my future direction. I've had a lot of great photographic expeditions and was paid well for some of the work, but my primary focus has been the design and manufacture of equipment. I continue to take lots of pictures and maybe someday I'll re-think doing a book.

I remember a CBS television special that you and Giddings worked on with Bob Croft. Tell us about that.» In 1968 Carl Roessler introduced me to Bob Croft, a Navy diver. Croft's goal was to set a new depth record holding his breath. Sponsorship was in place and I negotiated with Croft for the film rights. I needed partners in this deal and contacted Dewey and Al Giddings. Toward the latter part of 1968 we joined Croft's dive team in Ft. Lauderdale. Five weeks later Croft set a new record... 241 feet on a single breath of air. We recorded the dive on film, Al edited it and we co-produced *Deep Challenge*. The film was sold to CBS for a special.

How did Oceanic Products come about?» By 1971 the camera product line was taking most of my time. Ray decided to leave the business and I hired a manager to run the retail operation. There was good growth in diving during the early 1970s. My stores were operating on their own and we added swim instruction to the program. I was running out of room in the machine shop and was eager to expand the manufacturing division. I decided to spin it off and form a new company. In 1972 the product range became known as Oceanic. I brought in a partner who had owned and operated a large machine shop in Berkeley. We expanded our machining business for customers such as Dow Chemical, General Electric and others but my focus continued to be diving products.

You produced the iconic Hydro-35 aluminum housing for Nikon and Canon cameras that became the best-selling housing of its era. What year was that and how long a run did the housing enjoy?» I started the engineering for the Hydro 35 in 1971. Nikon and Cannon were the primary choices because of the large viewing systems and their selection of lens. This product coupled with the Hydro Strobe and various connectors kept us moving forward. We added housings for popular super 8 format cameras, movie lights & housings for 16mm cameras. A significant portion of the line was accessories for the popular Nikonos cameras.

Meanwhile, Oceanic was growing. When did the company become a full line manufacturer?» We definitely had growing pains. We were behind in deliveries and the business was not generating the projected cash flow. A fire in 1974 destroyed Oceanic. We picked up our pieces and moved to a temporary location while our building was rebuilt. We learned years later that an arsonist set fire to the building. I started making long road trips, traveled through every one of the 48 states except North Dakota. I made sales calls to every retailer that

would take the time to look at the product line. In the later part of 1974 I bought out my partner.

I knew that I needed to do something fast, my cash reserves were running low. So I sold my interest in the Anchor Shack stores and then embarked on a product design using injection tooling. My objective was to design a tool that would allow me to use the parts for a number of products. By mid 1975 we introduced the Ocean Pro lights and they became the best selling diving hand lights in the country. I entered into an agreement with Scubapro to produce the light on an OEM basis for them in Europe. My next focus was to design the electronics for a new strobe light. The same parts used for the light were used to produce the new strobe product line, the 2001 and 2003 strobes. The strobes coupled with ball joint arms were an instant success.

Who were the major players in dive manufacturing then?» The top three were US Divers, Scubapro and Dacor but there were lots of other companies such as Sportsways, White Stag, Bailey Suits; diving was still a very small industry.

How did you do competing against them?» We focused on niche products such as the photographic line, then lights, and began moving into electronics. Most of the larger companies were not selling products that we were designing so this allowed us to begin developing a brand and a customer base. The diving industry had its greatest growth from 1975 to 1990. Paul Tzimoulis at *Skin Diver* magazine promoted dive travel and underwater photography. This fueled our growth. We were a small company, profitable, and with a staff of people who wanted to expand. The bulk of the customers for our products were divers that came to a retail store and asked for the products; the store would order them, sell to the customer and keep a nice profit. But dive stores in general did not promote and inventory underwater photographic

equipment. We decided that future growth would require us to have a core product line.

At some point, you took over your friend Ralph Shamlian's company Farallon. How did that come about?» I met Ralph when we were producing the Anchor Shack products and we developed a lifelong friendship. Ralph, a brilliant inventor attracted the eyes and pocket books of investors to fund his new company Farallon Industries in 1971. Farallon became the buzzword in diving, introducing new products at a rapid pace. Innovation has its rewards but the downside is the continuing requirement for money. You can only go to the well so many times. By late 1975 Ralph was on the outs with his investors. Within a few months we learned that Norm Moore, the new CEO and largest investor, was negotiating to sell the product line to Scubapro. They wanted to buy the assets and leave Norm with the liabilities. Farallon was in the process of a major product recall and Norm didn't want to be stuck with this liability.

You can learn a lot by going through trash! We were diving into the Farallon dumpsters at night. Getting access to their current financial info and other correspondence provided us a picture of what Farallon was all about. I entered into discussions with Norm. He thought I was interested in buying the tooling for a movie light. This allowed me to begin discussions about his pending offer and to begin influencing him that we might be a better fit. Four weeks later I bought the whole company. I was in the office when he told Scubapro the deal was off. They were pissed! Especially when he told them it was me. I moved Oceanic from San Leandro to San Mateo across the bay and the new company was known as Farallon Oceanic until 1980 when we dropped the name Farallon and carried on with the name - Oceanic.

Farallon was the first company to invest in electronics. They were

building digital depth and pressure gauges. Because of many issues, I stopped producing a number of the products and wanted to go back and re-engineer them to eliminate the returns. Half of the cash flow was coming from analog instrumentation but they were buying the movements from other suppliers and installing them in plastic parts produced by Farallon.

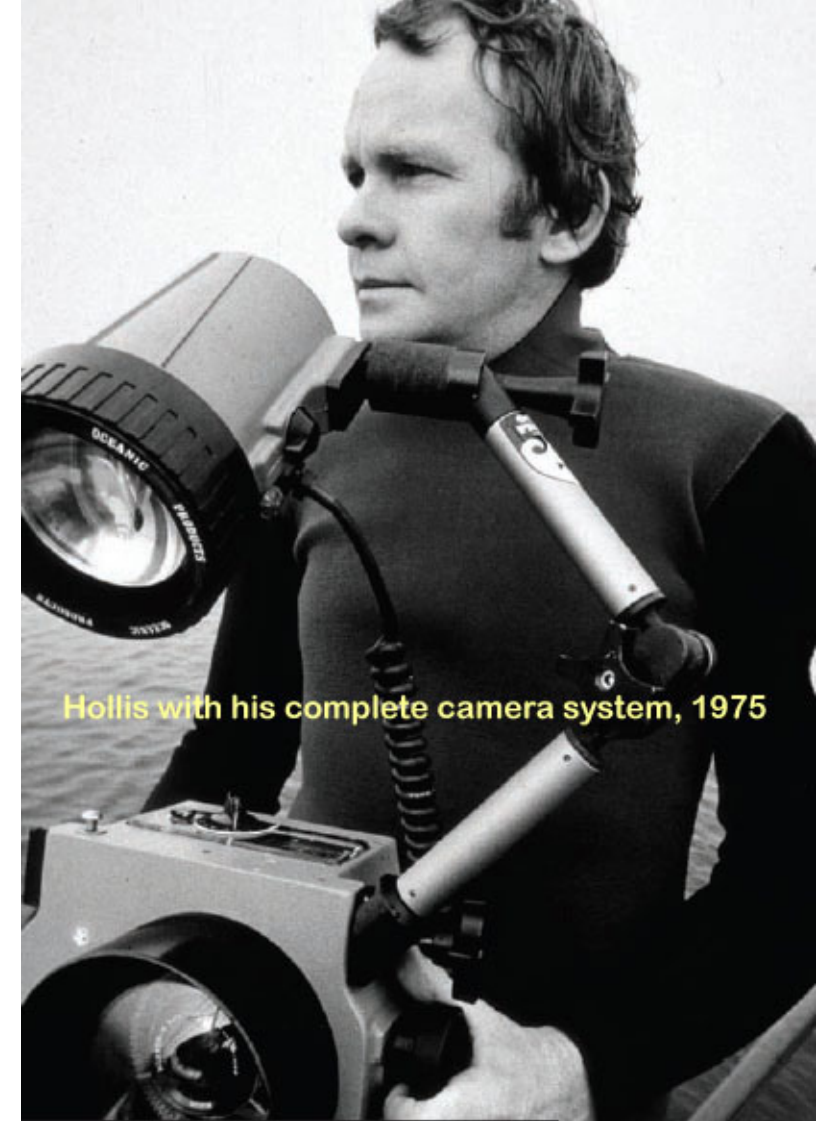
Oceanic continued to expand. What came next?» I thought we would be better served if we could engineer, design, and manufacture the analog movements. I hired an employee away from one of the suppliers and put one of our engineers on the project. My son Mike, a commercial diver for Taylor in the North Sea and the Gulf of Mexico, agreed to come home and work in the company. Mike had learned a lot in the three years he was employed by Taylor. I asked him to be a part of the new instrumentation program we formed called Pelagic Pressure Systems. Pelagic became an OEM supplier of products to Oceanic, our sister company Aeris, and a number of dive companies in the world. Pelagic manufactures OEM products for the industrial life support markets as well as aircraft instrumentation. Mike is the president of Pelagic.

In 1979 we also moved Farallon Oceanic back to San Leandro. Our machining division was getting larger and the customer base was growing. We formed another company in 1981, ROMI Enterprises. Today ROMI machines and produces the regulator lines for Oceanic, Aeris and other companies.

You were also involved with one of the first dive computers, right?» One of the products that Farallon developed was an early dive computer. This product was going through a recall with the Consumer Protection Agency. We assumed the liability and managed the recall. I continued the engineering effort to allow us to re-introduce the product.

I finally determined that the future dive computer needed to be an electronic product and not the type we were engineering. In 1979 I entered into an agreement with John Lewis, a physicist. John was a diver and had developed an algorithm for a dive computer. We began a development program to test the algorithm and, in parallel, to develop the electronics. We had our first operational dive computer at the end of 1979. We

continued to test the unit and made a presentation to US Divers in early 1980. They were impressed and this led to an agreement for Pelagic to be the OEM supplier of instrumentation beginning in 1984. Pelagic produced all U.S. Divers instruments and computers through 1995. We first introduced the Data Max gauge, a depth gauge with a bottom timer. This instrument gained in popularity and paved the way for our first commercial dive computer. We were the first company to have an air-integrated computer that provided remaining air time as



Hollis with his complete camera system, 1975

well as no-decompression and deco information. This product was introduced in 1984.

We entered into an agreement with Johnson Engineering, one of the companies associated with NASA. The project was to develop a stand-alone dive computer that could receive pressure information from a transmitter attached to the regulator. The product was delivered to NASA in 1987 and this became a commercial product the following year. Pelagic has continued to develop dive computer technology and is an OEM supplier to a number of companies. Oceanic and Aeris have a secure position in instrumentation and computers worldwide.

What became of the venerable Oceanic photo products line?»

To make the advancements needed to secure a solid position in instrumentation, regulators, and buoyancy compensators required our entire R&D budget. We were losing ground in lights and the photographic product line. To my disappointment, we decided to stop the funding of the Oceanic photo line in the early 1990s. This had been my passion, and photography still is, but we needed to make long term decisions that would best serve the growth of the company. Consider that we had invested in developing our own amphibious 35 mm camera complete with a large format viewing system and the ability to couple standard Nikon lenses encased in a lens housing. This was years before the Nikon RS model. To satisfy the growing requirement for 16mm photographers, we modified the Arriflex 16S camera by replacing the 100-ft. spools with 400-ft. coaxial spools. We then added new lenses to the optics and increased the viewing screen. A special housing was developed and this system was the standard for a number of underwater cinema photographers. I later developed a state of the art self-contained 16mm system with 400-ft. spools and through the lens viewing system. We only sold a couple of these units and the remaining unit is in my home. That was the end of the photo

line, an emotional time to shut the line down.

You had a few issues in management as well.» I hired Mike Chapman to be the president of the company in 1995. Mike had a long tenure at US Divers and we developed a good relationship over the years. Mike was a good leader but left a couple years later to form his own company, Body Glove. I then hired Rich Mitchka, the former president of Dacor. Rich was not a good fit with our company. I continued to look for the right person. In 1996 we decided to start a new brand for instrumentation and called it Aeris. This was introduced in 1997. Dan Emke, our sales manager on the east coast, moved back to California and was appointed the position of COO for Aeris. The company developed into a full line manufacturer and Dan is now President.

I remember the old building from the early 1970s. You've moved up a bit since then.»

In 1994 we bought our current building on Davis Street in San Leandro. This 110,000 square foot building houses the current operation. We are adding more office space and will move Aeris into the building in April 2007. One thing that separates us from most dive manufacturing companies is the fact that we manufacture the product from raw materials to the finished product. Some of our manufacturing is now offshore in our own plants located in China and Taiwan.

How about military work?» In the last five years Oceanic has won three government contracts to develop products for military applications. We designed and developed the CDDM, Combat Divers Display Mask. We are currently working on integrating the display mask portion into a full-face product made by DSI, a Bev Morgan product. The Data Mask, including a dive computer in the display, is in the Oceanic and Aeris product catalogs for delivery in July of



2007. The second contract was to develop a PDA that can be used by tactical swimmers and be the heart of a swim board. We're also developing CO2 sensors to be used in rebreathers. The most recent contract is to develop the ATUBA – Advanced Tactical Underwater Breathing Apparatus, a new fully closed rebreather.

What's next?» We have new company on the launch pad simply called Hollis. The Hollis product line will have a technical division including dry suits, flotation jackets, plates, canister lights including HID, Quartz and LED lamp heads. We are finishing a new line of underwater vehicles that will include features - long-duration, speed and thrust. We are designing an instrument for the vehicle that will provide speed and distance traveled and it will adjust for current movement. We will put the full-face mask with the HUD using a dive computer software program, not the military software. Coupled with underwater communication this product will be excellent for film teams and search and rescue teams. Pelagic is finishing a swim

board that includes a depth gauge that allows you to program in your compass heading and return with swim legs and timers. This product, in combination with a compass, will provide better information than current military swim boards. We have a new Hollis regulator that will be introduced by mid 2007 and we will introduce a commercial rebreather by mid 2008.

One of the great epic stories in diving is the saturation project on the *Andrea Doria* in 1973. How did you get involved?» Some friends of mine, Don Rodocker and Chris Deluchhi, Navy divers who had set some of the deep saturation records, were planning a new business when their enlistments were up in 1972. The first project was to design and build a portable saturation complex. The objective was to tow the complex 50 miles northeast of New York, to the wreck site of the *Andrea Doria*. They wanted to anchor a support boat to the *Doria*, lower the complex, secure it to the side of the wreck, swim down, and live in the complex. From saturation, they could then make dives from the complex, use cutting torches to create a hole in the port side, find the safe, and remove it. They wanted me to invest in the deal, have the contract for the film documentary, and help in the construction of the complex. I bit... hook, line and sinker.

In 1973 the diving system left San Diego on a flat bed truck... 20 tons of diving equipment bound for Fairhaven. Don and Chris had secured a support vessel, a stern haul fishing trawler, 65 feet in length named the *Narragansett*. Our support systems were installed on the deck and we slept in cloth bunks located in the fish holds. First class, huh? After establishing a down-line to the foyer doors on the port side, we lowered the complex, all 10 tons, and tied her off over the doors. Don and Chris swam down, entered the habitat and went into saturation. Two days later I went into saturation. Cutting torches were lowered and we cut the first entry into the *Doria*.

Describe the habitat itself.» We called it simply *Mother*. It was a pressure vessel like a recompression chamber, thirteen feet in length and five feet in diameter. The inside of *Mother* was designed to accommodate three saturation divers, a gas mixing panel and canisters for removing the CO₂ gas in our breathing loop. A hatch on the bottom of the chamber provided an entry and exit to the ocean. The hatch could be closed and sealed during descents and accents and sleeping periods.

The breathing gas inside of *Mother* was a mixture of 92 percent helium and 8 percent oxygen, varying with depth. The chamber was contained in a large frame with 40 large storage cylinders of gas: 8,000 cubic feet of helium, 1,200 cubic feet of oxygen and 4000 cubic feet of heliox. Under the chamber was a cage for in-water storage of our diving equipment including our hot water suits and all tools necessary for the project. The Kirby Morgan band masks with communication pods were kept inside *Mother*. The system displaced 21,080 pounds.

The chamber and dive system was connected by an umbilical to the master control van sitting on the deck of the *Narragansett*. The umbilical provided hot water for heating the chamber and for our hot water suits. It also had hoses for breathing gases, communication, video links and other life support systems. The umbilical to the surface support ship was the lifeline to *Mother* and the dive team in saturation.

There were several mishaps and close calls. Give us some insight on the hazards?» Just to get *Mother* secured to the side of the *Doria* was a formidable task in itself. We shackled a cable to a porthole opening close to the main foyer doors. Supporting the cable topside was a five-foot diameter metal buoy we nicknamed *Big George*. This cable was our down-line for *Mother*. The dive system had three

ballast tanks on the top. To lower *Mother* required us to move the down-line into a guide system with a braking mechanism on the side of the habitat.

Using the principles of a submarine we would jettison air from the ballast tanks, take on water, and achieve negative buoyancy. This allowed *Mother* to sink. To slow the sinking, the gas operator would use compressed air to blow the water from the tanks and we could achieve positive buoyancy in a short period of time. The objective was to create negative buoyancy, slide down the down-cable, and then secure *Mother* to the wreck.

On the morning of July 25, 1973 seven of us pulled *Mother* alongside the topside buoy. Fighting a one-knot current, we finally managed to get the down-wire cable into the guide system. We then recharged our cylinders, needing all of the air possible for the upcoming dive. This was to be one of the most physically demanding dives any of us had ever made, seven divers on scuba gear lowering 21,000 pounds of steel onto the side of the *Andrea Doria*, 170 feet below. I thought at the time, “I’m away from my new business, in the North Atlantic, 43 degree water temperature, and were going to swim down an entire saturation diving system and tie it off on the *Doria*. This has to be one of the most hazardous dives ever attempted.” About then, I figured I was just a little bit nuts.

You were nuts. How did the set-up operation go?» Ballast tank control was critical. To allow too much water to enter would sink *Mother* like a rock. The one-knot current could push it off target, meaning we could be over the side of the ship and land in 240 feet of water. Gary Gada, the diver manning the ballast tanks did a great job. He controlled the descent and we were floating about 20 feet off the side deck on target. Each corner of the system had a rope 100 feet

in length with a come-a-long. Four divers were now on the corners pulling the tie-down ropes out to their maximum length, finding a location tie off to and then using the come-a-long to pull *Mother* into position. Gary used the ballast tanks and locked *Mother* in a buoyant attitude, holding the four-point mooring in a tightly fixed position. *Mother* ended up next to the main foyer doors and hovering 10 feet off the port side.

Seven tired divers ascended to our decompression stop at 30 feet with second stages waiting for us with 100 percent O₂. Our schedule on all surface dives was to equal our bottom time at 30 feet on oxygen. George meanwhile had fired up the hot water system to begin heating *Mother*. The habitat needed to have an inside temperature of 105 degrees because the saturation divers would be breathing helium. That gas accelerates loss of body temperature so we needed to live about thirty-five degrees above what was a normal room temperature to be comfortable.

The morning of July 26th all systems were finally operational. Don and Chris had a meeting with George Powell, the diving supervisor, and Dr. McMillian, our medical diving officer. Four of us swam down with Don and Chris; they entered *Mother* and went into saturation. It was a major historical moment. Our next assignment was to get the cutting torches ready. We were going to cut a hole through the foyer doors to provide entry to the First Class area and the Bank of Rome.

One incident stands out in my mind particularly. Jack McKenney and the wet pot transfer. Give us the gory details.» Late afternoon July 26, 1973, Powell told Jack and me that we had a problem. He said that *Mother* had lost buoyancy and had taken on water. Water entered the canisters of our Sofnolime, the chemical we were using to remove the CO₂ from our breathing system. George said, “Guys, we

have two choices, take new canisters down to *Mother* or bring *Mother* up.” Well, bringing that thing back up was a huge task so we knew we had to get the canisters down ourselves.

McKenney and I, along with 24 members of our Saturation Systems dive team, had just spent the last seven days securing an anchor line from our support vessel to the port side of the *Andrea Doria* and then getting *Mother* tied next to the main foyer doors, our target to enter the ship. Inside *Mother* were Chris Deluchhi and Don Rodocker, the designers of our saturation dive system. Well, everyone is exhausted from the non-stop diving work and heavy exertion. Jack and I had already done a long dive that morning taking Chris and Don down to the habitat and then we went forward to film the *Doria*’s name on the bow plate. So we were pretty well done in when this new crisis raised its head.

George lights a big cigar and gives Jack and I our assignment: take the transfer pot to *Mother* containing two canisters with hot meals for the guys in sat and the needed tools for *Mother*. George wants the transfer pot brought back to the surface once its contents are delivered. And while I’m down there, he asks me to open two oxygen cylinders for gas mixing.

The evening of July 26th, Jack and I walk down the ramp on the stern of the *Narragansett* and get into the small boat that will take us over



to the anchor line. It's now 8:45 PM at night. Wearing wetsuits, twin 72s, and Fenzy vests we're ready to descend. During the daytime decompression stops we had lots of Blue sharks swimming close, and this was a concern. In addition to the transfer pot, we're taking two lights and a rope to tie off to the lifeboat davit and then secure the other end to *Mother* on the side of the promenade deck.

George told us the transfer pot would weigh about four pounds in water. My adrenaline was running high. They handed Jack the pot and it was a good thing that he was holding onto the side of the boat. Instead of weighing four pounds, it was closer to 30 pounds in water. Jack and I made a quick decision to inflate our Fenzy vests, each of us would sling one arm under the rope attached to the pot and use a free hand to hold onto the down-wire.

The phosphorescence was our only light for the first hundred feet. I yelled into my mouthpiece for Jack to turn on the dive light. He did and then turned it off. I yelled again and he left the light on. There was nothing to see on this descent into blackness but the light gave me a small degree of comfort. Our first contact was the large boat davit. One rule for me when diving shipwrecks is to become familiar with the area, memorize the location of everything. I talk to myself about where this is and that is. I want to minimize the chances of making a wrong decision and on dives like this it is easy for things to go wrong. I don't like the unknown, especially at night.

The initial plan was to tie the rope off on the davit, however things changed when Jack let go of the rope and it drifted off in the current. I signaled to Jack, "Stay there with the pot". I knew the location of another line and swam off in darkness to find it. I brought back the line and secured it to the davit. Now we needed to carry the pot across the beams on the promenade deck. A misstep here and one of us with

the pot would fall into the open area of the promenade and then into the opening of the ship. A bad situation.

We were only 50 feet from *Mother*; we continued this balancing act, working the pot to the solid hull. *Mother* came into view. She was really eerie at night, giving off a glow from the small outside lights and a humming sound from the system. With narcosis coming on, I felt like we had entered another zone. We lifted the pot into the cage. I used a tool to hit the entry hatch of *Mother* to let Don and Chris know we were there and it opened up with a hiss of escaping gas.

I left Jack with the task of getting the pot up into *Mother*, removing the canisters and getting the pot ready for the return trip. I went to the main gas bank, opened two cylinders of gas that were needed and checked the pressure on the outside panel. A quick glance at my watch determined that we were way beyond our planned bottom time. We needed to get the transfer pot back across the promenade and begin our ascent. I looked for Jack, his head was up in the habitat, and I knew he was breathing the helium mix inside. Jack was coherent but not thinking all that clearly due to narcosis from our own tanks breathing air. I grabbed his legs and yanked but it was another precious minute before he left the habitat. He handed me the pot, it was almost as heavy as before. I wanted to leave it but he insisted we needed to take it.

Time was critical; we were into serious decompression at this point. I looked at my pressure gauge: 900 PSI left; Jack showed me his gauge: only 500 PSI left. We're at 170 feet in the dark... I thought, "Damn, we're in trouble."

We started our ascent, Fenzy's filled, pulling our way up the anchor line. Our decompression regulators with 100 percent oxygen were



waiting above us but it seemed like miles at this point. Jack always ran low on air first and I was worried that he wouldn't make it. A moment later the worst happened: Jack let go of the pot and started to go up the line by himself. I'm frantically kicking with all the dead weight myself now and reaching out to grab the line. I dropped more than 40 feet before I locked my hand onto the anchor line. I was frantic at this point. I needed to get the damn pot to 30 feet before I run out of gas or ditch the thing and we might lose it forever.

I could see lights above me. I pulled hard on the line, bubbles racing past my head. I'm beginning to over-breathe the regulator as my air supply is going when a hand from another diver reaches out and takes the pot from my hand. I let go and began rocketing to the surface.

Before I can release the gas in my Fenzy my head hits the bottom of *Big George*. Support divers were telling me to get back to the decompression stop at 30 feet. Totally wasted, I stripped myself of my tanks and pulled myself into the small support boat. I grabbed the oxygen line that Jack was on and pulled hard. At the same time I yelled at George to fire up *Big Blue*, our topside decompression chamber.

You have only a few minutes to get your ass into a chamber from a decompression dive. Jack hit the surface and I said, "Get rid of your tanks now, we're going into the chamber." We ran up the ramp on the back of the *Narragansett*, scrambled into the chamber with our suits on, and collapsed. I told George on the way in to pump it down fast. Ten minutes had passed since I hit the surface and I was worried.

Gas flowed, the door sealed, and we were on our way back to pressure. It was foggy inside, night outside with flickers of light coming through the chamber windows. None of us talked for the longest time. Jack and I had made a lot of dives together. This was a close one. An hour later we were on oxygen at 60 feet and we came out clear and symptom-free. We took a day off but we were back at it the next. I went into saturation the following week with Don and Chris and we cut the first entry hole in the side of the *Doria*.

What do you feel was ultimately accomplished?» The experience of living in a chamber tied to the *Doria* at 180 feet for six days was surreal. The three of us made lengthy excursions as far as our 250-ft. umbilical would allow us to travel. We were saturated on helium inside the chamber but our excursions were on air. Therefore we were saturated on both gases. Because Chris had some skin abrasions, Don and I did most of the cutting. I had never cut metal underwater before but my training as a welder at Standard Oil paid off. Imagine,

cutting a hole through the doors of the *Doria* at night: hundreds of fish attracted by the light formed an igloo over me and Blue sharks were swimming through feeding on them during this operation.

Following a couple of hazardous dives inside the first class area we made the decision that we did not have the resources to finish the job. It was simply too dangerous to continue beyond this point. A decision was made to bring the complex up and head for shore. We shot a lot of film but a good film needs a beginning, middle and an end. We didn't have an ending. We needed something, some treasure. We sold an option to the film early on. The option financiers paid me to be in New York for three weeks for post editing but in the end they passed.

Almost eight years later, Peter Gimbel raised money to go back to the *Doria* for another assault to try to find the first class safe and other potential riches. How did you feel about going back?» I received a call in 1980 from Gimbel; he was a good friend. The Gimbel name was synonymous with business on the east coast and Peter was famous for his underwater films and being the first person to dive on the *Andrea Doria* following its sinking. He also was the producer, cameraman, and star of the breakthrough documentary *Blue Water, White Death* that brought sharks to the public in a real way for the first time about a decade prior.

Peter told me that he had a final quest, to determine if the watertight bulkheads on the *Doria* were secure when the *Stockholm* hit her and to find and remove the safes from the wreck. "Was I interested in going back?" he wanted to know. Like he had to ask me if I was interested... just give me the date! Peter's plan was to engage Oceaneering International and one of its large saturation dive systems along with a 200-ft. ship designed for operations in the North Sea. It could not get any better than this. Peter had the finances to back an

expedition of this type and he accepted nothing less than the very best system and team possible to ensure success.

Peter, Jack McKenney, Nick Caloyianis and I were to be the four underwater photographers. The four of us went through a saturation-training program at Commercial Diving Center in southern California. From there we assembled at Peter's family home back east to inventory and pack all of the photographic and dive equipment needed for the trip. One thing about Peter, he was big on contingency planning. He had multiples of nearly all the components and redundancy for every possible event and product.

We boarded the *Sea Level II* at Long Island and spent six weeks over the *Doria*. I spent 17 days in saturation on this dive. Jack and I made excursions to every area of the ship that our 250-ft. long umbilicals would allow. We were there to remove the doors, find the safe, and cut it free. We'd then bring it to the surface. Peter also wanted to penetrate the ship to see if the watertight doors were in place to further determine why this ship sank.

Ted Hess, the lead diver for Oceaneering, cut the doors free and we brought those topside. This allowed a giant entry into the first class area. The inside of the ship was a junkyard, most everything fell from the port side to the starboard side piling 10-15 ft. of junk in the area where the safe was located. To remove all this crap and a lot of great artifacts included, we built a giant sling using wire fencing. The topside winch operator would lower this big sling through the doors, and then down to the port side of the ship another eighty feet deeper. We spent days and nights, around-the-clock "weather permitting" piling everything in our way into this giant sling and taking it up through the opening. Jack and I were on all of these dives working and filming.

We had a basic layout of the ship to find the safe. I suggested that we use the plan we had since it was to scale, and it provided us basic indicators of the safe's location. We used a line on a spool with distance marks and this provided us the range transects as we looked for the damn thing.

Another piece of equipment we used was an eight-inch vacuum device that sucked debris from the starboard side and lifted it to the outside of the ship... eight feet overhead. Drew Rudy, an Oceaneering diver, and I were sucking our way through a ton of debris one night. He'd run the vacuum for a while and then let the silt settle to see what we uncovered. I was filming him while he was moving things around and when the silt settled on this dive I saw the knob of the safe. We just looked at one another with disbelief! I'm not a skeptic usually, but there were times that we thought we were not going to find this damn safe. The following day we lowered the cutting torches and cut it free.

We accomplished both objectives and Peter produced *The Andrea Doria, Final Chapter*. The film was a major hit; Peter recovered all of his investment and in the end made money on the production.

A lot of today's divers, who seem blissfully uniformed, lay claim to having more dives on the *Doria* than others. Your team spent time on the wreck that will never be equaled.» This was an incredible diving operation with a great group of divers. It was an experience I will never forget. I spent a total of 12 weeks on the *Doria*, including 81 surface dives and a total of 21 days in saturation. Jack and I were probably the first people who ever made a night dive on the *Doria*.

Saturation system deployed on aft deck of support vessel



Even though we dove more during the day, I spent more than 50 hours at night on the wreck cutting the hole in 1973, removing debris and filming inside the foyer and first class compartments in 1981. You're right; no diver traveling from the surface for bounce dives will ever come close to the time I spent down there. I figure I've got nearly 300 hours of time on the old girl. For those guys like Gary Gentile who trumpet their hundred dives or so of about 20 minutes bottom time each... well, they're about 250 hours or so short of my bottom time.

Your team went after the *Doria* with well-trained and highly experienced divers using then state-of-the-art systems. How did you feel about the surge of popularity that followed and interest among other divers who wanted to dive the wreck?» Just because you're an excellent diver doesn't qualify you to dive the *Doria* or other

deep wrecks. Some of the divers on our 1973 trip became nervous and after a couple of dives chose not to make any more. There are many factors: weather, currents, visibility, and cold water. The *Doria* is a big ship; it's easy to lose your orientation on the outside of the ship... let alone inside. There are psychological issues to deal with as well. Getting to the wreck is one thing; peering through the big hole is an eye-opener. On the inside you need to be trained and if you're not in the right frame of mind... well, things happen.

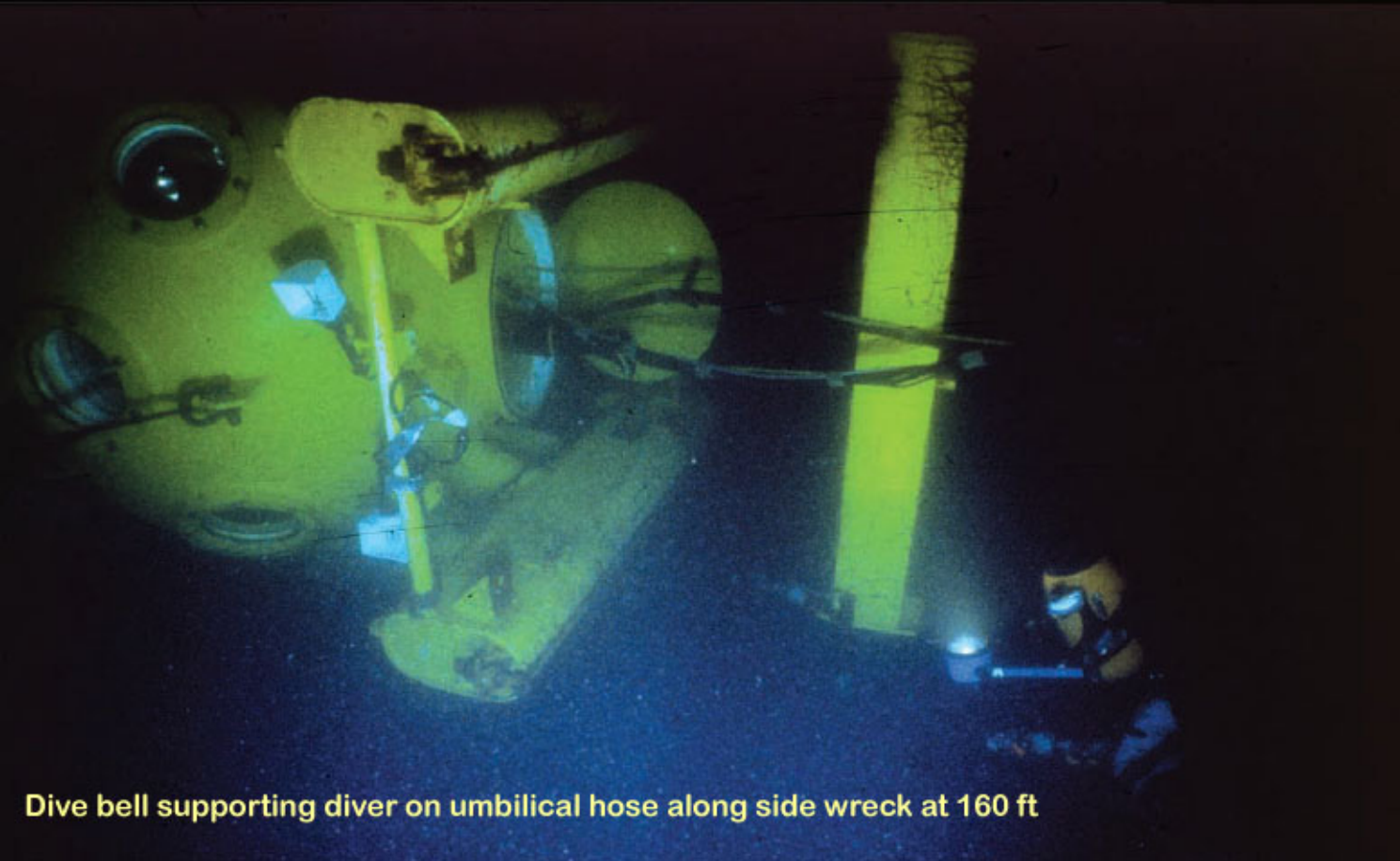
There was a rather astounding amount of accidents and fatalities that began in the mid-1980s and continued until recently. What are your thoughts on that era and the methodology a lot of those divers used?» Problems come from the lack of training and/or preparation. I'm of the opinion there is a lot of peer pressure that leads people to do things they should not be doing. Diving on the *Doria* is a good example.

Technical diving came out of the closet in the early 1990s and with it the use of mixed gas, accelerated decompression procedures, penetration techniques, etc. and still these mid-Atlantic wreck divers were knocking themselves off with regularity. Were you ever tempted to make comment based on your own expertise?» Of course, as you'll remember from your own experience back years ago, we didn't use the term "technical diving" during the 1960s thru the 1980s. The term came into use later to distinguish what was going on from the everyday sport stuff. Our groups rigorously planned each and every dive... and even then things went wrong. Without a strong support group topside, we could not have made the dives we did. I tend not to make public comments about what others were doing but I've offered personal opinions to divers who planned to dive the *Doria*. You'll have no trouble guessing what I told them. You were telling them the same thing.

Nitrox and dive computers became hotly debated topics in the same period. What were your opinions then about these innovations?» We were a forerunner in the development of electronic dive computers building our first unit in 1979. Properly used a dive computer today provides all divers extended time and more freedom underwater. The electronic dive computer is one of the great inventions for diving.

Nitrox came into full view in 1995 when DEMA put out a notice that they were not going to allow the term nitrox to be used and that exhibitors could not market nitrox training at the DEMA show. That was just plain stupid. It was a knee-jerk reaction reflecting their lack of knowledge on the topic. And the storm of protest that followed led to a swift decision to rescind that policy. The show went forward with nitrox vendors from all sectors. Oceanic was one of the first companies to acknowledge that their products could be used with nitrox mixtures to 40 percent O₂. NOAA divers had been using nitrox for 20 years at that point.

In many ways, the arch-conservatives of diving's old school seemed absolutely dead-set against just about every innovation that came along from BCs to single hose regulators to submersible pressure gauges. And this was way back in the late 1960s. How did you fit in to that group considering your engineering interest and desire to expand the sport?» I didn't share those perspectives. My focus is and has been to make diving safer and more enjoyable. Our tag line is innovation. Small and lighter products, easier breathing regulators, dive computers built into the mask. We were one of the first companies to announce and have a commercial rebreather at the DEMA show. This was 1995. I love to explore; I always want to swim deeper and stay longer. To satisfy that desire requires innovation and lots of engineering.



dropped. During the 1990s we witnessed an evolution of new sports, mountain biking with hi-tech features, roller-blading, skateboards, snowboards, kite boarding. These sports and others now compete directly with diving for time and discretionary income. In the mid 1990s people began to learn about computers and today every household has one or more. People are addicted to e-mail and Internet content.

To rekindle growth in diving requires exposure: marketing dollars are required and lots of them. DEMA and the diving industry do not have the resources required. My focus was to hire a marketing and communications firm to develop a means to do that. I am of the opinion that you need to develop partnerships with large companies and to be in a position to have personalities help market the product in

You've served multiple terms on DEMA's Board and as its President. What's your vision of the future for the sport? Will it regain its growth and attract more people to diving?» I was elected to the DEMA Board of Directors in 1993 or thereabout. I enjoyed being the president of the board in 2001 and 2002. During my tenure we made progress but we could have done more. There are political issues in DEMA. There will always be political issues, personal agendas, etc. and that prevents opportunity. One project was a major disappointment for me.

Diving had rapid growth in the late 1960s through the 1980s. Diving had exposure with the *Sea Hunt* series and regular Cousteau specials. This fueled growth. When these programs went off the air, popularity

media other than dive publications. We hired a firm and the first task was do research, to establish what motivates people to get into diving, the audience, etc. You need documented credible research before you can enter into discussions with potential co-marketing opportunities. During the end of my term we signed a contract with a firm to begin the first phase: research. When I left the board, the board changed, and somewhere along the way this project lost focus. It took three years to finish the research and at double the cost. To the best of my knowledge, this project is shelved... end of story. Entry-level certifications have not increased in several years. In fact, on an annual basis, they are less than six years ago. Not a very pretty picture. It's hard to maintain your engineering budget in a flat or declining market.

What do you think will be the largest area of growth in the next decade?» In terms of products, it will be tied to electronics. We are going to start shipping our Data Mask in mid-summer 2007. Other similar products will follow. You will see advancements made in dive computers offering more data along with information as to where your buddy is or where the boat is and how far away. Electronics will be included in BC's, regulators and, for sure, in rebreathers. We will see more rebreathers in the market place. Yeah, they're expensive and not as user-friendly as open-circuit SCUBA but this product will find its level in the market place.

In terms of new divers, dive travel is the attraction. Family vacations on liveaboards or specialty dive resorts are key. People are traveling more than ever and the thirst is there to dive in exotic locations.

Let's look back a bit. You had the chance to go out and visit a lot of the most exotic diving regions back when diving travel was fairly primitive. Any hairy experiences to share.» Beyond the *Doria* and wrecks in Bikini and Truk lagoon, my stressful experiences are minimal. The ones I do remember are drift dives in the Galapagos and areas of the South Pacific. I got on the wrong side of Wolfe Island in the Galapagos one time and the current was taking me taking me south... next stop Antarctica. The pick-up boat finally came around and saw my arm flapping away. I never dive without safety sausages any more. I love drift diving but I remember that it's very difficult for boat operators to see you if you're not visible due to water conditions, location of the sun, and distance from the boat.

Somewhere along the way, you stumbled into Papua New Guinea. When was that and what impression did the region leave with you?» I had the opportunity to dive most places on the planet; there are a lot of great places, Truk Lagoon, Palau, Galapagos, Cocos, Sulu

Sea, Red Sea, Sudan and shipwrecks like the *Doria*. But my favorite location is Papua New Guinea. My first trip there was with Bob Halstead on the *Telita*. I went back two years later on the *Chertan*. The owner, Rob van der Loos, and I became good friends. I wanted to explore the southern islands, the Engineer Group, the Conflicts, Misima and the Louisiade Archipelago. Rob agreed and we spent two to three weeks a year for several years doing these trips and discovered some fabulous diving. The waters of Milne Bay have to be some of the best on the planet. The biodiversity does not get any better than here.

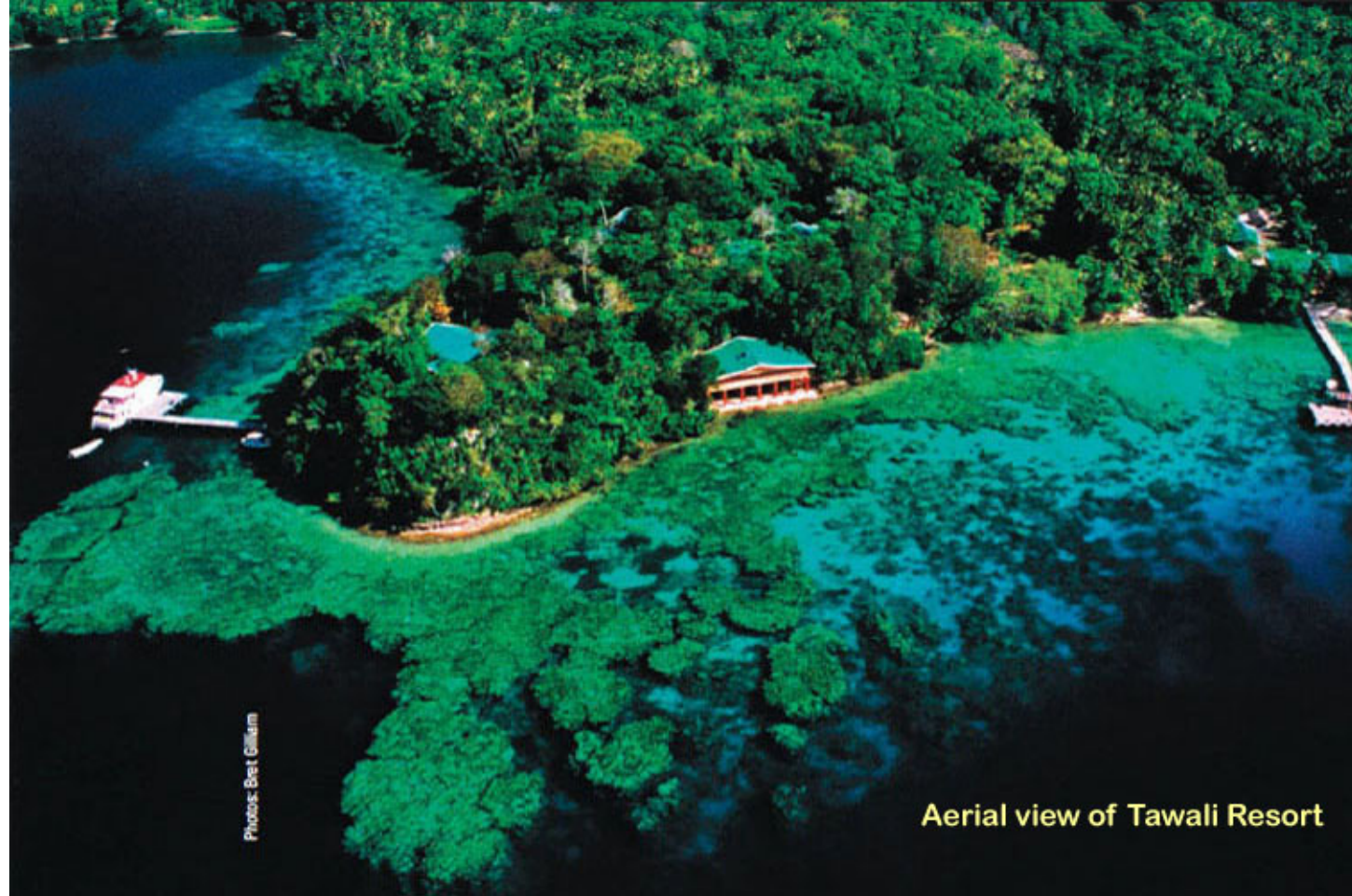
So that sparked the vision you had for your new Tawali Resort?» My wife Ronda and I talked to Rob about buying a big live-a-board boat in PNG. We later talked about buying a piece of land on the north coast and building a small eco-dive resort. We have done both.

How did you ever locate that remote property and manage to acquire it?» It took seven years to secure title to the land and build Tawali. The resort is at the mouth of Hoia Bay; on a limestone bluff 60 feet off the water. The main lodge with a dining room seats 50 people. A front veranda with a breath-taking view of Milne Bay and its outer islands is perched on the high bluff. There are now 14 bungalows along covered walkways. We put in two main wharfs for our boats. We built our own home at the base of the bluff just 15 feet off the water. We also have staff housing where 40 people live that are employed at Tawali. We have an instructors' house with four bedrooms over the dive shop, a compressor building with 25,000 cubic feet of gas in storage including 32 percent Nitrox. We just installed our hydro machine to keep tanks date current along with a new workshop for repairing motors and other equipment. A 60-ft. dive boat for our day trips was added four months ago. We are currently building a scientist workshop. Other projects include showers off the wharf including

additional rinse tanks for cameras after getting off the day boats. At the top of the stairs we are going to build a big room with tables for working on camera systems, charging outlets and lockers to allow individual storage of camera equipment. It's a very special place and provides immediate access to some of the world's best diving that was previously virtually inaccessible except by a handful of liveaboards.

You've recently thrown some more chips into the pot by buying a 120-ft. luxury liveboard vessel. Tell us about the ship and how that came to be?» The *Chertan* is a great liveboard but it has limitations for big trips to the Louisade Archipelgo and the chain of islands and reefs on the way. We also want to begin trips to Egum Atol and other reefs in that area. With this in mind we started looking for a boat. In October of 2006 we entered into an agreement to buy the *Aqua One*, a liveboard that has operated in Thailand and Indonesia for the past five years. The vessel is now at Tawali and will begin operation in March of 2007. We call it *Spirit of Niugini*.

You and I both have been around long enough to see what used to be pristine marine systems decimated by natural and manmade influences. What can we do to preserve what's left of the world's great diving?» Education and we need to limit the pressure on fragile eco-systems. Bonaire and a few other islands in the Caribbean are doing just that and it's working. The Red Sea is a different story... the pressure there is such that they are destroying reefs. On a recent trip, our day boat with 20 divers was moored to a small reef structure



in open water off the coast of Hurgada. The problem was there were seventeen other boats moored or tied to each other or us. There were no less than 400 divers underwater during those dives! Beginning divers holding onto anything they could hold onto. It was funny: they gave you the number of the boat you're on. That number is also painted on the bottom of the boat and you can more easily find your way back to the right one.

Do the Third World governments have the will and financial resources to act independently to save their ocean habitats?» Diving tourism in the Red Sea is a big business. They have the resources and someone with political power needs to step to the

plate. The Ecuadorian government is financially poor but they control the Galapagos. The Asian fishing fleets are after the sharks and the governments tolerate illegal fishing. If the government ever issues a permit to fish the sharks, that would kill dive tourism in that region. Asian fishing fleets have severely reduced the shark population in the Pacific and it will continue until action is taken.

You've got one choice as the single place to go for the best diving in the world. Where and why?» That's easy: Papua New Guinea... 1400 islands, five million people, 700 cultures and that many languages. PNG has the best biodiversity of marine life on the planet. The waters are clear and warm and, for the most part, unspoiled. We built our second home there. Granted, it's a long way to travel but we wanted a place for our children and their children to be able to travel to one of the last unspoiled destinations on the planet.

Those of us who started diving in the 1950s had Lloyd Bridges, Cousteau, and others to inspire us in diving. Finally, who do you see as the next emerging leader/hero/role model?» We currently have several role models: Jean-Michele Cousteau, others in the Cousteau family, Giddings, Howard Hall, Stan Waterman, and James Cameron. But none have the media appeal like Lloyd Bridges did in *Sea Hunt* or the original Cousteau series. We need a role model, a Tiger Woods of diving. A basic problem with our sport is that it's not conspicuous. A diver goes underwater and there is no real-time activity for the audience to follow.

You've had a lifelong passion for motorcycles. Didn't that nearly do you in back a few years ago?» I grew up on motorcycles; they have been a part of my life forever. I ride my bike to and from work on sunny days. I did a lot of off-road riding, hill climbs, trails and even entered a few amateur races. I fell off many times, too, but was never

hurt until January 2, 1995. My son Mike and I were riding our trail bikes and climbing this shale rock hillside, hopping over boulders, pretty wild stuff. I remember telling myself I need to turn this damn bike around. The next thing I remember was lying on the ground with the bike on top of me. I was in serious pain. Mike came back and helped me get the helmet off. I could move my head; that was a good sign. I tried to get up but the pain in my legs was excruciating. That was a bad sign. Mike basically dragged, half-carried me down the hillside to a trail. Another bike came along and Mike sent him off to get the rangers. They wanted to bring in a chopper to take me out but I said no. So Mike loaded me and the bikes into the pickup. Jon Hayes, my son-in-law, kind of held me into a sitting position during the one-hour drive to the hospital.

My wife, Ronda, met us there and she was frantic. I got wheeled into the emergency room and this Indian doctor is over me asking me questions, keeps repeating the same question. I'm asking for a shot of morphine or something to reduce the pain. They finally determined that I needed to be moved into the emergency trauma room next door with its own set of doctors. Following x-rays, and checking all vital areas, they put me out. I woke about eight hours later; Ronda was there. The head doctor from the trauma unit told me that I broke all the ribs on one side, fractured the scapula into four pieces, broke my collarbone, and cracked my pelvis in three areas, and had a slight bruise to my heart. Not bad for the second day of a new year.

I hate bedpans! So I was determined to get out of bed in the next two days. They put me on a morphine drip, allowing an extra drop if needed but it would allow you only one extra drop every 15 minutes. I woke early the second morning and started adding the drops. Ronda arrived a bit later. I was on a major high and told her to get a walker. She flatly refused. I insisted and she finally said okay. I pulled my

legs around onto the floor and began to lift myself to try to stand. Even with the flood of morphine, the pain was too intense and I had to admit defeat. On day three, with the help of Ronda and a nurse I managed to get to the bathroom. I endured the pain, used the toilet, hurdle one was behind me. Ten days later I was out.



With motorcycle, 2004

During the ten days I was hospitalized, DEMA put out a notice to the industry for whatever reason that led people to believe I was dying. Ask Ronda sometime how many plants and flowers we received; it was overwhelming. The deliveries continued; we filled all of the rooms in the ward and the nurse station. A nurse asked one day, “You must be a very important person, who are you?” I told her I was a Senator but not to tell anyone. In a short while all the nurses and doctors were poking their heads into the room saying hello. What a week!

You’re 70 years young. Any thoughts of retiring?» I’m into putting this new Hollis line together, my twin sons, age 22, are now in the business and I’m having fun watching them grow into normal adults. Ronda and my daughter Debbie are marketing Tawali and the new boat. So, no, I’m not ready to retire yet but I look forward to my trips to Tawali.

“There is much to do and so little time” – my favorite line.



Hollis ready for dive at Tawali, 2007

An underwater photograph of a cave interior. The scene is dimly lit, with a bright, circular opening in the distance that creates a strong beam of light. The cave walls and floor are rocky and uneven. The overall color palette is dark with highlights of light blue and white from the light source.

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December 2011

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