New Method for Saturation Diving

Lighter, Faster Decompression and Portable Alternatives to U.S. Navy Mixed Gas Diving

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ABSTRACT

Background: Conventional U.S. Navy deep diving is limited to 300 feet and requires the support of large surface platforms and a minimum of 13 divers. The breathing media used is HeO_2 and the diving apparatus is the MK-21. Recompression chambers, storage racks and equipment in excess of 50,000 lbs. are required on site.

Methods: By employing the use of alternate breathing media and new technology, deep diving can be accomplished in a more compact space with less decompression and to deeper depths with increased safety.

Results: Incorporating new knowledge of decompression tables and algorithms would allow the depth limit to be increased to 600 feet. The use of constant Partial Pressure of Oxygen rebreathers and dive computers can increase safety and decrease required decompression time. The incorporation of inflatable chambers and rebreathers would also reduce the required footprint and weight of a team as well as vessel required.

Conclusion: A team of 12 highly trained divers could be deployed worldwide with six rebreathers, one inflatable chamber, two sets of SCUBA bottles and a laptop computer. These divers could rapidly deploy on any commercial airline with all required material as checked luggage. Once on station, they could transit to the problem area on nearly any vessel suitable for the conditions.Data will be presented from experimental dives as proof of concept.

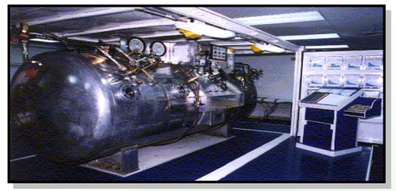
Current Navy Flyaway System

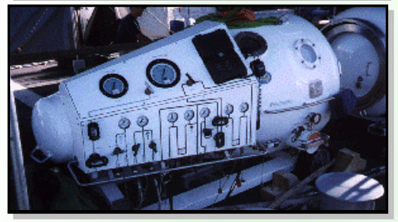
EQUIPMENT	WEIGHT	L	W	H	CUFT
CONNEX 1	15000	238	96	102	1349
CONNEX 2	16000	238	96	102	1349
FADS III CHAMBER	5000	142	69	72	408
FADS II O_2 RACK	2400	70	60	33	80
175 COMPRESSOR	2294	85	36	52	92
5K COMPRESSOR	2140	75	53	55	127
DIVER HEATER	3100	48	41	67	76
GAS PALLET	2500	55	48	40	62
Total	48,434				3,543

Proposed Flyaway Loadout

EQUIPMENT	WEIGHT	L	W	H	CUFT	Cost
3-K bottles O_2	400	12	12	60	5	$2000
3-K bottles He	400	12	12	60	5	$2000
5 SCFM compressor	120	26	16	17	5.45	$5000
6 rebreathers	550	30	18	18	10	$140,000
Personal dive gear	120	26	16	17	5.45	$10,000
Portable chamber	240	48	48	18	24	$30,000
Total	1830				54.9	$189,000

Current Recompression Chambers





Proposed Recompression Chamber

Basic Tenants of Lightweight System

- 96% Lighter than current system
- 98% Less cubic space required
- 84% Cheaper than current system
- Doubles the current max depth of dive
- Significantly decreases decompression time while requiring only 10% as much gas as the current system
- All equipment is commercially available
- Requires fewer divers/operators
- Less expensive
- More compact and easier to transport

Advantages of Trimix

- Decrease decompression time
- Decrease risk of High Pressure Nervous Syndrome (HPNS)
- Decrease risk of oxygen toxicity
- Less thermal losses
- Decrease “Mind race”
- Enables use of drysuit

Requirements for Proposed System

- One Diving Officer
- One Master Diver
- Ten Divers
- Satellite Phone
- Laptop Computer
- Six Rebreathers
- Decompression Software
- One portable Decompression Chamber
- Two AN/PQS 2A Hand-held Underwater Sonar
- One Remotely Operated Vehicle (ROV)

Conclusion

The current Navy philosophy is cumbersome and outdated. The U.S. Navy needs a fast reaction, deep diving capability. This lightweight system would greatly exceed our current diving capabilities, while being lighter, cheaper, more flexible, and able to be transported and implemented in a third of the current time. The Navy needs to align itself with the commercial & civilian diving sector in order to ensure the utility of our diving program, give our tax payers the best system for there money, and most importantly execute the Navy’s mission in timely and competent manner.