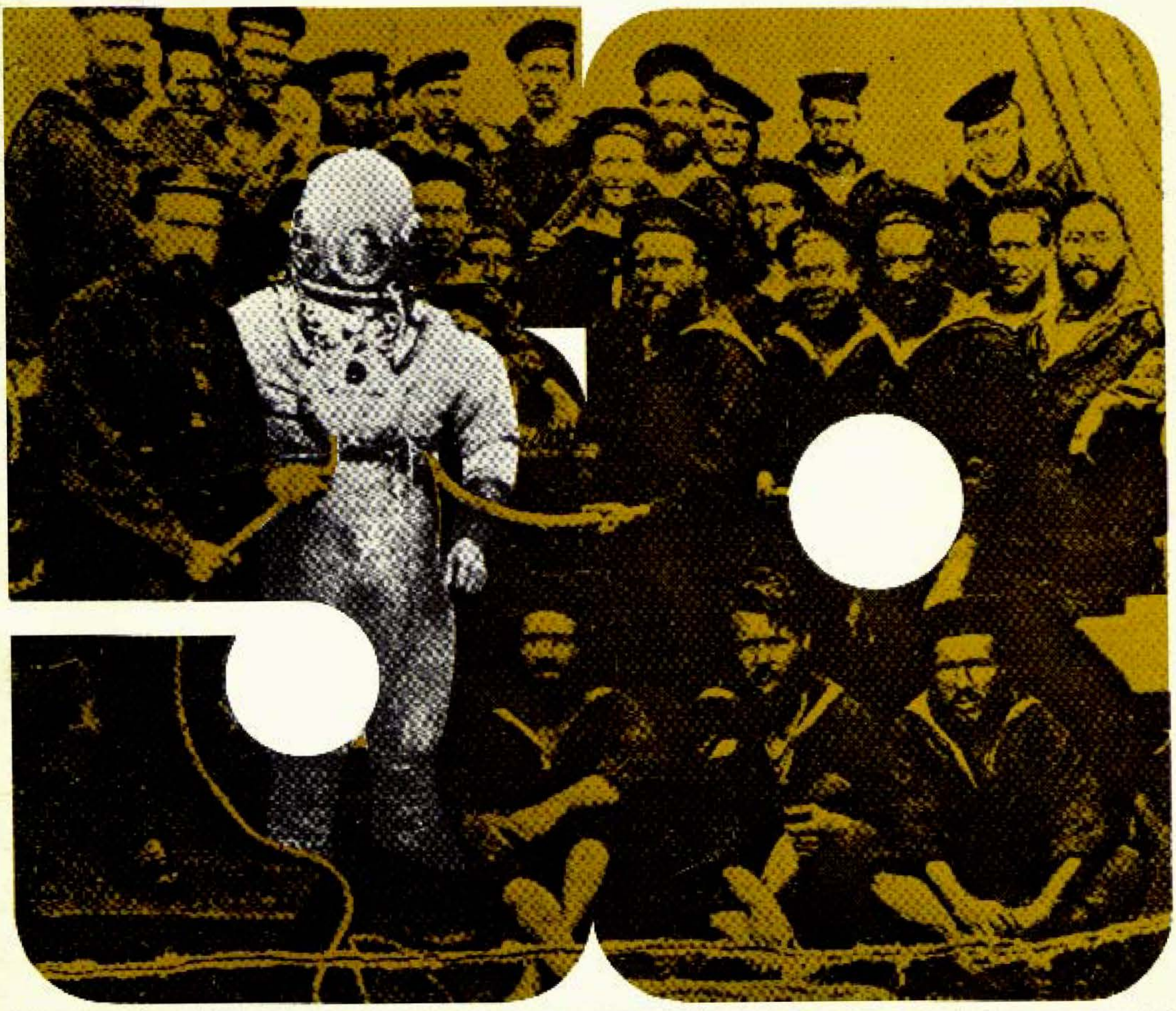
FALL 1978

FACEPLATE



50TH ANNIVERSARY NSDS

FACEPLATE

. . . the official magazine for the divers of the United States Navy

VOLUME 9, NO. 3

FACEPLATE is published quarterly by the Supervisor of Diving to bring the latest and most informative news available to the Navy diving community. Articles are presented as information only, and should not be construed as regulations, orders, or directives. Discussions or illustrations of commercial products do not imply endorsement by the Supervisor of Diving or the U.S. Navy.

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EDITOR-IN-CHIEF
CDR F. Duane Duff

ASSISTANT EDITORS-IN-CHIEF
CDR Frank M. Richards
LT Frank DiGeorge

MANAGING EDITOR
Stephen Person

LAYOUT
Lisa Degenhardt

PRODUCTION
Sally Huff

Front cover shows a group of divers at the turn of the century. The U.S. Navy has been training divers for more than 100 years, but a permanent school was not established until 1928. NSDS marks its Golden Anniversary this year (see page 18). (Photo courtesy of Chief Joseph Scalpi, NSDS)

Inside front cover shows diver wearing MK V Deep Sea Diving Outfit during diver tools training at NSDS. (Photo by LT Pete Herlin, NSDS)

Back cover shows a school for enlisted divers aboard the USS HARTFORD 101 years ago. (Naval Photographic Center photo)

SOUNDINGS

MASTER DIVER NOTEBOOK ISSUED

As a result of interest expressed at last year's Master Diver's Conference in San Francisco, the Supervisor of Diving has assembled and issued a comprehensive Master Diver Notebook to each of the Navy's 77 master divers. The Notebook is an invaluable reference tool containing diving-related messages, notices and instructions promulgated by OPNAV, SECNAV, NAVFAC, NAVMAT, NAVSEA, BUMED, SURFLANT and SURFPAC. It also contains excerpts pertaining to diving from the BUMED and BUPERS Manuals, plus all AIG 239 messages since February, 1976. These AIG (address indicating group) messages are issued by CNO (OP 23), CHNAVMAT, NAVSEA, and NAVSAFECEN to promote diving safety and other urgent information to all diving activities. Master divers will receive packets of the latest messages and instructions twice each year to keep their Notebooks current. Because copies are limited, individuals interested in the publication are encouraged to consult with their master divers, rather than request copies from the Supervisor of Diving.

RADM BURKHARDT NAMED DEEP SUBMERGENCE DIRECTOR

On August 21, Rear Admiral Lawrence Burkhardt, III, relieved Rear Admiral Albert J. Baciocco, Jr., as Director, Deep Submergence Systems Division (OP 23) and Director, Attack Submarine Division (OP 22) in the Office of the Chief of Naval Operations. Prior to his appointment, RADM Burkhardt served as Chief of Staff, Commander Submarine Force, U.S. Atlantic Fleet, Norfolk, Virginia. RADM Baciocco has been appointed Chief of Naval Research.

NAVY DIVER I.D. CARDS

The Supervisor of Diving has authorized the issue of an identification card to qualified Navy divers. The primary purpose of the card is to identify the holder as a diver so that if he becomes unconscious or ill from an undetermined cause, he may be considered for recompression treatment. Additionally, it is expected that the cards will assist Navy divers who do not hold certification cards from civilian diving organizations in obtaining air and other services from commercial dive shops. Activities desiring such cards should address their requests to the Supervisor of Diving, NAVSEA Code OOC, Washington, D.C. 20362.

SPEAKING OF LETTERS

The issuance of the Navy diver identification cards discussed above is a direct result of letters written by divers to FACEPLATE. Remember, one of this magazine's primary purposes is to respond to your questions and needs. Your letters, comments, and suggestions are welcomed. Let us hear from you.

USS PIGEON GETS NEW C.O.

Commander Charles J. Duchock has relieved Commander Albert J. Smith as commanding officer of the twin-hulled submarine rescue ship USS PIGEON (ASR-21) at San Diego, California. CDR Duchock previously served aboard the submarines PICKEREL, GUDGEON, and SALMON, and was chief instructor at the Australian Joint Anti-Submarine School at HMAS ALBATROSS. CDR Smith is now assigned to Staff, COMSUBDEVGRU One.

HYDRAULIC DIVER TOOLS MANUAL ISSUED

The technical manual for the operation and maintenance of U.S. Navy diver tools has been issued by the Naval Sea Systems Command. The tools were developed or modified for underwater use by the Diver Tool Group of the Diving and Salvage Department at the Naval Coastal Systems Center. The thirteen-chapter manual contains complete information about the two groups of hydraulic tools (power tools and diver-powered tools), plus information about the variable buoyancy lift bag, hydraulic hoses, and hydraulic fluids. Ordering information on the Hydraulic Diver Tools Technical Manual will be forthcoming.

MORE ON IEP B-12

Some 50 representatives from the United Kingdom, Canada, Australia, and naval activities throughout the U.S. were at the Navy Experimental Diving Unit August 22-24 for a meeting of the 1978 Information Exchange Project (IEP) B-12. The meeting provided an opportunity for each country to share developments, address common problems, and discuss future directions in diving. Among the topics of discussion were metric conversion in diving, one-atmosphere diving suits, thermal protection and decompression schedules.

Participants from the United Kingdom included CDR A. G. Worsley, RN, Superintendent of Diving; SURGN CDR R.R. Pearson, RN, Senior Medical Officer (Underwater), Institute of Naval Medicine; P. R. Christopher, Senior Principal Scientific Officer and Head, Experimental Diving Unit; Robert Hicks, Higher Scientific Officer from the Experimental Diving Unit; and CDR A. B. Hortin, RN, staff Officer to the Commander, British Navy Staff, Washington. Also attending were members of the U.S. Navy Diving Exchange Group serving with the Royal Navy, including LCDR S. F. Cwiklinski, USN; LT K. D. Hammar, USN; and BMCM (MDV) P. Behling.

U.S. Navy participants included CDR F. Duane Duff, Supervisor of Diving; CDR W. N. Klorig, NAVSEA Deputy Director of Ocean Engineering; CDR R. A. Bornholt, Staff, Commander, Naval Surface Forces Pacific; military and civilian professionals from NEDU and NCSC; and CDR C. A. Bartholomew, C.O. of NEDU.

CHIEFS GARNETT AND HILLIS RETIRE AT NCSC

BMCM(DV) William A. Garnett, III, and BMCS(DV) Marrion F. Hillis retired from the Navy on July 11 at the Naval Coastal Systems Center, Panama City, Florida. Both had been assigned to the Swimming and Diving Division of the Diving and Salvage Department. At retirement ceremonies, both Garnett and Hillis received plaques from the Navy Experimental Diving Unit in appreciation of their support to that command; plaques from the chief petty officers of NCSC and the tenant commands; the national ensigns that flew over the command on their last day of service; and other mementos of the occasion. Also, Master Chief Garnett received a plaque from LTCOL Barclay Hastings, Marine Corps Program Office, in appreciation of his support to an amphibious boat task being conducted at NCSC.

PROTOTYPE JET/DREDGE TOOL REDUCES DIVER FATIGUE

Water-jetting or dredging is frequently required in underwater salvage and construction tasks to remove sediments. Current jetting methods require the diver to contend with large, heavy hoses, unbalanced nozzle systems, and in some cases poor visibility created by the disturbed sediments. When dredging, divers must handle awkward equipment and remove debris from the easily-clogged intake. Both techniques are less than efficient and lead to diver fatigue.

Under a task initiated by the Civil Engineering Laboratory, Port Hueneme, California, the Naval Coastal Systems Center, Panama City, Florida, tested a number of jetting and dredging components, then assembled a prototype, diver-operated jet/dredge tool using a Stanley SM-2 sump pump and a 3-inch "Gold Dredge." The combination jet/dredge, which was developed by NCSC's Carl Smith and John Mittleman, is a force-balanced system requiring little diver effort to handle. It also yields higher excavation rates than current methods because the jet continually breaks up sediment in front of the dredge. And, because the dredge sucks up the cloud of silt raised by the jet, visibility remains relatively clear, allowing the diver to monitor his progress. Details on the design, development and testing of the combination jet/dredge tool are reported in NCSC Technical Memorandum 229-78.

LCDR CONANT COMMANDS USS SUNBIRD

Lieutenant Commander E. Conant relieved Commander E. Craig as commanding officer of the USS SUNBIRD (ASR-15) at change-of-command ceremonies in New London, Connecticut, recently. CDR Craig now goes to Charleston, South Carolina, as executive officer of the submarine tender USS ORION (AS-18).

HIGH PRESSURE NERVOUS SYNDROME PROBED AT NMRI

Researchers at the Naval Medical Research Institute in Bethesda, Maryland, are investigating the physiological mechanisms that cause the neuromuscular tremor divers experience during compression, especially at depths over 1000 fsw. This tremor is a symptom of the high pressure nervous syndrom (HPNS). It severely interferes with diver performance and safety to the extent that it may limit the speed of compression as well as maximum depth a diver may attain. Researchers S. P. Gruenau and M. J. Ackerman have observed a parallel between the physical characteristics of HPNS on both animals and humans. Using guinea pigs, the researchers hope to discover the physiological mechanism which brings on the tremor. Once this mechanism is understood, strategies can be developed to counteract or prevent it. NMRI is directing continued research toward this goal.

L-r: RADM Chambers, LCDR Sandoz, MMCM Gwinn, BMCS Petrasek, and PN1 Whitehead.

RADM CHAMBERS REENLISTS DIVING DETAILER PETRASEK

Senior Chief Petrasek, entering 17th year as a professional Navy diver, now helps enlisted divers in the areas of career planning and duty assignments.

BMCS (MDV) A.J. "Pete" Petrasek, the Navy's enlisted diving detailer, was reenlisted on September 22 by Rear Admiral Lawrence C. Chambers, Chief of Naval Personnel for Enlisted Development and Distribution. The ceremony took place at the Wolfe Building, Silver Spring, Maryland, and was attended by Lieutenant Commander John F. Sandoz, Coordinator for UDT/Seal and EOD enlisted divers; PN1 Gary W. Whitehead, training coordinator for enlisted diver programs; and MMCM (EOD) Robert L. Gwinn, to whom RADM Chambers presented a citation for superior performance during the former's duty as Master Chief Petty Officer of the Command, NAVSCOL EOD, Indian Head, Maryland, from 1973 to 1978.

As enlisted diving detailer, Chief Petrasek is the focal point for Navy divers in areas related to career planning and guidance, travel, and duty assignments. His diving career began 16 years ago when he completed training at the escape training tank, Pearl Harbor. He was assigned as one of the first Navy divers aboard the icebreaker USS EDISTO (AGB-2), and later, while assigned to the USS PRESERVER (ARS-8), participated in the salvage of the OCEAN EAGLE off San Juan, Puerto Rico.

During duty at the Navy Experimental Diving Unit in 1968, Chief Petrasek participated in the historic 1,000-foot dive at Duke University, and was a diving subject during the subsequent 600-foot Navy-Duke dive. He next served with the MK 1 Deep Dive System at Norfolk and then with USS TRINGA (ASR-16), where he became a master diver.

Since joining the Office of the Chief of Naval Personnel as enlisted diving detailer in 1976, Chief Petrasek has dedicated himself to providing information and counsel to divers, and to carrying out the difficult and unenviable task of balancing divers' duty requests with the Fleet's needs.

DECOMPRESSION SICKNESS & DEEP AIR DIVING

NSMRL Researchers Show that the Occurrence of Decompression Sickness Among U.S. Navy Divers Making Deep Air Dives is Extremely Low, but that When It Occurs, It is Probably Caused by Individual Differences in Susceptibility Rather than by Pushing the Decompression Table Limits.

William L. Hunter, Jr., CDR, MC, USN
Gene B. Pope, HMC(DV), USN
Danny A. Arsu, HM1(SS), USN

Naval Submarine Medical Research Laboratory,
Groton, Connecticut

The overall incidence rate of decompression sickness among U.S. Navy divers is consistently well below one-tenth of one percent, a figure which is among the lowest in any diving organization in the world. This very low incidence rate attests not only to the safety of the Navy's decompression schedules but also to the manner in which diving operations are conducted in the Fleet.

However, decompression sickness casualties do occur, and we have the responsibility for examining such accidents in order to determine the possible explanations for them and to devise methods to prevent similar accidents in the future.

The vast majority of Navy dives (over 97 percent) utilize air as the breathing medium and are conducted at relatively shallow depths. Approximately 97 percent of all air dives are to depths shallower than 150 feet of sea water, gauge (fswg). By contrast, the majority of decompression sickness casualties occur in deeper dives. If air dives to 150 fswg and deeper are compared to air dives shallower than 150 fswg, the incidence of decompression sickness in the deeper dives is more than ten times that seen in the shallower dives.

Such a finding probably fails to surprise Navy divers. They know (sometimes from personal experience) that deeper dives are generally more dangerous than shallow dives. They also know the importance of selecting the correct decompression schedule. The Navy Diving Manual Section 7.4.2 addresses schedule selection by stating:

"...As assurance that the selected decompression schedule is always conservative—(A) always select the schedule depth to be equal to or the next depth greater than the actual depth to which the dive was conducted, and (B) always select the schedule bottom time to be equal to or the next longer bottom time than the actual bottom time of the dive..."

The manual goes further by stating:

"NEVER ATTEMPT TO INTERPOLATE BETWEEN DECOMPRESSION SCHEDULES. If the diver was exceptionally cold during the dive, or if his work load was relatively strenuous, the next longer decompression schedule than the one he would normally follow should be selected..."

This suggests that if there is any question (for example: cold water, heavy work load), the next longer schedule should be chosen.

Navy divers are actually taught to be even more conservative. The procedure taught at the Naval School, Diving & Salvage, is as follows:

If the dive is within 2 feet or 2 minutes of the appropriate schedule, the next deeper and/or longer schedule should be used.

In other words, don't "push the tables." This procedure was recently emphasized in FACEPLATE (see "The Old Master" column, Winter 1976), and allows for depth gauge inaccuracies and so forth. Coming very close to table limits is thought to increase the likelihood of decompression sickness, while dropping to the next deeper and/or longer schedule is believed to add a measure of safety for the diver. Closely related is the belief that most dives that result in decompression sickness are those which do "push the tables."

6,600 Dives Analyzed

During other work involving decompression principles, we became interested in whether or not there is any relationship between "pushing the tables" and the development of decompression sickness.

We obtained data for air dives logged from 1971 through 1975. This information was supplied by the Naval Safety Center and consisted of selected items found on the OPNAV 9940/1 forms ("Diving Log–Combined Accident/Injury Report). Because the majority of decompression sickness casualties occur in deeper dives, we decided to look at all air dives that were decompressed on the 150/10 schedule or more (that is, 150 fswg or greater for 10 or more minutes.) A total of 6,600 such dives were logged during the 5-year period studied.

By comparing the actual depth and bottom time of the dive to those of the decompression schedule used, we were able to classify a dive into one of three categories:

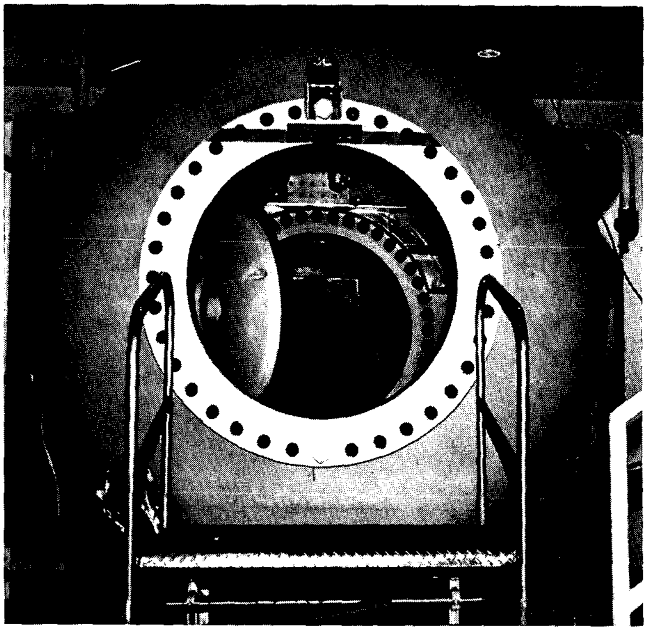
1. Under Schedule Limits
   The actual depth was 3 or more feet shallower than the schedule and the actual bottom time was 3 or more minutes less than allowed by the schedule. (Example: Dive 146 feet for 17 minutes. Schedule 150/20 used.)
2. Near Schedule Limits
   a. 2 *or* 2 – Either the actual *depth was within 2 feet* of the schedule depth, *or* the actual *bottom time was within 2 minutes* of that allowed by the schedule.
   (Example: Dive 146 feet for 18 minutes, or for 20 minutes. Schedule 150/20 used.)
   b. 2 *and* 2–The actual *depth was within 2 feet* of the schedule depth *and* the actual *bottom time was within 2 minutes* of what the table allows.
   (Example: Dive 149 feet for 18 minutes, or 150 feet for 20 minutes. Schedule 150/20 used.)
3. Exceeded Schedule Limits
   Either the actual depth or the actual bottom time exceeded the depth/time limits of the schedule. In other words, inadequate decompression was given. (Example: Dive 149 feet for 23 minutes. Schedule 150/20 used.)

The Findings

A summary of our findings is presented in Table 1. The data in Column 1 of the table reveal the following:

- Nearly 99 percent of deep air dives logged were decompressed in accordance with procedures set down in the U.S. Navy Diving Manual (Category 1 + Category 2).
- Less than 20 percent appear to have followed the NSDS recommendation to use deeper/longer tables if close to the limits (Category 1).
- Over 80 percent of these deep air dives, which are known to be more dangerous, were not decompressed on a deeper/longer schedule even though they were very close to allowable depths and/or times (Category 2a + 2b).
- Over 1 percent of deep air dives received inadequate decompression (Category 3).

The data in Columns 2 and 3 of the table show that the percentage of decompression sickness casualties in each category (under, near, and exceeding the limits) is virtually identical to the percentage of the number of dives that were made in that category, and there is no



statistically significant difference between the two. (For any statistics buffs out there: Yates corrected chi square $= 0.255$, $df = 3$, $p > 0.95$.)

Column 3 shows, in addition, that the decompression sickness rate remains nearly the same across all categories. And so it is true that most cases of decompression sickness occur in dives that are approaching the table limits. But that would be expected, because most dives approach table limits. In addition, the casualties appear to be independent of the "2 or 2" rule.

What this may mean is that the Navy schedules work very well when used correctly, and that most of the time decompression sickness casualties may be related to factors other than the dive/decompression profile itself. We already have scientific evidence that some divers are more susceptible to decompression sickness than others (another example of science "discovering" what field personnel already knew). These differences in susceptibility are loosely termed individual variation, and could possibly be related to factors such as age, physical condition, anatomical patterns of small blood vessels, or sensitivity of the body's chemistry to stress.

At any rate, since the data indicate that the rate of decompression sickness is nearly the same whether dives are close to table limits or not, the "2 or 2" rule (admittedly unwritten) may not offer as much of a safety margin as thought.

Of course, the analysis does not take into account work load, water temperature, or other dive-related factors, but it is assumed that such factors would balance out between the categories. These conclusions may give dive supervisors more leeway in their choice of schedules or at least less anxiety when dives are approaching schedule limits.

Special comment should be made about Category 3. Although no casualties were reported, all 88 of these dives involved actual bottom times in excess of the schedule time (for example, a dive to 150 fswg for 34 minutes that was decompressed on the 150/30 schedule.) The average excess was 5.08 minutes. In no dives was the recorded dive depth in excess of the schedule depth. It is impossible to determine whether this is a real finding, or whether this represents recording errors—either in filling out the 9940/1 report forms or in transcribing them into the computer format. We suspect that it is a recording problem, especially in view of the fact that no decompression sickness occurred in this category. But, if Fleet divers are actually following such practices, they should discontinue them and follow standard procedures.

TABLE 1

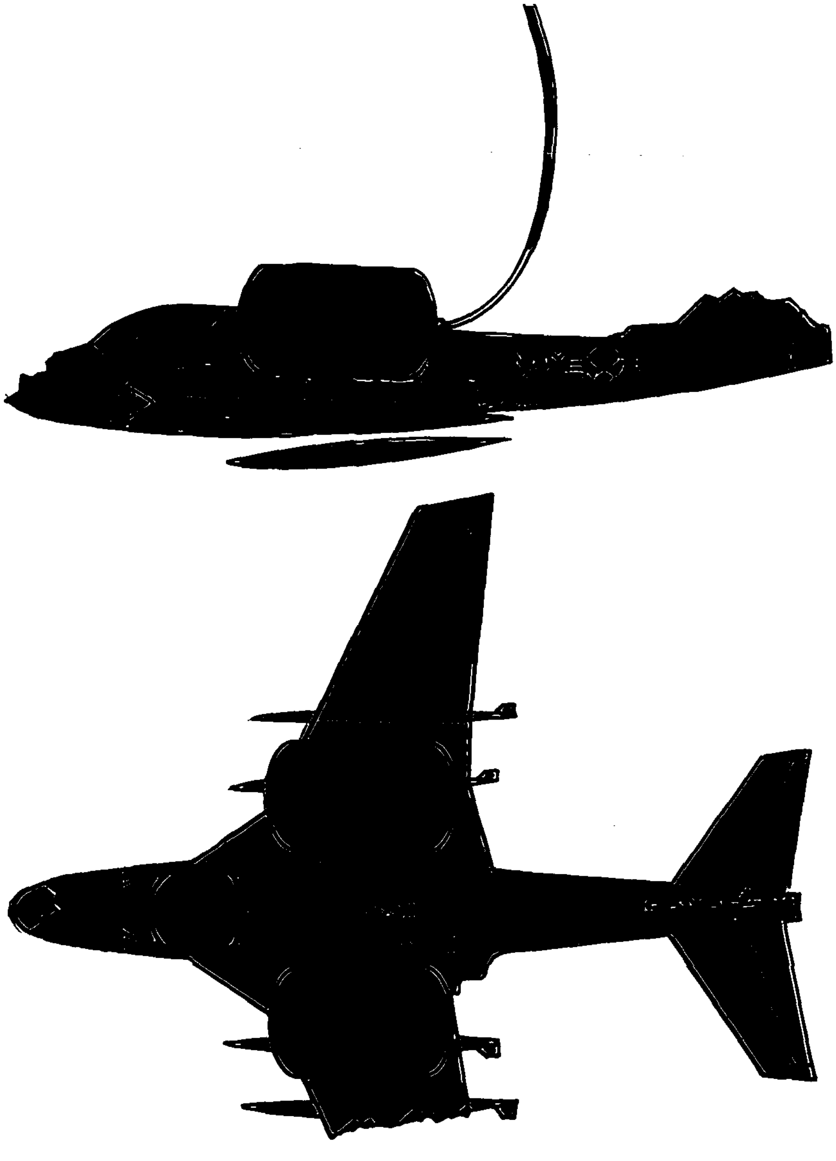
DEEP AIR DIVES AND
DECOMPRESSION SICKNESS CASUALTIES BY CATEGORY

	Column 1		Column 2		Column 3
	ALL DIVES		DIVES LEADING TO CASUALTIES		DECOMPRESSION SICKNESS RATE
CATEGORY	Percent	Number Logged	Percent	Number Logged	Cases per 1000 Dives
1. Under Schedule Limits	17.0	1119	19.0	12	10.7
2. Near Schedule Limits					
a. Within 2 min. *or* 2 ft.	30.7	2028	28.6	18	8.9
b. Within 2 min. *and* 2 ft.	51.0	3365	52.4	33	9.8
Total Near Limits (2a + 2b)	81.7	5393	81.0	51	9.5
3. Exceeded Schedule Limits	1.3	88	0.0	0	*
TOTALS	100.0	6600	100.0	63	Overall Decompression Sickness Rate = 9.5 Cases per 1000 dives

*The number of dives in Category 3 is not large enough to calculate a meaningful decompression sickness rate.

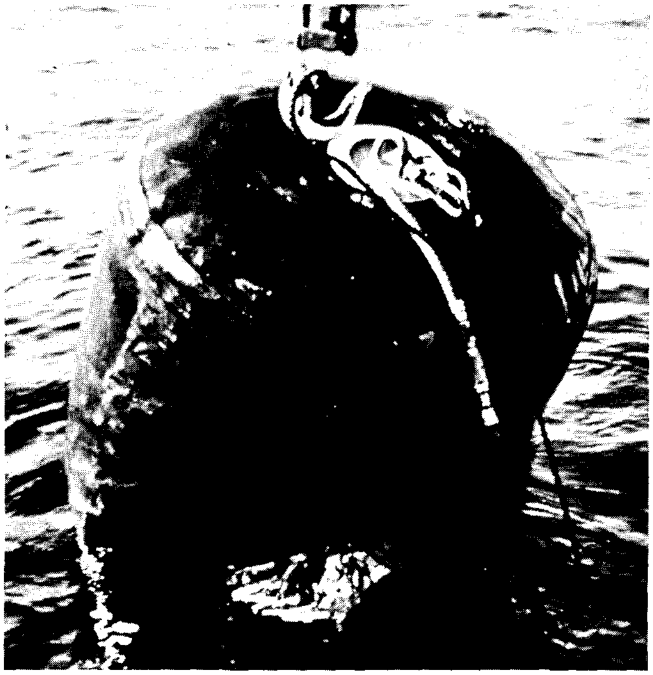
USING THE 8.4-TON SALVAGE PONTOON IN THE HORIZONTAL MODE

This Technique Isn't "In the Book," but has Proved Effective–Especially in Raising Sunken Aircraft



A MARINE SALVAGE OPERATION IS SOMETIMES BEST CONDUCTED BY RAISING THE SALVAGE OBJECT CLOSE TO THE SURFACE WITH SALVAGE PONTOONS AND THEN TOWING IT ASHORE. NORMALLY, THE NAVY'S 8.4-TON, INFLATABLE PONTOONS ARE USED IN A VERTICAL MODE TO ACCOMPLISH THIS, BUT THEY HAVE BEEN USED WITH GREAT SUCCESS IN SEVERAL RECENT OPERATIONS IN A HORIZONTAL CONFIGURATION.

Illustration shows recommended placement of 8.4-ton inflatable pontoon at each wing of damaged aircraft, close to fuselage.

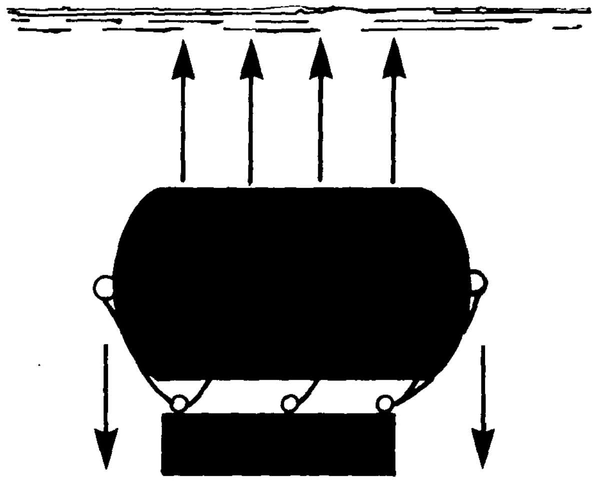


If You Try It

To use the 8.4-ton salvage pontoon horizontally, complete the majority of rigging and heaving around topside in order to reduce diver work. Snatch blocks and power winches should be used in the yard-and-stay method of pontoon positioning. Chafing gear should be used on nylon slings to avoid cutting by jagged metal. The use of the pontoon in the horizontal position does not overstress the rubber pontoon.

Further recommendations for the proper use of the 8.4-ton salvage pontoon in the horizontal position are as follows:

- The 8.4 ton pontoon should be the unmodified type with relief valves on each end.
- Set valves at each end of the pontoon at 7 to 8 psi.



Straps and/or cargo nets should be rigged around the pontoon to prevent it from bowing or humping at center when inflated.

- When setting pontoons, make sure that exhaust valves are at lowest point so that they stay in the water when on surface.
- Use cargo net or nylon straps of appropriate strength and position them to support entire length of pontoon, if possible, when lifting.
- When rigging, allow for full 86-inch diameter and 121-inch length of inflated pontoon.
- Partially inflate pontoon for neutral buoyancy. The pontoon and net configuration is too heavy and bulky to be managed by divers otherwise.

While the Supervisor of Salvage approves of the use of the 8.4-ton pontoons in a horizontal mode, it should be noted that this method has not been extensively tested, and should be used only when operational requirements rule out the primary vertical mode.

When a United States Navy A-6 Intruder crashed in 40 feet of water in Oakland Harbor earlier this year, SUPSALV representatives recommended attaching two 8.4-ton pontoons horizontally to the aircraft. This would provide a total lift of 16.8 tons to raise the 14-ton aircraft. The pontoons were well suited to the size of the aircraft, fitting neatly above each wing close to the fuselage.

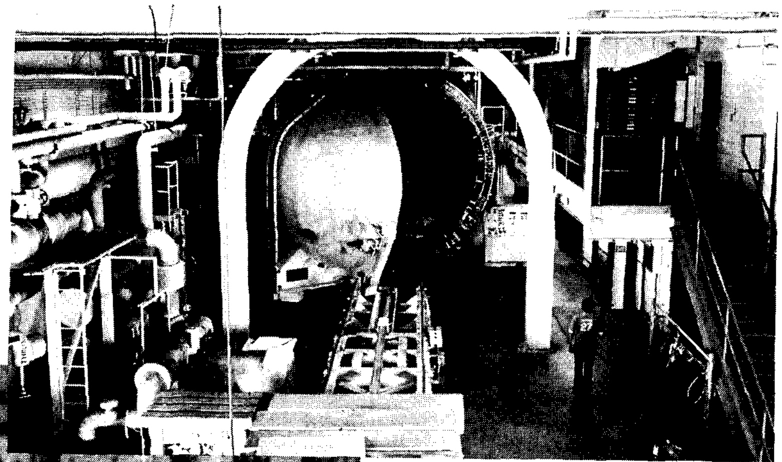
The aircraft was brought to the surface and towed to NAS, Alameda, with most of the port wing and tail section riding above water. Once alongside the pier, four slings were rigged from a 100-ton rail crane to the lift padeyes on both pontoons. The A-6, with pontoons attached, was lifted from the water, concluding a highly successful operation.

The rigging procedure for the A-6 salvage operation was as follows: Two nylon slings were crossed beneath the fuselage, one from port forward to starboard aft, the other from starboard forward to port aft. Each nylon strap SWL was 26,000 pounds. The pontoons were lowered in place by the yard-and-stay method with lines passed down through the lift sling padeyes back to a dive boat. Two fold purchases were then used to pull the pontoon to the wire straps. A third line was rigged to prevent the 750-pound pontoons from free-falling. Two additional wire straps were rigged on top of the aircraft from port forward to starboard aft, and vice versa, to prohibit any movement of pontoons and slings during the lift.

FOURTEEN DAYS DOWN

Scenes from an NEDU Saturation Dive at the Ocean Simulation Facility

The Navy Experimental Diving Unit has conducted several important saturation dives at the Navy's giant Ocean Simulation Facility in Panama City each year since the OSF became operational in 1974. The most recent dive series was to simulated depths in excess of 300 feet, during which three life support systems were evaluated. Participating in the dive were: LT Gordon Rank, CF; LCDR Ian Buckingham, MED, CF; HMCM(DV) Burwell; ENC(DV) Robert Tardy; HTC(DV) David LeJeune; and BM1(DV) John Johnston. The OSF is the Navy's largest hyperbaric facility and features five dry chamber complexes in addition to the 55,000-gallon wet chamber, which is 15 feet in diameter and 47 feet in length.



Above: Dive is conducted inside Ocean Simulation Facility's 55,000-gallon wet chamber. Below: LT Rank displays a hearty appetite inside one of OSF's five dry chambers. (Photos by T. Ulbricht)

Above: Flow of information is continuously monitored on OSF medical deck. Right: In the OSF control room, Dive Supervisor LT J.T. Harrison and Projects Officer LCDR Bob Demchik direct a segment of the dive.

Lieutenant Philip Kern, USN
and
HM1(DV) Daniel E. Kane, USN
U.S. Naval Submarine School

The USS NUCLEARFISH has just surfaced off the coast of New England and begun her transit of Long Island Sound, making her way toward the submarine base at Groton, Connecticut. Her patrol at an end, she now faces what has historically become the most frequent setting for a submarine accident. In the busy shipping lane, the NUCLEARFISH is accidentally rammed by a merchant ship headed for the open sea. She sinks and comes to rest in 120 feet of water.

The Submarine Rescue Ship HAWK is dispatched to assist the downed submarine. Underwater communications between the submarine and the rescue ship indicate that blowing ballast will not raise the NUCLEARFISH and that her severe starboard list will not allow the McCann Rescue Chamber or the Deep Submergence Rescue Vessel to mate with her escape hatch. Deep-sea divers from the HAWK enter the water to investigate and have confirmed the report.

Although the preceding is a hypothetical situation, history has proven that it has happened, and that it may happen again. Large ships often fail to identify the small silhouette of a submarine and, thinking it is a highly maneuverable small craft, fail to avoid it.

The staff at the Escape Training Tank at the U.S. Naval Submarine School in Groton, Connecticut, knows that crews will be able to safely exit from stricken submarines like the NUCLEARFISH and be returned to port—they have trained every U.S. Navy submarine crew in the Individual Free-Breathing Buoyant Escape Method of Submarine Escape.

Submariners Learn Buoyant Ascent Techniques At Submarine School's Escape Training Tank

Escape methods have been taught at the tank since 1930. A need existed then, as it does now, for training submarine crews in methods of escape in the event that all other methods of rescue fail or are deemed impossible.

When Submarine School students arrive at the escape tank, they change into swimming trunks and go directly to a classroom where they are given instruction in the use of the Steinke Hood. This device protects the escapee's head and face from the water, allowing him to breathe easier, alleviate his apprehension, and reduce the incidence of air embolism.

Upon completion of the classroom phase, the students enter the tank and demonstrate that they can safely and expeditiously make an escape from 50 feet through a lock or hatch similar to those on submarines.

The Steinke Hood provides a rate of ascent of 425 feet per minute. Because air embolism is a very real factor at this rate, the student is observed closely throughout his training in the water. The student is also instructed in the proper operation of the escape hatch, or lock. Nitrogen narcosis and air embolism are cumulative effects of exposure to pressure, and too much time spent in preparing the escape hatch can be as damaging to the escapee as improper use of the hood.

The Seibe-Gorman apparatus of 1914 (above) was a forerunner of today's Steinke Hood (right), which was developed at the Escape Training Tank in 1960. Buoyant ascent technique is taught to all Submarine Service personnel.

Once the student leaves the 50-foot lock (or any of the shallower locks) during his course of training, he is always within reach of an instructor ready to stop his ascent and pull him into a safety lock should he fail to exhale properly or experience trouble. If the student should be afflicted with air embolism, a diving corpsman on continuous duty during tank operation stands ready to initiate medical treatment with a recompression chamber located at the top of the tank.

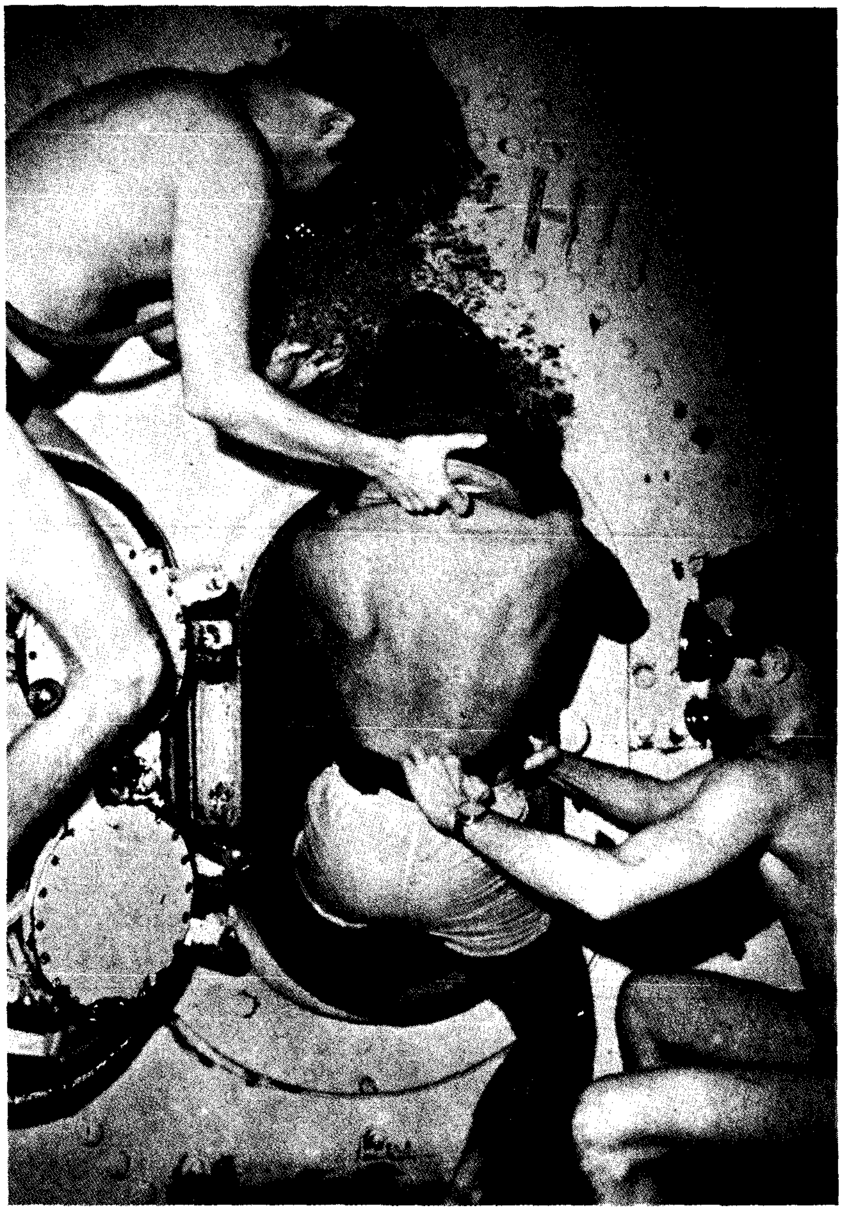
The individual method of submarine escape has been used in the past and is credited with saving hundreds of lives. The other methods in use are: The McCann Rescue Chamber, a cable-controlled escape lock carried by rescue vessels; and the Deep Submergence Rescue Vessel (DSRV), a mobile escape lock carried by the most modern rescue vessels.

Improvements in escape methods were promptd by the sinking of submarines F-4 in 1915, the S-51 in 1925, and the S-4 in 1927. These disasters led to the development of the McCann Rescue Chamber mentioned above, and the Momsen Lung, which was successfully used in 200 feet of water off Key West, Florida, in 1929. This device was a vast improvement over the Siebe-Gorman apparatus developed in 1914. But, the Momsen Lung had an ascent rate of only 25 feet per minute and provided no protection for the escapee's head, thus making all but experienced swimmers apprehensive and the potential for air embolism great.

In 1956, the "blow-and-go" method of escape was devised. The escapee was still completely exposed to the water and exhaled continuously during the ascent. The method was tested in the open sea in 302 feet of water from the submarine ARCHERFISH off Key West in 1958. It increased the rate of ascent in excess of 400 feet per minute through the water using a life jacket with 46 pounds of positive buoyancy and relief valves for air expansion. It was a major step forward.

In 1960, Lieutenant Steinke, Officer-in-Charge of the Escape Training Tank, developed a device which protected the head and face from the water. The Steinke

From 50 feet, a Submarine School student exits Tank's submarine hatch wearing Steinke Hood. Instructors watch each student closely, as the ascent rate is 450 feet per minute.



Hood was successfully tested in the open sea in 1961 in 309 feet of water from the USS BALLAO, again off Key West. The hood remains the primary method of individual submarine escape and has sufficient buoyancy to carry several people safely to the surface. The "blow-and-go" method is an acceptable back-up technique should something happen to the hood itself.

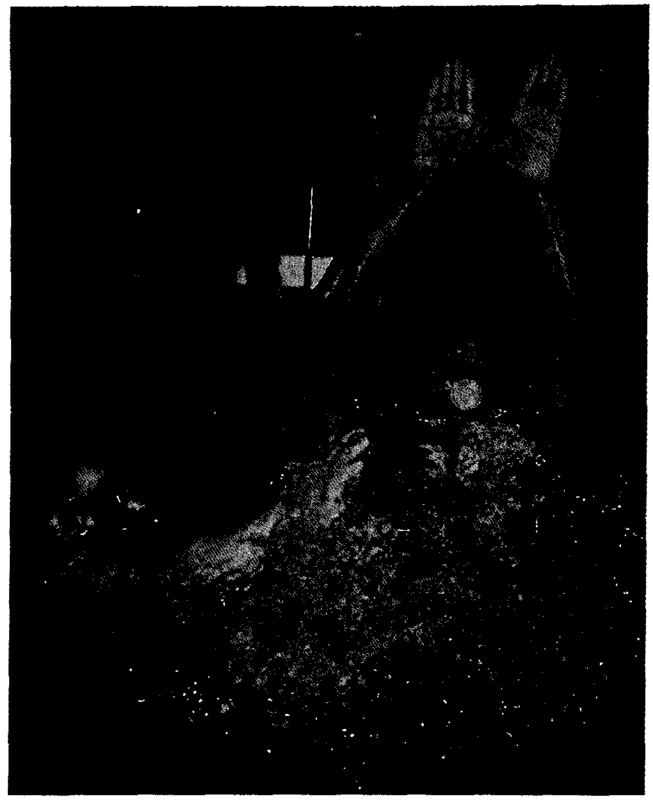
The escape training tank's primary mission is to teach escape procedures. However, over the years its mission has been expanded to include scuba instruction for the Submarine Force. On a space-available basis, Marine Corps, Coast Guard and Army personnel are also given scuba training, along with selected law enforcement personnel.

The tank and staff have the capability of training 8,500 individuals in submarine escape each year. The instruction staff is made up of two diving officers, one master diver, three medical deep-sea diving technicians, and 23 qualified divers. Each must undergo an arduous qualification period after reporting for duty. It takes an average of six months for a diver to become qualified as an instructor in everything from systems and classroom instruction, to actual water station practice. The diving at the escape tank is unique in that the majority of dives made are breath-hold dives at depths of 25 to 50 feet.

The escape tank maintains two recompression chambers: a double-lock aluminum and triple-lock steel chamber. Their primary function is to perform standard pressure testing for Submarine School students, conduct oxygen tolerance tests for diving candidates. and hyperbaric treatment for local diving operations and escape training. The chambers also constitute the primary treatment facility for diving casualties in the New England area. The escape training tank is supported actively by doctors from the Naval Submarine Medical Research Laboratory and maintains liaison with the Coast Guard, Army, Air-Sea Rescue and State law enforcement agencies in the event that evacuation or treatment of diving casualties is required. This arrangement provides patients with a specialized staff of diving medical officers, along with the complete support of the Naval Submarine Medical Center and its hyperbaric facilities.

The history of the escape tank has not been all smooth sailing. In 1969, the elevator shaft experienced a fire that required the combined efforts of the submarine base and municipal fire departments to extinguish. In 1977, the tank was given its first major overhaul, a task requiring 13 months to complete. During this period, the 135-foot tower, empty and acting like a gigantic sail, was threatened by adverse weather and extremely high gusts of wind. However, all turned out well, and as a final step of the overhaul, insulation and siding were added to the side of the tank to promote better water temperature control and to conserve energy.

The escape training tank officially started training students again in July 1978, but only after a thorough instructor training period. Just six hours after receipt of formal systems certification, the staff commenced hyperbaric treatment on a civilian diving casualty. The tank has been in full operation ever since.



Student breaks surface (above) moments after passing halfway point in ascent (below). His mastery of the free-breathing buoyant escape technique may someday save his life.

NAVAL SCHOOL DIVING AND SALVAGE GOLDEN ANNIVERSARY

"IT IS A PLEASURE TO EXTEND CONGRATULATIONS TO COMMANDER ROPER AND TO ALL WHO WILL OBSERVE THE 50TH ANNIVERSARY OF THE NAVAL SCHOOL, DIVING AND SALVAGE. SINCE ITS ESTABLISHMENT IN 1928 AS THE DEEP SEA DIVING SCHOOL, THIS ACTIVITY HAS SERVED THE NAVY WITH PROFESSIONAL DISTINCTION. THE ACHIEVEMENTS OF OUR DIVERS IN WORLD WAR II AND IN THE KOREAN AND VIETNAM CONFLICTS HAVE BORNE ELOQUENT WITNESS TO THE QUALITY OF THE TRAINING WHICH YOU HAVE PROVIDED. THROUGH THE YEARS, YOU HAVE MET THE MANY AND VARIED DEMANDS OF WAR AND PEACE WITH THE SKILL AND SPIRIT THAT HAVE MADE THE BADGE OF THE NAVY DIVER AN EMBLEM OF HONOR. AS YOU CONTINUE YOUR FINE SERVICE TO OUR NATION, I OFFER BEST WISHES FOR THE FUTURE."

ADM J. L. HOLLOWAY III
CHIEF OF NAVAL OPERATIONS

In a letter to the Commandant, U.S. Navy Yard, Washington, on 25 November 1927, the Chief of the Bureau of Navigation expressed his concern "about the present shortage of deep sea divers in the Navy, and the fact that no active steps are being taken to provide them."

He then asked the Commandant if the Navy Yard "could accommodate a class and if you foresee any difficulties in the way of establishment of a (diving and salvage) school."

The Navy Yard responded favorably to the inquiry and, six months later, in July of 1928, the first class of 25 students reported to the school for six months of training under the command of Lieutenant Henry Hartley.

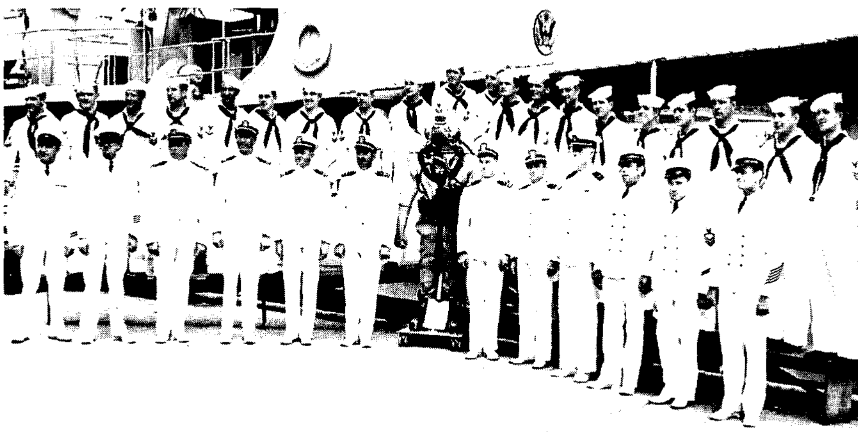
The Deep Sea Diving School, with its 13 instructors and attached personnel, was thereby established, joining the Navy Experimental Diving Unit which was formed the previous year at the same location.

Today, the Naval School, Diving and Salvage (NSDS), is the largest and most advanced school of its type in the world. NSDS graduates more than 300 officers and enlisted personnel each year in all phases of diving, ship salvage, and submarine rescue.

The School's training capabilities will be further enhanced when it occupies its new facility in Panama City, Florida, in 1980. With this move, NSDS will rejoin NEDU, which has been located there since 1975. The two activities will remain separate commands, but will renew their historical ties and benefit mutually from each other's expertise and facilities.

1916

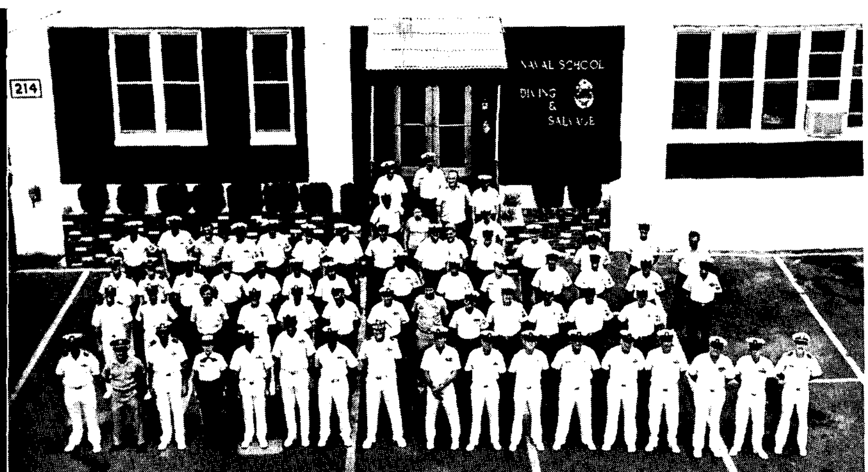
Following the loss of the S-4 submarine in 1915, and the publishing of gunner George Stillson's diving report the same year, a Navy diving school was established at Newport, Rhode Island, graduating its first class in 1916. The school closed during World War I.



1942

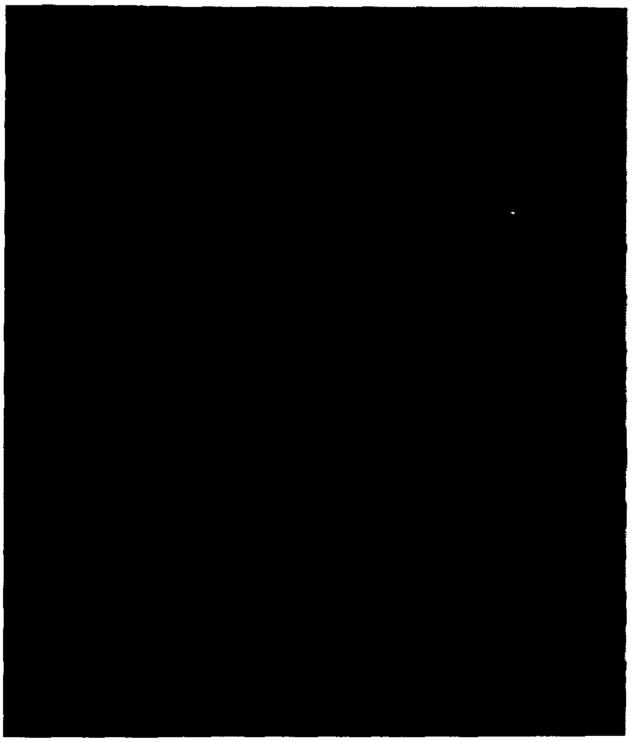
In 1942, NSDS was approaching its 25th anniversary and preparing to move into new quarters at Building 143 at the Washington Navy Yard. LCDR Lowell Stone is in front row, sixth from the left.

1978



In 1978 the NSDS staff assembled at Washington Navy Yard location for perhaps the last time before the School moves to its new location in Panama City. Commanding Officer James Roper is at front row, center. Executive Officer LCDR John Allen is at far right.

THE EARLY YEARS



Gunner George Stillson during experimental dive, 1915.

The establishment of a permanent U.S. Navy diving school in 1928 was long overdue. Although a training school in Newport, Rhode Island, had been turning out small numbers of divers intermittently since the 1880s, American diving techniques were far less advanced than those of the British Navy. The training period was a mere two weeks in duration and divers spent most of their time recovering spent torpedoes from the Newport Torpedo Station range.

Except for the successful recovery of items from the USS MAINE which was sunk in Havana Harbor in 1898, the record of U.S. Navy diving training and operations is obscure. Moreover, the Navy did not actively promote the advancement of deep diving, nor was it aware of diving's potential.

Then, in 1912, thirty years after the establishment of the Newport school, the situation began to take a turn for the better, thanks to the energies of Chief Gunner George D. Stillson. Stillson observed that divers in England applying Haldane's decompression tables were routinely diving to much deeper depths than the U.S. Navy's 60-foot limit. In a comprehensive report to the Navy's Bureau of Construction and Repair, he laid out the results of his extensive experiments and analysis of "the entire subject of diving in the Navy, including the methods of training and efficiency of naval divers." His report, which makes for fascinating reading, sharply criticized the state of Navy diving, concluding that the methods were "inefficient," the diving apparatus "dangerous and not standardized," the regulations "inadequate," the graduates "woefully inefficient," and the pathology and treatment of compressed air illness "not generally understood."

Stillson highlighted his report with responses from a questionnaire he sent to Fleet divers. One respondent wrote: "I wish to state that I have nothing to suggest that would be either instructive or interesting to you," and another wrote: "As I have not had anything to do with diving in the last six or seven years, I consider that I am unable to make any criticism or offer any suggestions for improvements." A third wrote: "No doubt more experienced men than I are sending some dandy reports, and I hope you make your point. . ."

Stillson did indeed make his point. After listing 29 detailed recommendations, including "the organization of a school and methods for training naval divers," he was given the go-ahead in 1913 for establishing an experimental diving team in Brooklyn, New York, with four chief gunners and Surgeon George R. W. French, who had aided him during his earlier work.

The success of Stillson's subsequent tests, including a dive to 274 feet in 1914, was instrumental in the formation of a more modern Navy diving school back in Newport. Stillson's divers reached a record depth of 304 feet during the salvage of the submarine F-4 off Hawaii in 1915. Navy diving and the school thus appeared to be headed for an illustrious future. But, once again, progress was interrupted, this time by World War I. The school was closed while most of the divers were ordered to Europe to engage in salvage operations.

In 1925, the USS S-51 sank in 132 feet of water off Block Island, Rhode Island. It took 10 months to raise the submarine due to the shortage of divers and severe weather conditions. But, it was only after a second submarine disaster, the sinking of the USS S-4 just two years later, that the Navy and Congress were prompted to rekindle the diving program.

So, at last, in 1928, a permanent school for the training of divers and salvors was established at the Washington Navy Yard, its present location.

Above: Undated photo shows diver in full MK V dress, tenders and telephone talker.

Top: Deep sea diver and tender at Navy Yard, New York, 1909. Center: Class in diving, Cape May, New Jersey. Left: Divers aboard USS FALCON during historic salvage of submarine S-51 off Block Island, 1925.

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When the U.S. Naval School, Deep Sea Divers, opened its doors at Building 146 on the Washington Navy Yard waterfront in 1928, Officer-in-Charge LT Henry Hartley possessed a deep appreciation of the seriousness of his mission. In the frenetic two-year period prior to the establishment of the School, he was commanding officer of the USS FALCON during the heroic S-51 and S-4 submarine salvage operations. He, probably better than anyone, understood the limitations of Navy diving, and the need for more and better-trained divers. At the time of the S-51 sinking in 1925, only 20 Navy divers were qualified to go below 90 feet.

The Navy Department gave the School and the neighboring Experimental Diving Unit its full backing to carry on the legacy of Gunner Stillson's pioneering efforts in experimental diving and diver training. By 1927, work on helium-oxygen mixtures which had begun at the Bureau of Mines Experimental Station in Pittsburgh, Pennsylvania, had progressed well and was transferred to the Experimental Diving Unit. The close proximity of the School now enabled instructors to incorporate the experimental findings immediately into the training curriculum.

Breakthroughs in helium-oxygen diving were vital if Navy divers were to be able to overcome the dangerous physiological effects of breathing air at deep depths. These breakthroughs were soon achieved; by 1937, a diver on HeO_2 reached a simulated depth of 500 feet in one of NEDU's chambers, opening the way for diving and salvage work on a vastly greater scale, and increasing the assurance of rapid submarine salvage and rescue.

Just two years later, another submarine disaster occurred that would put the new generation of Navy divers and their technology to a crucial test. In 1939, the USS SQUALUS (SS 192) sank in nearly 250 feet of water off the New Hampshire coast. Again, the USS FALCON was called in for the rescue and salvage attempt. Now-Commander Henry Hartley was among the members of the Special Salvage Unit, as were Commander Charles B. Momsen, pioneer in submarine escape methods, and Commander Allan R. McCann, designer of the submarine rescue chamber.

The successful rescue of 33 of the crew and subsequent salvage operation dramatically proved the effectiveness of the School's training efforts. Dives were conducted with HeO_2 breathing mixtures and no fatalities occurred. Acting Secretary of the Navy Charles Edison, in addressing the participants, stated:

> "For many years the Navy has worked untiringly to develop submarine rescue and salvage equipment and to perfect the techniques of deep sea diving . . .The commendable success achieved is a tribute to all who have contributed to the development of the Navy's equipment and to those who trained the officers and men for submarine rescue and salvage work. . ."

President Roosevelt also praised the members of the Squalus unit, writing:

"The Commander-in-Chief expresses to all of you his appreciation of (your) untiring devotion to duty, courage, skill, initiative and self-sacrifice . . . Your determination and efficient efforts have held the attention of the entire nation and the successful completion of this unprecedented task merits the highest approval and admiration. I commend you for upholding the reputation of the Navy in accordance with its time-honored traditions."

Based on the success of the SQUALUS operation, the Navy increased funding for its diving and training program, for the number of divers was still relatively small. By 1938, the School had achieved an international reputation for excellence in diving and salvage training. Through the authorization of President Roosevelt, the School admitted, as it continues to do today, a select number of foreign students for training.

During World War II, the demand for divers naturally rose sharply. The School expanded in size and moved to new quarters in Building 214 at the Washington Navy Yard in 1943. NEDU shared the new facility with the School from 1943 to 1975, when the former relocated to Panama City, Florida.

During the War, the School trained 30 students every three months, and increased its permanent enlisted instructional staff to 12. Students also received two weeks of diving training on a sunken vessel at 140 feet with zero visibility and strong currents.

To meet the demand for divers and salvors during the war years, a satellite school was established in New York when the liner NORMANDIE accidentally sank alongside Pier 88. Students were thereby able to receive on-the-spot, practical experience in diving and salvage. This school was subsequently moved to Bayonne, New Jersey, and trained students until 1957, when it was incorporated with NSDS. Also, a school for Navy scuba divers was established in Key West in 1954, but is no longer active.

On September 18, 1967, the status of the U.S. Naval School, Deep Sea Divers, changed from an activity to a command, with a mission to "train selected officer and enlisted personnel in deep sea diving techniques, salvage diving techniques, and underwater mechanics, with particular emphasis on submarine rescue and salvage operations, ship strandings, and salvage demolition operations, at various depths."

Thousands of Navy divers have been trained at NSDS since 1928. Many have learned salvage skills raising the School's sunken ship hull at Oxen Cove in the Potomac River (this page). Others have received part of their training at satellite schools, such as the now-defunct scuba school in Key West, Florida (opposite).

A LOOK AT ONE OF DIVING'S FORGOTTEN HEROS

When Lieutenant Henry Hartley became the first Officer-in-Charge of the Naval School, Deep Sea Divers, in 1928, he had already been in the Navy for 27 years. In a brilliant career that spanned 47 years, Hartley rose from cabin boy to rear admiral and played a key role in the evolution of Navy diving and salvage. His efforts in the salvage of three submarines and in the establishment of the diving school places him alongside Gunner George Stillson as one of the giants in the early history of diving.

Seaman Hartley's interest in diving probably began at his first training station at Newport, Rhode Island, where the Navy had a small school for divers. At Newport, he received the Gold Medal for achieving the highest standing in general naval knowledge. He later qualified for diving at the Newport Torpedo Station, and was, like nearly all Navy divers at that time, a gunner, for in this rating, work was closely associated with setting and retrieving torpedos, mines and other ordnance under water.

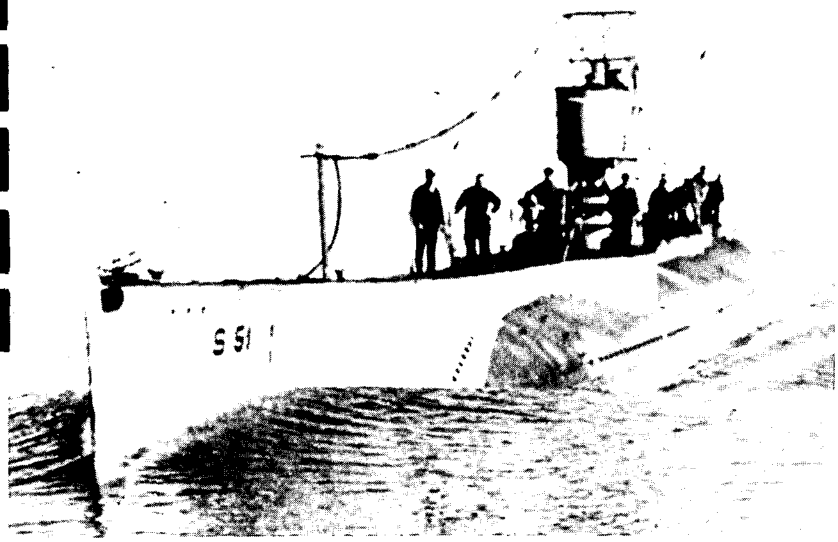
He advanced to Chief Gunner and was warranted Boatswain in 1915, the year Gunner Stillson published his historic report on the state of Navy diving. After World War I, he was commissioned Lieutenant, and in 1921 reported to the Naval Academy in Annapolis. There, he studied, on his own initiative, postgraduate courses in Engineering and General Line.

In 1925, LT Hartley assumed the fateful assignment as commanding officer of the USS FALCON, the first of the ships converted to submarine rescue work. The challenge of this command was not long in coming. In September 1925, the submarine S-51 sank after being rammed by the steamer CITY OF ROME off Block Island. And shortly thereafter, in 1927, the submarine S-4 was rammed and sunk by the Coast Guard Destroyer PAULDING off Provincetown, Massachusetts.

In recognition of his services aboard FALCON in salvaging the two submarines, LT Hartley was awarded the Distinguished Service Medal and the Navy Cross. But more important was the tremendous boost to diving that he and his divers helped foster. When a permanent school for the training of divers was established the following year, Hartley was appointed its first officer-in-charge. Reporting in July 1928 to the Navy Yard, Washington, where he enlisted in 1901, he began the task of training and graduating a new generation of Navy divers.

But this was not the end of his efforts. In 1939, and now a commander, he became Technical Aid to RADM Cyrus Cole aboard FALCON in the rescue efforts and salvage of the submarine SQUALUS which had sunk off the Isle of Shoals, New Hampshire. Using the McCann rescue chamber, a Navy diver was sent down to attach a cable to the submarine and signal to the men trapped inside that help was on its way. Thirty-three of the crew were saved, and the submarine raised to the surface in this unprecedented operation. The Navy Department again praised Hartley's "proven efficiency, devotion to duty, resourcefulness, and thorough knowledge," and promptly acted to increase its commitment to the diving and salvage program.

Commander Hartley later attained the rank of Captain during World War II, and even served aboard the USS CONSTITUTION as Executive Officer after this historic ship was restored. Hartley was the only one aboard with experience in sail, and guided "Old Ironsides" across the seas on numerous port visits. Hartley retired as a rear admiral in 1947, culminating a career nearly half a century long during the struggling, formative years of Navy diving.



U.S. Submarine S-51

U.S. NAVAL SCHOOL, DIVING AND SALVAGE

OFFICERS-IN-CHARGE

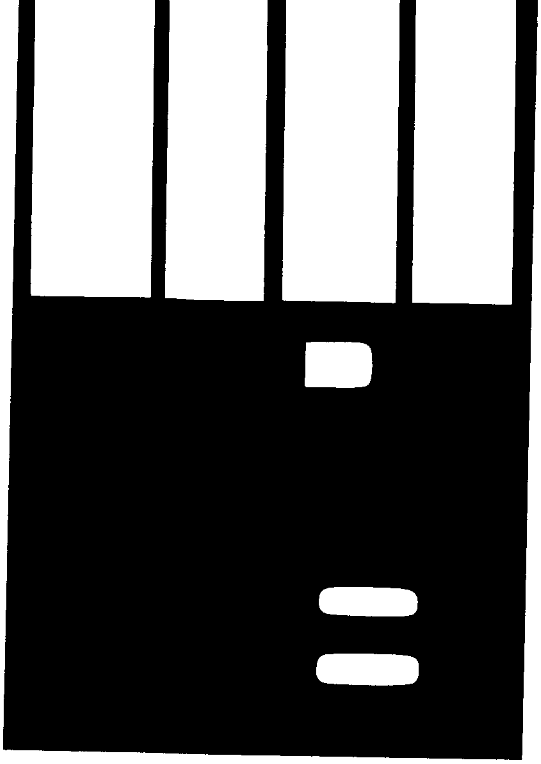
LT Henry Hartley, 1928-31
Chief Gunner Edward L. Moyer, 1931
LT Norman Ives, 1931-33
LT William A. Gorry, 1933-35
LT Joseph B. Renn, 1935-37
LT William A. New, 1937-39
LT John L. Detar, 1939-40
LT Joseph B. Renn, 1940-41
LCDR Lowell T. Stone, 1941-43
CDR William A. New, 1943
CAPT Orville K. O'Daniel, 1944-47
CDR George G. Molumphy, 1947-50
LCDR Howard T. Fulton, 1950-52
LCDR Walter K. Wilson, 1952-54
CDR Maino Des Granges, 1954-57
CDR George H. Mahoney, 1957-60
CDR John C. McNicol, 1960
CDR Norval E. Nickerson, 1960-63
LCDR George E. Enright, 1963
CDR Charles H. Hedgepath, 1963-66
CDR William R. Leibold, 1966-67

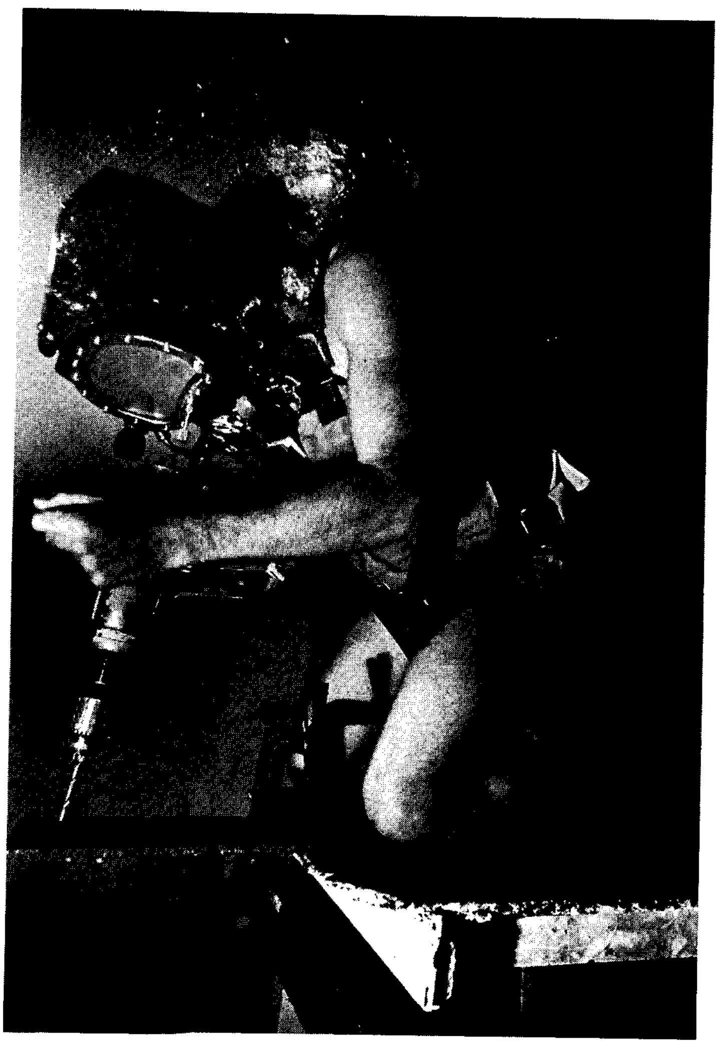
COMMANDING OFFICERS*

CDR William R. Leibold, 1967-68
LCDR Billie L. Delanoy, 1968-69
LCDR James F. Newell, Jr., 1969-70
LCDR Walter E. O'Shell, 1970-72
LCDR Anthony C. Esau, 1972-76
CDR Frank M. Richards, 1976-78
CDR James E. Roper, 1978

**On 18 September 1967, the School changed from an activity associated with the Navy Experimental Diving Unit to a separate command.*

After commanding salvage operations of submarines S-51 and S-4, LT Henry Hartley became the Diving School's first commanding officer. He later served on the submarine SQUALUS task unit and retired in 1947 as a rear admiral. He is shown here as a captain aboard USS CHESTER during WW II.





Today, the Naval School, Diving and Salvage, offers the most comprehensive program of diving and salvage training in the world. While U.S. Navy commands at other locations (i.e., San Diego, New London and Pearl Harbor) have been and still are engaged in scuba and 2nd Class Diver instruction, NSDS acts as their curriculum model manager and is the only school certified for 1st Class and advanced diver training, and Master Diver training.

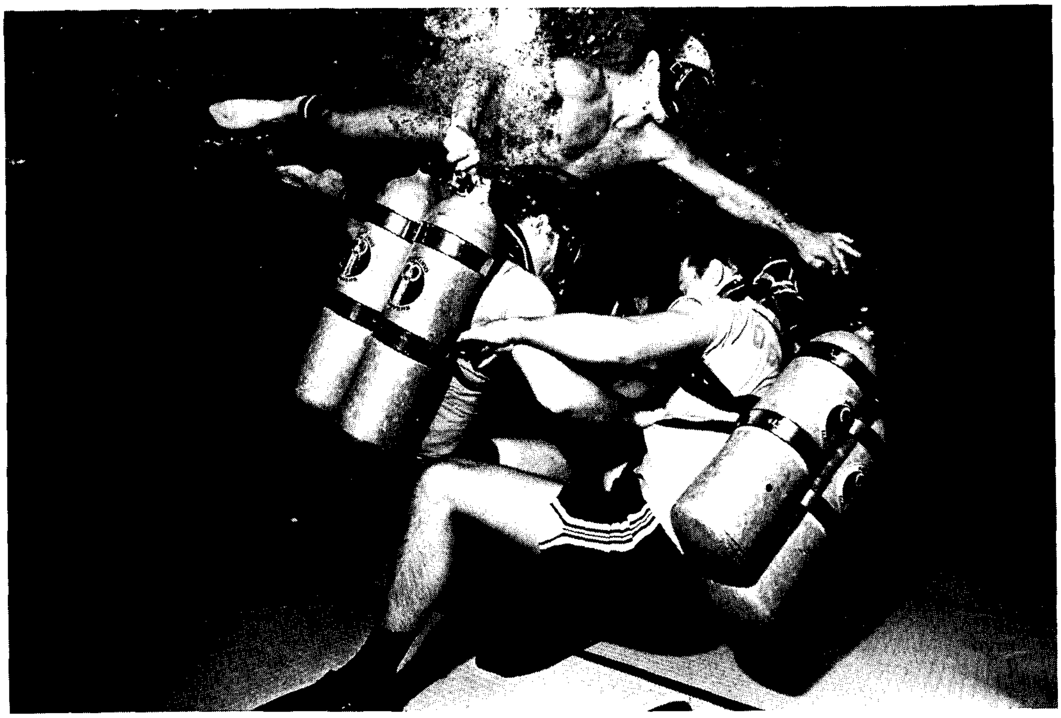
The courses of instruction available at NSDS encompass the following eleven categories:

Deep Sea Diving Officer (and cross training)
Ship Salvage Diving Officer
Prospective Commanding Officer and Executive Officer Indoctrination for ARS and ATF Ships
Recognition and Treatment of Diving Casualties
Medical Department Diving Officer
Medical Deep Sea Diving Technician
Master Diver Qualification
Diver 1st Class
Diver 2nd Class
Scuba Diver
Specialized Brief Training (HCU Reserves, Midshipmen, etc.)

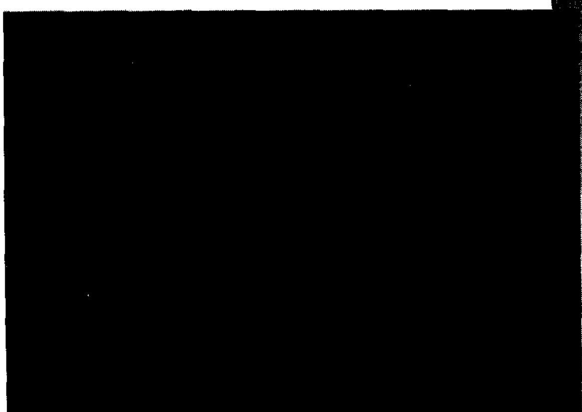
In addition, the School will offer Special Operations Officer (1140) training in the near future. The School also trains Army, Marine Corps, Coast Guard, selected civilian and NATO military personnel in diving, salvage, and diving medicine. As an example of the School's typical non-regular-Navy student make-up at any given moment, a recent sampling showed the following enrollment: 4 U.S. Army, Coast Guard and Marine Corps students, 2 civilians, and 11 foreign officer and enlisted students (representing Canada, Israel, Pakistan, Iran, Korea, Philippines and Colombia).

NSDS stresses individualized instruction and safety, and, as a result, has a very low student-instructor ratio. Depending on the course, the size of the class may vary from five students (maximum for the Master Diver course) to 25, but never higher. Students also have access to a broad range of instructional aids and equipment, including sound-on-slide teaching machines, films, color video cassette TV, and closed-circuit TV, plus resuscitation models for the demonstration of CPR techniques. Course length ranges from a one-week indoctrination into the recognition and treatment of diving casualties, to the 23-week deep-sea HeO_2 diving officer course. Students also receive practical experience in salvage techniques with the School's patrol craft salvage wreck in the Potomac River.

In this, the final full year of training at the Washington Navy Yard facility, the School expects to graduate slightly more than 600 students in the eleven course areas. This represents an increase of roughly 250 graduates over last year's total, and is due in part to the Fleet's increased need for divers, and in part to the anticipated down time that will result from the upcoming move to Florida.



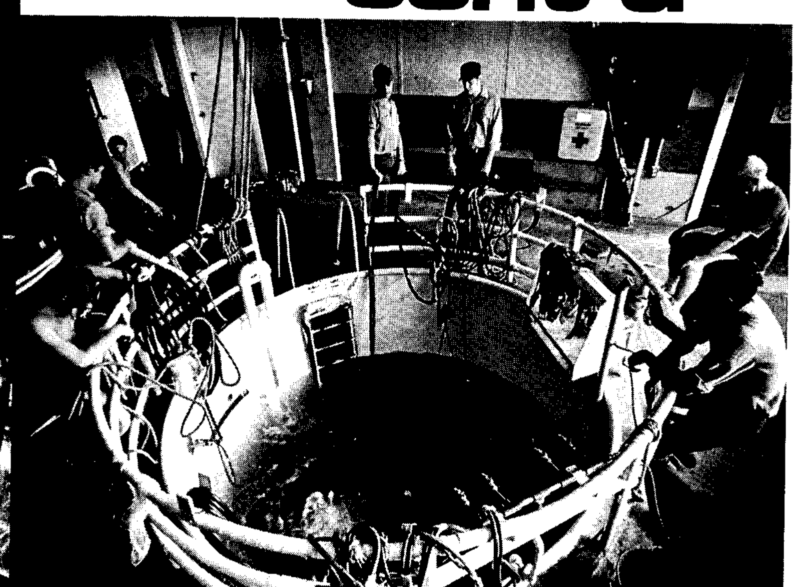
As their equipment is "adjusted" by instructors, scuba students learn importance of buddy system and of maintaining composure under emergency conditions. (Underwater photos on pages 26, 27 and 30 by LT Pete Herlin, NSDS)



The familiar barge, TOM O'MALLEY, alongside pier at Washington Navy Yard.

NSDS IN 78 cont'd

Clockwise from above: NSDS students receive instruction in MK V deep sea diving outfit, scuba, underwater welding in tank, and night diving. (Photos by PH1 Michael Wood, NTTC)



A HORSE FOR WOULD-BE MASTERS

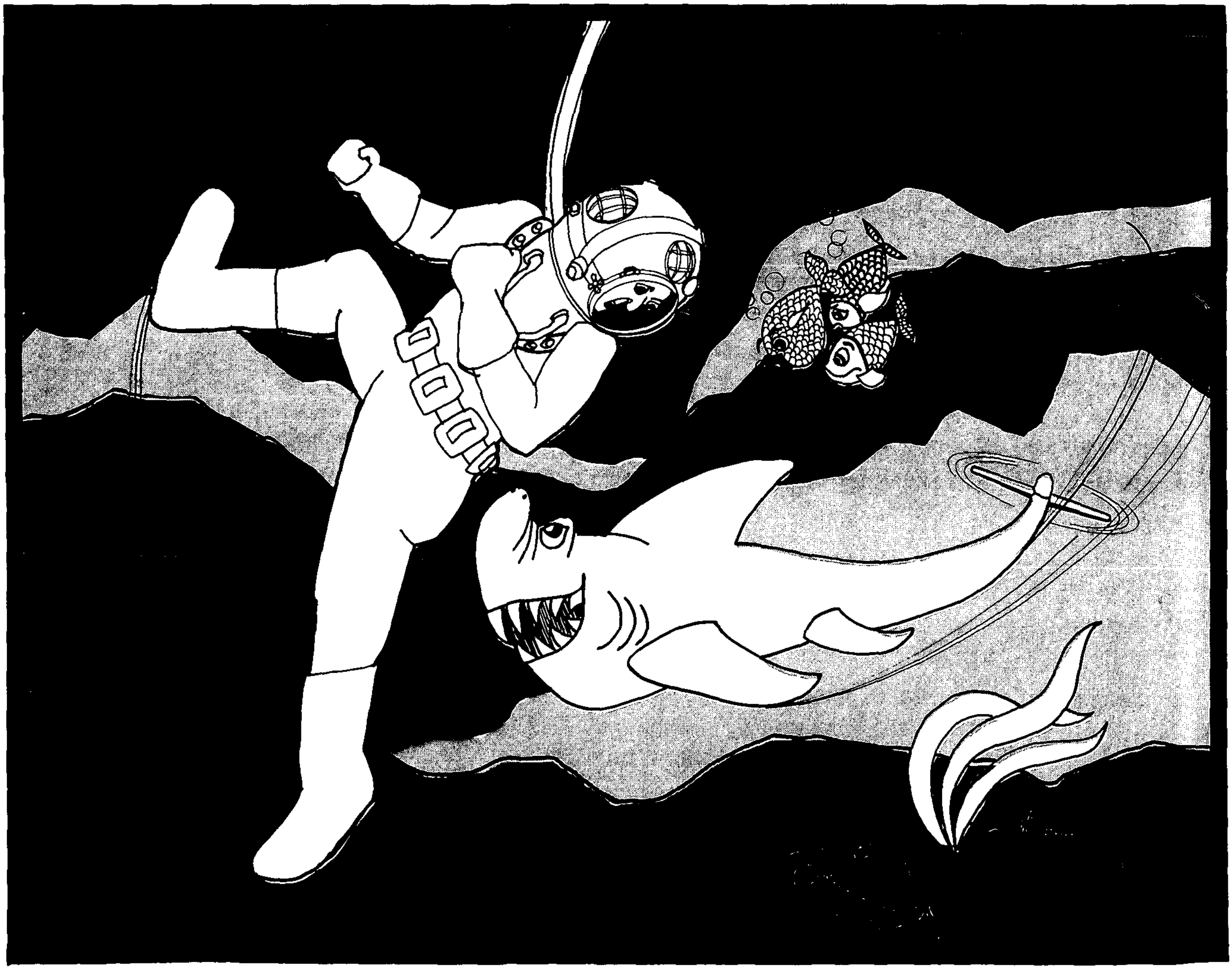
(Submitted by LCDR John W. Allen, NSDS)

The traditional Master Diver Evaluation Course, conducted only at NSDS, is a major milestone in the professional Navy diver's career. It is also an unforgettable experience with particular emphasis on final drill week. The Master candidates are presented with different diving "problems" on each of four days. For the sake of variety, the staff officers and masters strive to construct original and realistic drills which will oblige the candidates to demonstrate their best in diving superivision. However, in all fairness to future, would-be master divers, and in tribute to 50 years of thinking up drill scenarios, NSDS is giving out a one-time-only "Horse" on the drill most recently added to the infamous drill book, so listen up:

DRILL NO. 87 – TEETH

Mechanical Shark Unit (MSU) is lowered over the fantail prior to bringing Master candidates on deck. Operator checks pneumatic operation and ballast units of shark with special emphasis on jaws and tail actions. When diver reaches forty-foot stop on HeO_2 dive, shark unit is immediately released aft. Unit operator will have shark move in a large semicircle, then cut sharply toward the ship at approximately 20 knots. Shark will then dive and return to the surface with diver in his mouth. This procedure will be repeated until the candidate makes the correct response.

NOTE: This drill requires excellent coordination between fantail, staff, diver and the shark. The originality of this "Horse" drill is credited to the inventive and unusual mind of CWO4 Bos'n Shoop who is presently hiding out on USS HUNTLEY.



LOOKING TO THE FUTURE

The following are excerpts from Rear Admiral A. J. Baciocco's remarks at NSDS last June on the occasion of the School's most recent change of command.

The divers of the past, the present and the future epitomize what an English Army officer, the Duke of Wellington, had to say about the Navy nearly two hundred years ago:

"I have never found Naval men at a loss. Tell them to do anything that is not impossible, and depend upon it, they will do it... Their manner of life creates in them a self-reliance which you seldom find in men of other professions. They are not to be taken by surprise."

* * *

The Diving and Salvage School's reputation of being the Navy's premier diving school has been built over many years. I think that it is particularly significant that not only does 1978 mark the fiftieth year since the school was established here, but it is also the last full year of training in the cool, clear waters of the Anacostia River before relocating to the Florida Gulf Coast under a new name, the Naval Diving and Salvage Training Center. I am confident that Washington's loss will be Panama City's gain and with the new and improved facilities its reputation for training excellence will continue to grow.

* * *

The sea is our way of life and as sailors we maintain the greatest respect for her as a teacher, as a provider, and as the severest sort of task master. For many in the Navy who operate on or under the waters, an earned respect for the sea is usually sufficient to carry us through most ordeals. But, for the Navy's diving and salvage forces, the lessons of the sea become more varied, intense and demanding. When called for, our divers are expected to operate under the cruelest of conditions.

* * *

Until the early Twentieth Century, U.S. Navy diving generally relied on developments imported from abroad and very little attention was paid to diving. Equipment was not standardized and, to say the least, operating procedures were very loose. However, since 1912 when Warrant Gunner Stillson led a program to improve diving equipment and decompression procedures, the Navy has been in the forefront of diving. His early work laid the foundation for development of reliable decompression tables and specialized apparatus which are the cornerstones of modern deep diving technology.

* * *

From this foundation has evolved the use of helium-oxygen breathing mixtures, improved physiological standards, and a Navy capability for deep diving using saturation techniques. Safer and more efficient equipments and procedures have been developed for divers— with the most recent acquisitions being the MK 12 diving system for general purpose deep diving and the MK 15 system for special missions...

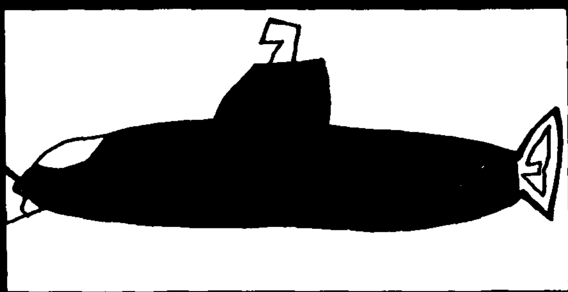
* * *

...We are currently reassessing our programs in order to concentrate on providing the Navy diver with the best tools, work systems and procedures to enable him to more effectively accomplish his missions. I hope you will share with me my optimism for the future.

* * *

And it is to the future that we must look. The Gunner Stillsons, the Captain Ellsbergs and the Captain Bonds provided us the foundation for Navy diving and salvage upon which we must build, but it is the graduates of this school who will provide the leadership for building the future.

Last Winter, Diana Tomlinson's class from the Glen Forest Elementary School in Falls Church, Virginia, visited NSDS. Later, they wrote to guide CWO4 Ron Shoop about their impressions, some of which are reprinted below, unedited, along with their drawings:



Dear Mr. Shoop,

The field trip was highly exciting I must admit. Therefore I write to tell how I liked it. The wieght of the shoe was *very* hard to get even an *inch* off the floor! But what was really surprising was how the divers manage to do the bolt test in time. The trip was fun as I said surprising and complicating (that's the way I like it).

Sincerely yours,

Dear Mr. Shoop,

We had a nice time on the tour. The part I thought was funny was when we went on the salvage barge and saw that suit that looked like Darth Vaders brother. I also liked when you showed us that guy doing drills under water.

Sincerly,

John Scherbenske

Dear Mr. Shoop,

The decompression chambers were realy neat. When I looked at that guy he looked like he was in underwear and when I looked at you you looked right back in a funny way and also the trip was good but you were the best of all. I bet you going down in the sea is scary but who cares when I grow up I'm going to be like you.

Sincerely yours,

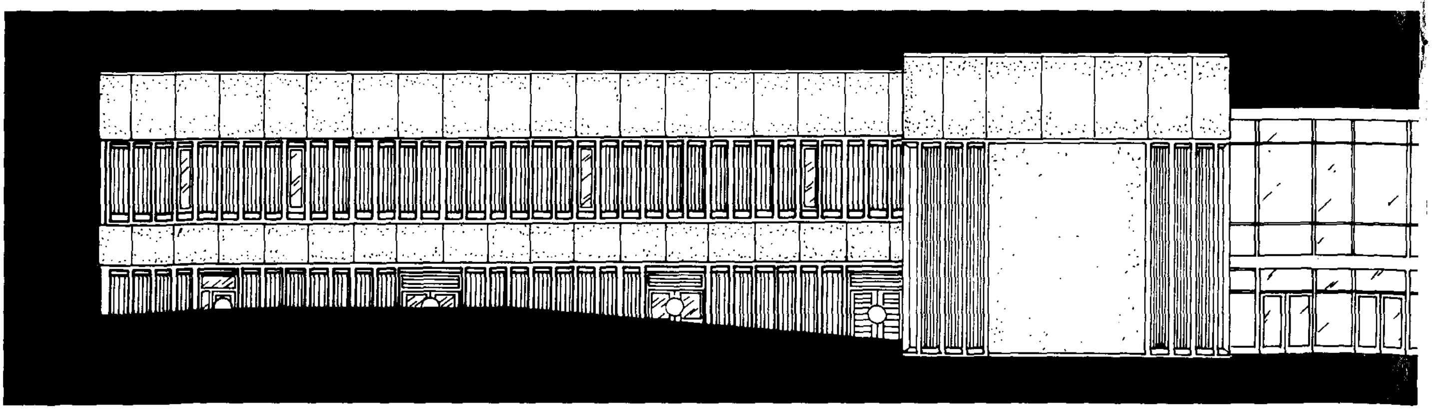
THE YEARS AHEAD

Construction is well under way on the new U.S. Naval Diving and Salvage Training Center in Panama City. Since groundbreaking last January, the Center's major facilities are taking shape, including the 52,500-square-foot instructional building, 50-foot free-ascent training tank, 50-foot by 90-foot training pool, 750-foot-long quay wall, 2,200-square-foot pierside support building, and a 4,000-square-foot equipment maintenance building. The new NDSTC is located along an eight-acre site on the west side of Alligator Bayou opposite the Navy Experimental Diving Unit and the Naval Coastal Systems Center.

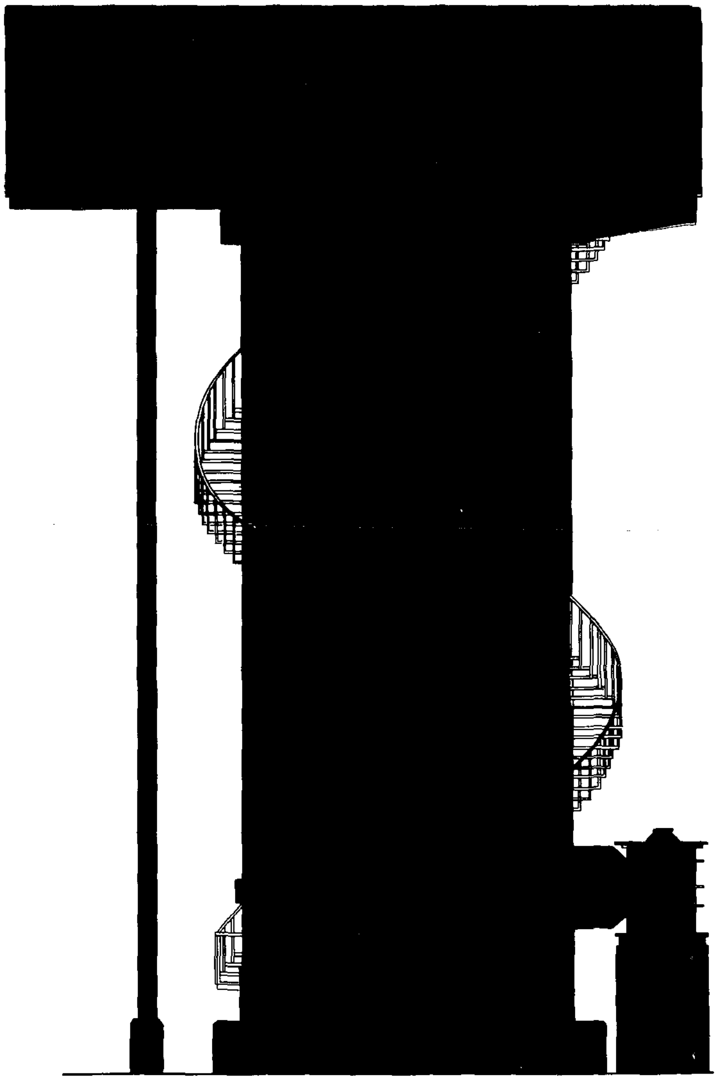
The new main instructional building will house three hyperbaric chamber complexes, three open tanks, an expanded compressor capacity, a hydrostatic scuba bottle testing facility, and an underwater observation room with a telephone system for scuba instruction in the training pool. In addition to more classrooms and study space, the training center will boast a large auditorium for command-wide presentations and lectures. Medical and laboratory facilities will also be expanded in size and scope.

Although the hyperbaric chambers and some of the other older equipment currently at NSDS in Washington will be dispersed or donated to Navy museums, one of the more notable relics of the School will be making the trip to Panama City. This is the wreck of the patrol craft escort, one of three hulls now resting in the shallows of Oxen Cove. For years, the hull has been raised and scuttled by successive salvage training classes. The old vessel will be towed to the site of the new training center, where it will once again be sunk and used to train future salvors.

At about this time next year, construction on the new facilities in Panama City will be complete. NSDS at the Washington Navy Yard will close its doors and begin



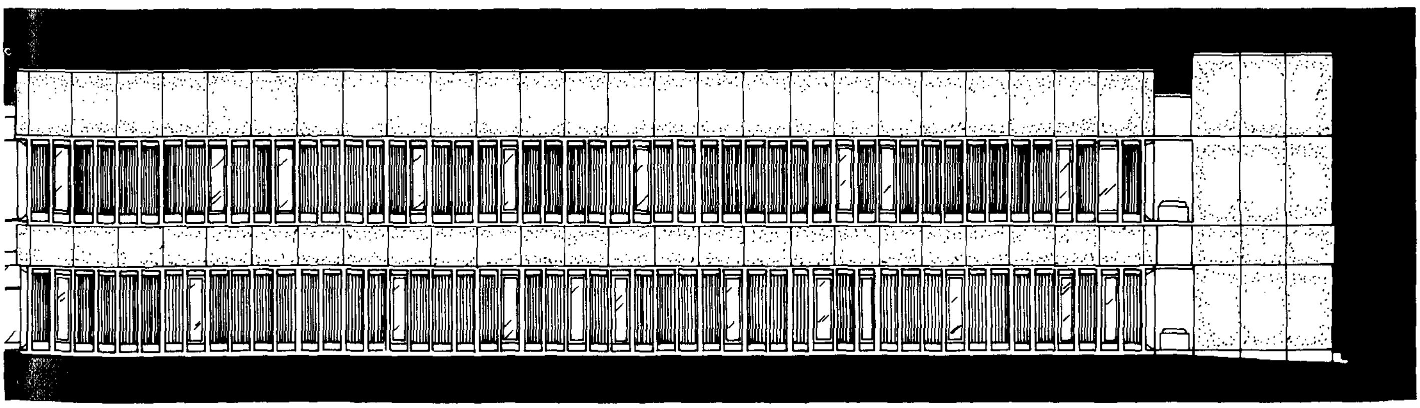
The new U.S. Naval Diving and Salvage Training Center being constructed in Panama City, Florida, will feature a 52,500-square-foot main instructional building and a 50-foot free-ascent tank. Training is scheduled to begin at NDSTC in early 1980.



its move. When training begins at NDSTC in early 1980, the average onboard student attendance is expected to be 217, roughly ten times the size of LT Hartley's first class.

In 1915, Gunner Stillson recorded his deep conviction for the expansion and improvement of Navy diving, adding, "A diver at his work is not in an ordinary condition in life. He has to undergo an ordeal that requires mental and physical strain. His duty is important and requires technical training."

Today, Stillson's vision is a reality. During the past fifty years, the U.S. Navy has exhibited an increasing commitment to the training of divers, salvors and diving medical specialists. The professionals who graduate from the new training center during the next fifty years will no doubt uphold this tradition. They will be the best trained and equipped underwater specialists ever, yet will be pioneers in their own right, in the still young science of diving.



DIVING ACCIDENTS

Accident rates for U.S. Navy diving in 1977 showed a marked decrease from 1976, according to statistics compiled by the Naval Safety Center. For major diving accidents, the rate is down from 11.3 to 9.0 accidents per 10,000 dives. Minor accidents are down from 8.4 to 4.0 accidents per 10,000 dives. From a total of 74,493 dives logged during the calendar year, 96 accidents were reported. More than half of the accidents involved decompression sickness and more than half, including both deaths, occurred during training. The highest accident rate occurred during diver selection. The figures below are reprinted from Fathom magazine.

Navy Dives and Accidents by Purpose of Dive:

Purpose	Total Dives	Major Accidents	Major Accident Rate %	Minor Accidents	Major Accident Rate %
Tender	413	1	.24%	0	0.0%
Experimental	394	5	.13%	0	0.0%
Medical Treatment	227	2	.88%	0	0.0%
Sports or Recreation	859	2	.23%	0	0.0%
Equipment Testing	444	0	0.0%	0	0.0%
Requalification	6,754	7	.10%	0	0.0%
Selection	262	7	2.67%	5	1.91%
Training	28,023	35**	.12%	10	.04%
Work	36,253	9	.02%	12	.03%
Other	864	1	.12%	0	0.0%
Totals	74,493	69	.09%	27	.04%

Navy Dives and Accidents by Type of Equipment Used:

Type Equipment	Total Dives	Major Accidents	Major Accident Rate %	Minor Accidents	Minor Accident Rate %
Deep Sea Mixed Gas	553	4	.72%	1	.18%
Deep Sea Air	3,881	8	.21%	1	.03%
Lightweight Mixed Gas	502	3	.60%	0	0.0%
Lightweight Air	13,541	4	.30%	10	.07%
Open-Circuit Scuba	42,643	13	.031%	9	.02%
Closed-Circuit Scuba	3,434	5*	.15%	1	.03%
Semiclosed-Circuit Scuba	2,780	4*	.14%	0	0.0%
Experimental Equipment	268	0	0.0%	0	0.0%
Other	6,891	28	.41%	5	.07%
Totals	74,493	69	.09%	27	.04%

Number of accidents by Type Accident:

Decompression Sickness	56
Oxygen Poisoning	11
Air Embolism	4
Omitted Decompression	3
Subcutaneous Emphysema	1
Barotrauma	22
Mechanical Injury	5
Drowning (Fatal)	0
Near-Drowning	1
Hyperventilation	1
CO_2 Poisoning	4
Bad Gas	1
Hypoxia	1
Disorder of Consciousness	1
Unknown	1
Other	4
Total (some accidents were combined types)	96

**Each asterisk indicates a fatality.*

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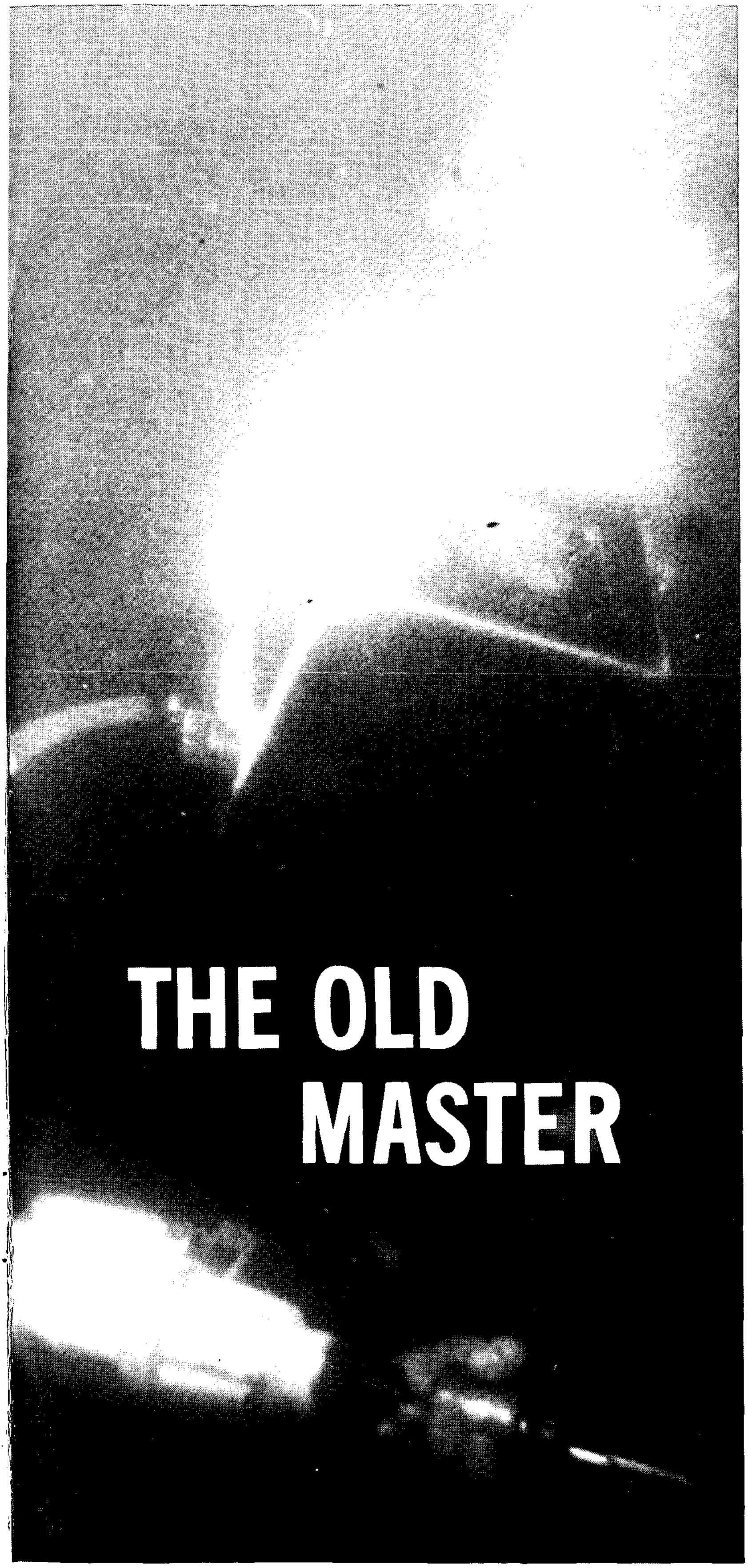


THE OLD MASTER

Several people in the EOD community have asked me if there are plans to replace the double-hose, non-magnetic regulators that are now held by the EOD community. Also, where can spare parts be obtained for the regulators they hold? I've done a lot of research, and here's what I've been able to find out so far.

At present there are no plans to replace the double-hose, non-magnetic regulator. SPCC Mechanicsburg has no contract with any company to manufacture parts for the regulators that now exist. SPCC did tell us that if we could furnish them with a list of spare parts, they would tell us if any parts are available and where they could be obtained. Our EOD Officer here at the Unit is in the process of furnishing SPCC with the list of spare parts. When SPCC Mechanicsburg lets us know if spare parts are available, we will let the EOD community know.

The Technical Evaluation for the MK 12 SSDS mixed-gas mode got under way during the month of September and should be completed around the first of November. And with the Operational Evaluation scheduled for early 1979, the life of the old MK V hard hat gets shorter and shorter. A word of caution, though: Don't take any of the MK Vs home with you as they will be recalled and accounted for.

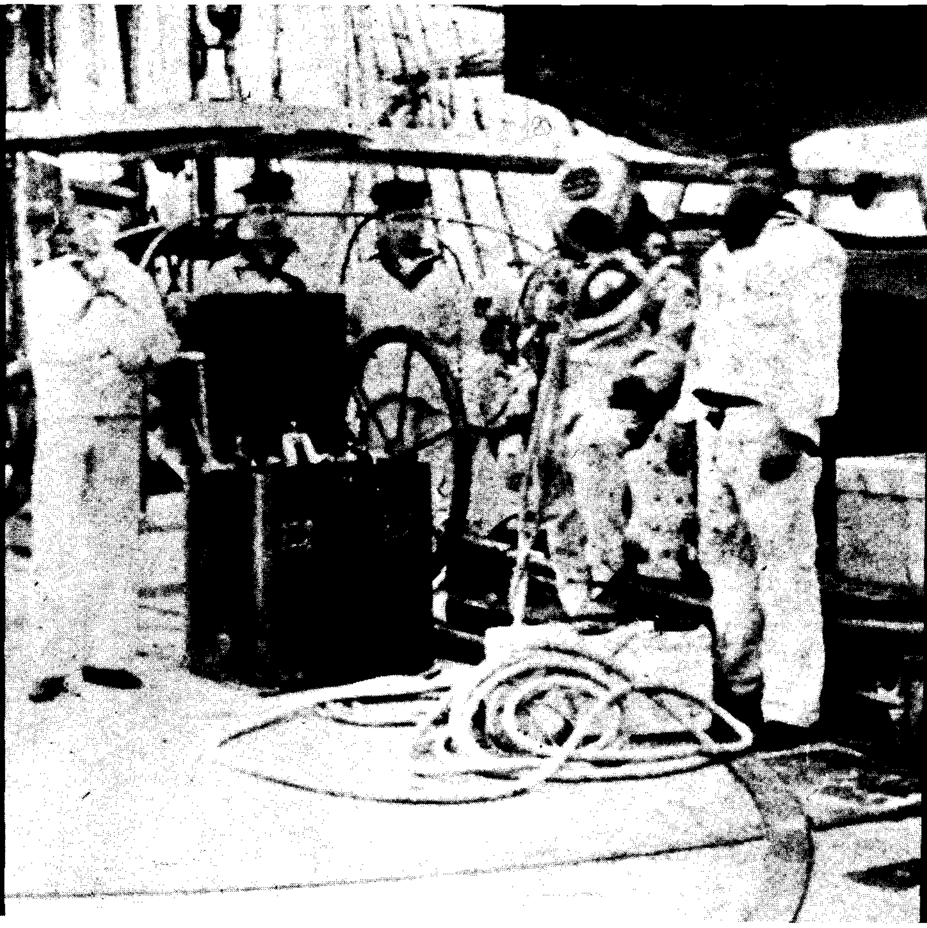
The year 1979 will be a very busy year for the Navy Experimental Diving Unit. There are several tasks under way now, such as the Gulf Heater, Econo Heater, wet phones and Mako high-pressure compressor. Some of the tests that we will be starting soon are Tethered Diver Communication System, regulators to update the Approved Products List, depth gauges, and digital watches. We hope to start the TECHEVAL on the MK 14 saturation diving system in 1979. If you are not familiar with the MK 14, it is commonly called the push-pull system (see FP, Fall 1977).

We have a deep dive scheduled for 1979 which will be in excess of a thousand feet. And we will see a lot of new faces at NEDU in 1979. For those who have orders already, we're looking forward to seeing you. One of these days, and I'll predict it will be soon, you will see a report on smokers and non-smokers in diving and the effects of smoking on diver work rates.

All supervisors and masters have something to say about the new diving officers just out of school. You must remember that they are still learning and it is your job to help them. This reminds me of the time I was doing a chamber dive and had a new diving officer. When the chamber surfaced, the topside tender called out, "Seal broke!" The young diving officer jumped up and said, "How long will it take to fix it?" It was good for a laugh, but think about it. The fellow was conscientious; he wanted it repaired as soon as possible and not let it go. Too many times we let things go and they don't get done. Keep your equipment in working condition! With that, I'll leave you till next time.

Safe diving!

BMCM (MDV) James L. Tolley
Senior Master Diver, USN
Navy Experimental Diving Unit



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