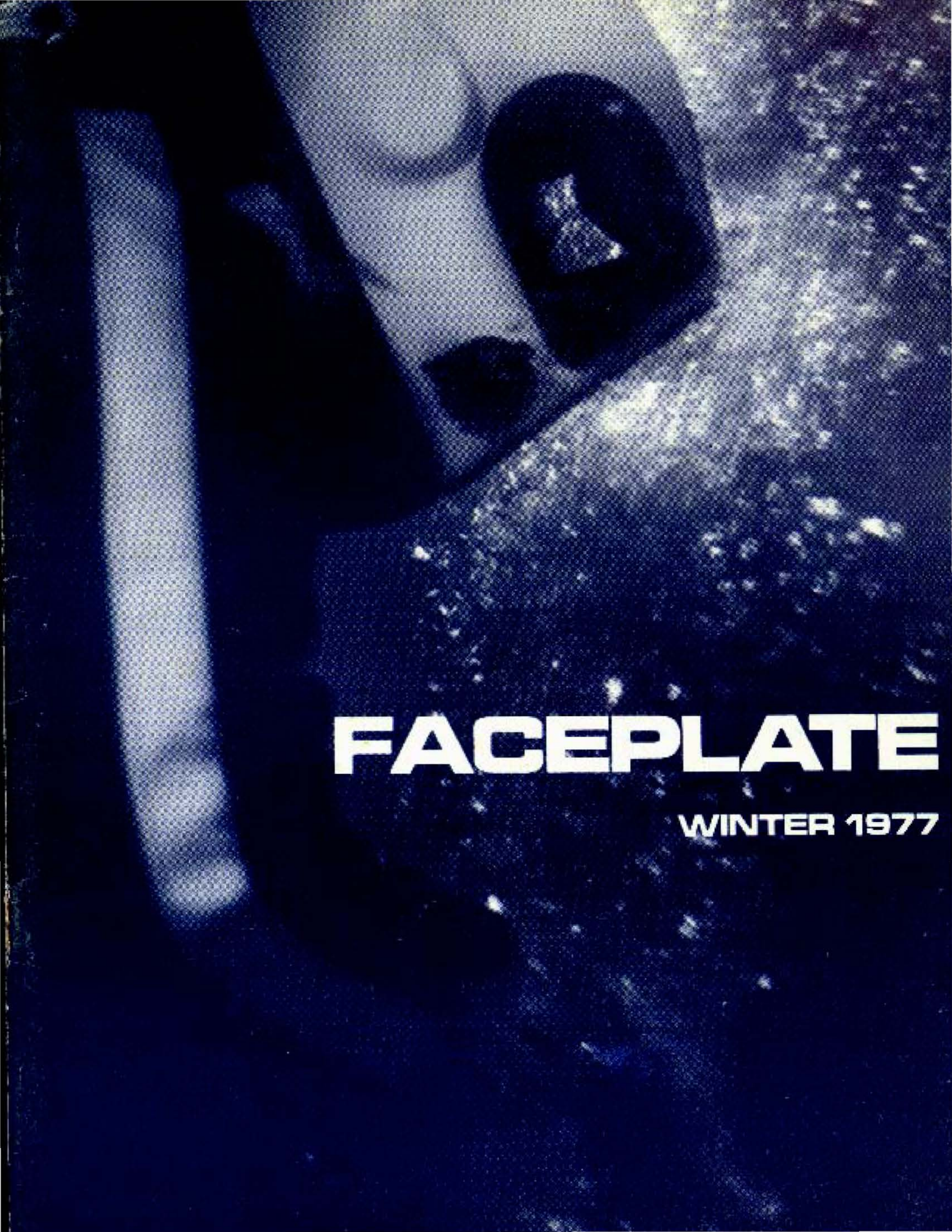
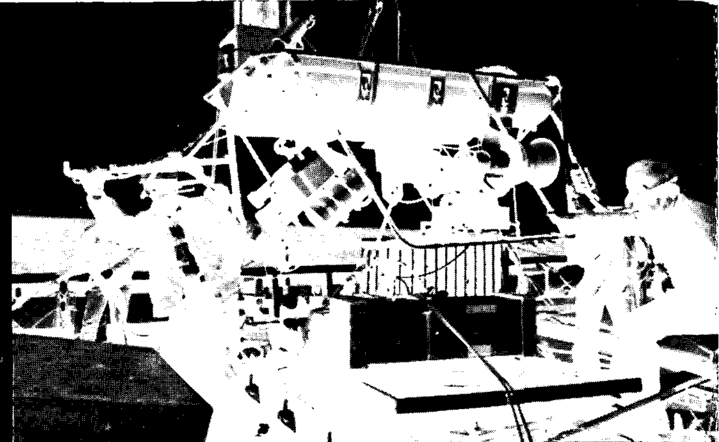
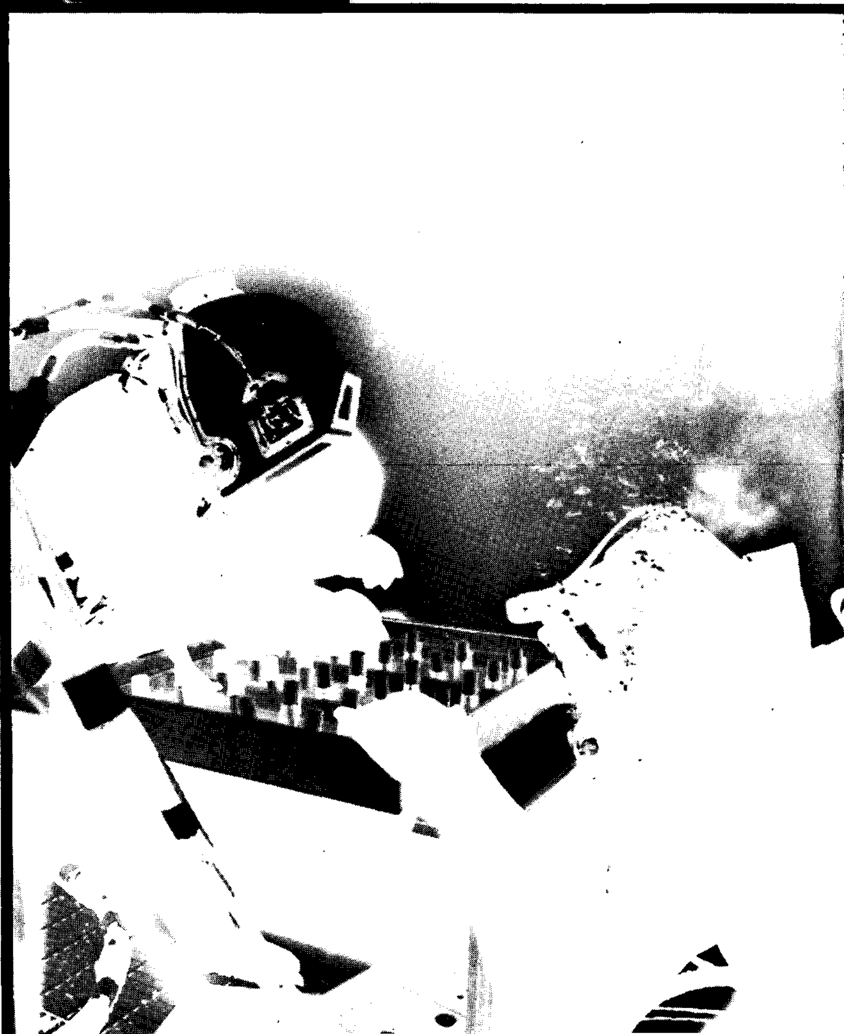


# FACEPLATE

WINTER 1977

# FACEPLATE

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

VOLUME 8, NO. 4

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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Front cover shows HTC(DV) Carlson wearing Mk 12, trying a new underwater cutting gas at Naval School, Diving and Salvage.
Inside cover photos show, clockwise from upper left: Apra Harbor clearance scene (page 22); Deep Drone during A-7 ops (page 18); sonar trace watch during F-4N search (page 9); Mk 14 and Mk 1 bandmask tests at NEDU; and HTC(DV) Carlson suiting up for dive at NSDS (page 8).

# SOUNDINGS

### NEW AIR SAMPLING REQUIREMENTS

NAVSEANOTE 9597 of 27 May 1977 requires that all high and low pressure divers' air sources be sampled for gas contaminants and particulate matter on a semi-annual basis. The goal of this program is to establish standard equipment, procedures, and analysis methods, thereby ensuring that all diving activities have satisfactory air for diving.

Actual sampling for this program started in September 1977. The first samples were taken from the U.S. west coast, Alaska, and from remote Pacific fleet activities. The initial ground work for this program was done by Naval Surface Weapons Center (NSWC), Dahlgren, Virginia. This program is funded for the first year by NAVSEA, and coordinated by NSWC with analysis by the Texas Research Institute, Inc.

Each activity with air sources to be sampled is contacted by message from NSWC approximately 6 weeks before the scheduled sampling date. If this date is unacceptable for some reason (overhaul, mission, etc.), NSWC must be contacted and an alternate sample date should be established. Then, 2 weeks before the sample date, a message from NSWC will be sent to confirm the date. The sample kit with instructions will be delivered by UPS in CONUS, and by the U.S. Postal Service outside CONUS. Samples should then be taken and returned with the kit as specified in the instructions.

### 1,500 FSW PRESENTATION

Senior CPO David J. Ball was awarded the Navy Achievement Medal while at a depth of 1,500 fsw on November 29, 1977. This occurred during the recently completed saturation deep dive in the Ocean Simulation Facility at the Navy Experimental Diving Unit. HMCS Ball's award in part cited him for professional achievement in the superior performance of his duties while assigned to the Naval Research Lab, Port Hueneme, California.

# The Working Diver — 1978

The seventh bi-annual 2-day "Working Diver" symposium will be held on March 7 and 8, 1978 at Battelle Memorial Institute, Columbus, Ohio. More than 600 divers, salvors, scientists, and engineers from the United States and abroad are expected to attend. The symposium is being sponsored by the U.S. Navy Supervisor of Diving and Office of Naval Research, the Salvage and Diving Committee of the Marine Technology Society (MTS), the Ocean Technology Division of the American Society of Mechanical Engineers (ASME), and Battelle-Columbus.

Specialists from Canada, England, France, Japan, and the United States will present 21 papers discussing topics of current interest to working divers and salvors. Subjects include ship husbandry, thermal problems in diving, large-object salvage systems, underwater television, and arctic diving operations. The speakers represent the U.S. Navy, U.S. Coast Guard, U.S. Department of Commerce, Canadian government, diving equipment manufacturers, diving contractors, salvage companies, research organizations, and universities.

Mr. W. W. "Woody" Hayes, head football coach at The Ohio State University, will be the banquet speaker on March 7. RADM G. C. Heffner, SC, USN (Ret.), assistant to the president of Battelle Memorial Institute for Community Affairs, will be banquet toastmaster.

Chairing the symposium will be CAPT Robert B. Moss, USN, Director of Ocean Engineering and Supervisor of Salvage. Members of the program committee are CDR F. Duane Duff, USN Supervisor of Diving, Mr. Walter R. Bergman, Assistant to the Supervisor of Diving; CAPT William F. Searle, Jr., USN (Ret.), Chairman of the Committee on Salvage and Diving, MTS; Dr. Jack R. Malson, Chairman of the Ocean Technology Division, ASME; Ms Betty Alkire, senior administrative assistant; and Mr. Peter S. Riegel, research engineer, Equipment Development Section, Battelle Columbus.

For registration information, contact Ms Susan Armstrong, Battelle's Columbus Laboratories, 505 King Avenue, Columbus, Ohio 43201, (614) 424-7769.

# NEDU REPORTS:

Navy Experimental Diving Unit Report 19-74. *Testing Procedures for Closed-Circuit and Semi-Closed-Circuit Underwater Breathing Apparatus.* Mr. S. D. Reimers.

*Introduction:* The purpose of this protocol is to outline the general procedures and equipment to be used by NEDU personnel in the evaluation of semi-closed-circuit and closed-circuit underwater breathing apparatus.

This protocol has been written in terms as general as possible consistent with clear understanding. It is not intended to be a step-by-step procedure that can be applied directly to the testing of a given piece of diving apparatus. Such a procedure would very quickly become out of date. It is rather intended as a detailed guide with which the Project Engineer can plan the evaluation of the apparatus to be tested. The quantities to be measured and controlled are specified for each type of test. The basic test equipment required is outlined along with the considerations governing its set-up, calibration and use. Typical test conditions and data handling requirements are also outlined for each type of test. With only a basic understanding of modern instrumentation and testing techniques, a Project Engineer should be able to make the detailed decisions necessary to apply this protocol to a specific piece of diving equipment.

Navy Experimental Diving Unit Report 20-74. *Testing Procedures for Open-Circuit Air Diving Helmets and Semi-Closed-Circuit Mixed Gas Diving Helmets.* Mr. S.D. Reimers.

*Introduction:* The purpose of this protocol is to outline the general procedures and equipment to be used by NEDU personnel in the evaluation of open-circuit air and semi-closed-circuit mixed gas diving helmets.

This protocol has been written in terms as general as possible consistent with clear understanding. It is not intended to be a step-by-step procedure that can be applied directly to the testing of a given piece of diving apparatus. Such a procedure would very quickly become out of date. It is rather intended as a detailed guide with which the Project Engineer can plan the evaluation of the apparatus to be tested. The quantities to be measured and controlled are specified for each type of test. The basic test equipment required is outlined along with the considerations governing its set-up, calibration and use. Typical test conditions and data handling requirements are also outlined for each type of test. With only a basic understanding of modern instrumentation and testing techniques, a Project Engineer should be able to make the detailed decisions necessary to apply this protocol to a specific piece of diving apparatus.

Navy Experimental Diving Unit Report 13-76. *Effect of Cold Gas Inhalation on Cardiac Rate in Man at Depth: A Preliminary Study.* E. T. Flynn, J. M. Alexander, B. Hoke, D. L. Jackson.

*Abstract*: Two Navy divers breathed first warm and then cold helium-oxygen mixtures while performing graded exercise on a bicycle ergometer at simulated depths of 0, 200, 400, 600, 800, 850, and 1,000 feet of seawater. In all cases heart rate increased in proportion to the increase in oxygen consumption with exercise. When compared with warm gas control values, no consistent changes in heart rate were apparent in either subject during cold gas inhalation through a depth of 800 feet. At 850 and 1,000 feet, however, both subjects demonstrated a significant reduction in exercising heart rate on cold gas. The potential mechanisms underlying these changes in cardiac rate and their impact in terms of cardiovascular performance and exercise tolerance are discussed.

Navy Experimental Diving Unit Report 3-77. *First-Article Test of the Mk 1 Mod O Mask (Morse Model).* D. J. Schmitt.

*Abstract*: The first USN Mk 1 Mod O mask built by Morse Diving Equipment Company, Inc., of Boston, Massachusetts, under Contract No. N00024-76-C-4184 was delivered to the Navy Experimental Diving Unit in Panama City, Florida in December 1976.

First-article test was conducted during the week of 5 December 1976. The first-article test plan was developed from the specification, primarily the Contractor's drawing package.

The mask passed all tests successfully. However, testing revealed some deficiencies and led to recommendations for minor change and review of some Mk 1 Mod O mask requirements.

**These research reports have been issued by the Navy Experimental Diving Unit, Panama City, FL. Non-DOD facilities desiring copies of reports should address their request to National Technical Information Service, 5285 Port Royal Road, Springfield, VA 22151. DOD facilities can obtain copies from the Defense Documentation Center (DDC), Attn: DDC-TSR-i, Cameron Station, Alexandria, VA 22314. Prices vary according to the individual report.**

# Who Are Your MASTER DIVERS?

UPDATE UPDATE UPDATE UPDATE UPDATE UPDATE UPDATE UPDATE UPDATE

*Faceplate published a list of USN Master Divers and their addresses in the Summer 1977 issue. However, not only have there been several changes since then, but several addresses were already out of date at that time. Therefore, an entire list is being published again here—to supersede that presented before.*

MMCS(MDV) MIKE ANDERSON
SEA DUTY COMPONENT
HARBOR CLEARANCE UNIT ONE
FPO SAN FRANCISCO, CA 96601

BMCS(MDV) LEE RINEHART
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NAVAL COASTAL SYSTEMS LAB.
PANAMA CITY, FL 32401

HTCS(MDV) FRANK BUSKI
USS KITTIWAKE (ASR-13)
FPO NEW YORK 09501

HTCM(MDV) EARL BENNETT
HTCS(MDV) RICHARD BRADY
HTCS(MDV) GEORGE GILSON
HTCS(MDV) JOHN SCHLEGEL
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NAVAL DISTRICT WASHINGTON
CODE 611.1
WASHINGTON, DC 20374

BMCS(MDV) ERNEST CALTENBACK
NAVUNWATSYSCEN NEWPORT, RI
BLDG 118 NEWPORT, RI 02840

GMGS(MDV) PHIL COLVIN
USS DIXON (AS-37)
FPO SAN FRANCISCO, CA 96601

BMCM(MDV) JOHN DAVIS
NAVY SPECIAL WARFARE
GROUP #2
LITTLE CREEK, VA 23521

HTCS(MDV) DAVID DECEMBER
USS BRUNSWICK (ATS-3)
FPO SAN FRANCISCO, CA 96601

BMCS(MDV) HERBERT HARPER
SUPSALV WEST COAST OFFICE
BLDG 7 RM 82
NAVSUPACT T.I.
SAN FRANCISCO, CA 94130

QMCS(MDV) GERAL DRAPER
USS HOWARD W. GILMORE (AS-16)
FPO NEW YORK 09501

HTCS(MDV) JERRY JENNINGS
USS CONSERVER (ARS-39)
FPO SAN FRANCISCO, CA 96601

HTCM(MDV) RALPH JONES
MMC(MDV) CHARLES WETZEL
HARBOR CLEARANCE UNIT TWO
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BMCS(MDV) MIKE EINHELLIG
USS CANOPUS (AS-34)
FPO NEW YORK 09501

HTCS(MDV) BOB JONES*
NOSC
LONG BEACH, CA 90801

ENCS(MDV) BILL ROMAINE*
USS FLORIKAN (ASR-9)
FPO SAN FRANCISCO, CA 96601

TMCM(MDV) BILL GHOLSON*
INSTRUCTOR SERVICE
SCH COMMAND
NAVAL STATION
SAN DIEGO, CA 92136

*(*DUE FOR TRANSFER AFTER JANUARY 15, 1978.)*

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NORFOLK, VA 23521

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BMC(MDV) ROY MOWEN
USS EDENTON (ATS-1)
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HTCS(MDV) STEVE LECHNER
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SCH EMPL ORD DISPSL IDNHDMD.
NAVAL ORDNANCE STATION
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HTCS(MDV) SAM HUSS
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c/o BMCS PETE PETRASEK
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ENCS(MDV) JIM STARCHER
COMSERVRON 8
NAVAL STATION
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HTCS(MDV) RAY STEELE
MAINT AND SUP SUBBASE PEARL
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QMC(MDV) JESSE WILLIAMS
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C/O NAVAL CONSTRUCTION
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CODE 222
PORT HUENEME, CA 93043
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SWC(MDV) CHARLES COPE
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USS HUNLEY (AS-31)
FPO NEW YORK 09501

BMCM(MDV) JAMES WHITE
USS ORION (AS-18)
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BMC(MDV) DICK WIEBE
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HUNTSVILLE, ALA 35801

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MMCS(MDV) BOB MOORE
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MMCS(MDV) BILL YARLEY
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ETCS(MDV) DUSTY RHODES
HTCS(MDV) DAVID DEBOLT
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BMCS(MDV) JUAN RAMOS
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MMCS(MDV) BUD KILBURY
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MMCS(MDV) ROBERT WHILEY
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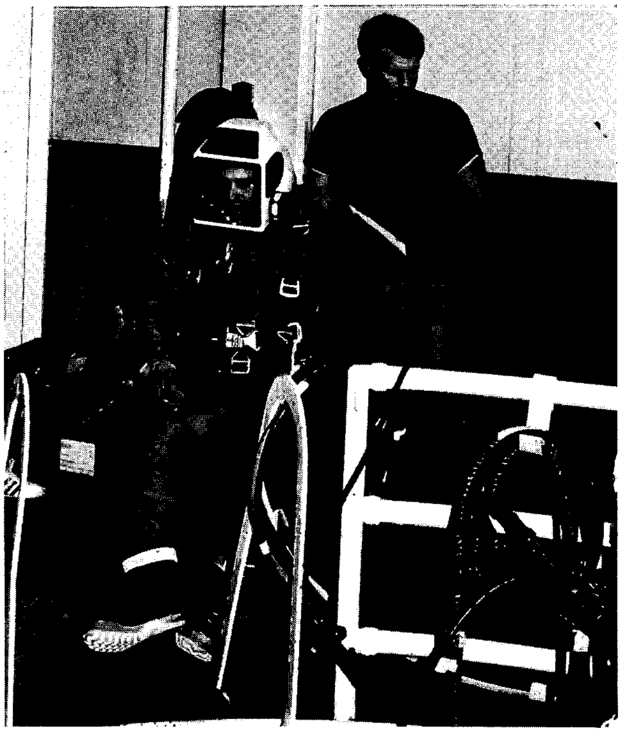
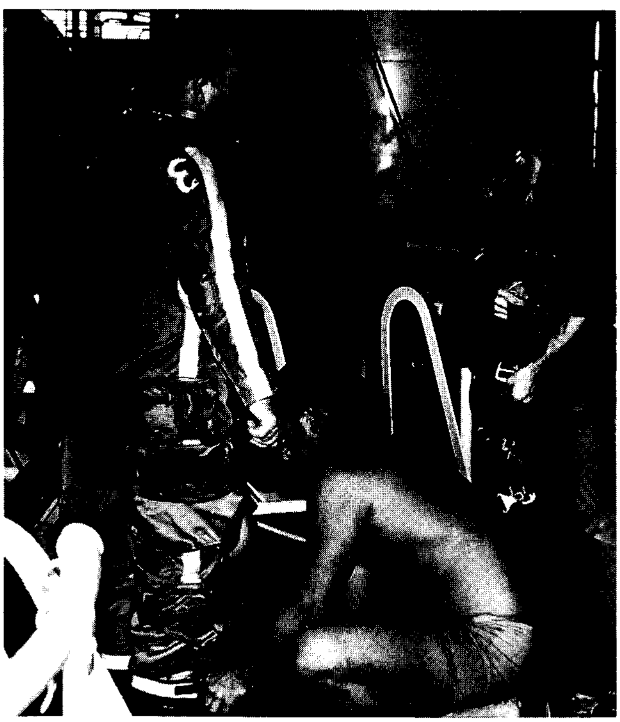
TRAINING AND EVALUATION UNIT
FPO SAN FRANCISCO, CA 96601

# New Equipment Tested by Two of Navy's Oldest Divers



EOC(DV) Scalpi (above) and HTC(DV) Carlson (below) suit up in Mk 12 SSDS for Mapp gas demonstration.



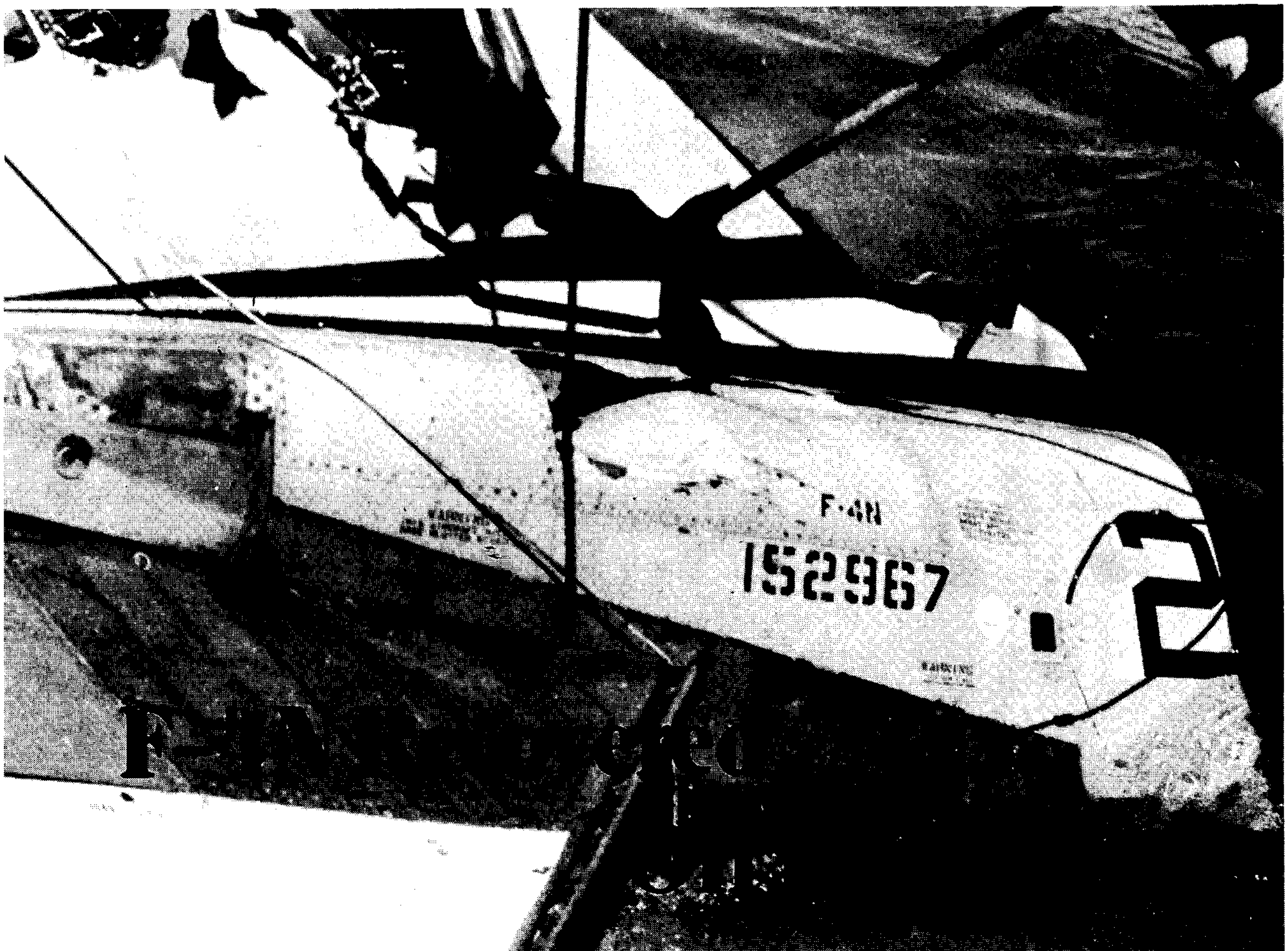
In a special demonstration at the Naval School, Diving and Salvage, Washington, D.C., HTC(DV) Eiglid Carlson and EOC(DV) Joseph Scalpi (both stationed at NSDS) tested the new Mk 12 Surface Supplied Diving System and a new underwater cutting and welding fuel called Mapp gas. The experiment took place on November 17, 1977, for representatives from the Naval Facilities Engineering Command, Naval Sea Systems Command, Naval Material Command, and various commercial companies whose products were being used.

Both Chief Carlson and Chief Scalpi began diving and underwater cutting and welding in 1955 and are considered two of the Navy's most experienced underwater cutting and welding experts. Thus, it was a case of the newest equipment and procedure being tested by two of the oldest Navy divers.

Mapp gas (methylacetylene propadiene) was developed in the early 1960's as a cutting and welding fuel. For the last few years, it has been used for topside cutting and welding in shipyards. The Navy is currently evaluating Mapp gas for underwater use because of the following advantages over other gases used:

- It is much more economical to use than the gas now used.
- It is very portable.
- It can be used with standard underwater cutting and welding equipment to depths of 150 feet.
- It is resistant to flashback.
- It is safer to use than hydrogen or acetylene. The gas is much more stable than other settling gases; also, the gas is not toxic and it diffuses easily into the air.

The experiment was conducted in 10 feet of water in one of the NSDS open diving tanks. The Mapp gas was used with an Airco underwater cutting torch to cut strips off of metal plates that were 1-1/8-inch, 1/2-inch, and 1/4-inch thick. The cutting proved to be very quick and clean, with very little slag going off into the water. Both divers reported having no trouble in holding the torch down while cutting; and that, in fact, the cutting was as fast and as smooth as if it has been done on the surface instead of in the water. The program was a demonstration only. Mapp gas is not authorized for use by anyone in the fleet except Underwater Construction Team One (which has a special CNO waiver). The use of Mapp gas is being considered for inclusion in the *Underwater Cutting and Welding Manual*, now under revision.



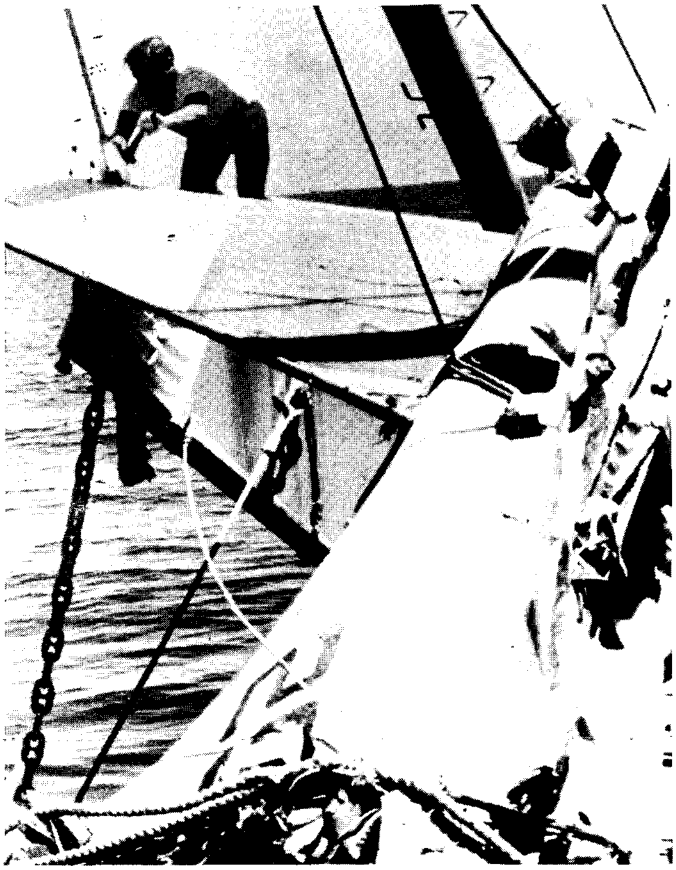

Recovery of tail section.

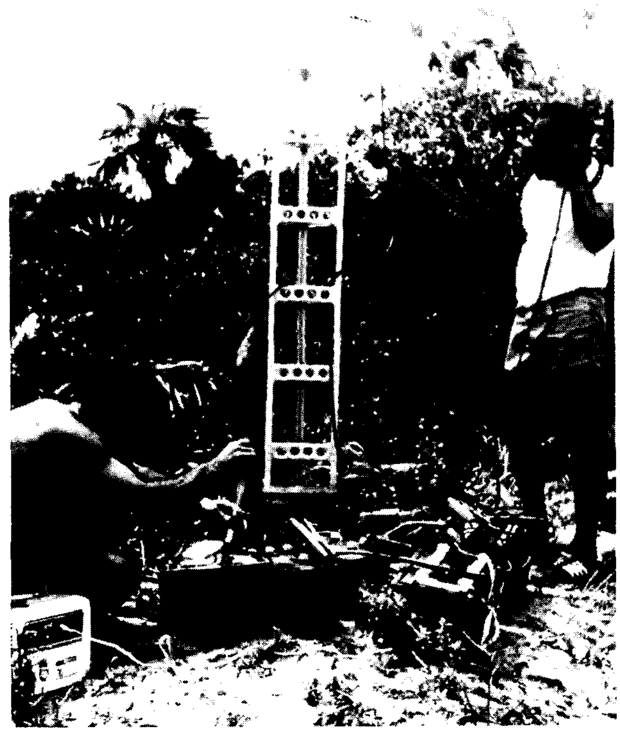
LT Steven Robinson, *NAVEODFAC*

During a basic tactics training flight, an F-4N, BUNO 152967, attached to VF-171 Key West Detachment, experienced a flameout at 14,000 feet approximately 30 miles wnw of NAS, Key West, Florida. After attempting re-start procedures several times unsuccessfully, the pilot and RIO both ejected safely and were promptly picked up by the station SAR helicopter. Returning to the area after bringing the pilots ashore, the helicopter marked a drifting oil slick with a buoy. This accident,which occurred on August 23, 1977, happened almost exactly a year after another similar incident with the same type aircraft and in the same area (see FP, Winter 1976). To determine the cause of the crash and, hopefully, to prevent similar occurrences, an accident investigation board was formed to locate and recover the aircraft. The urgency of the situation dictated the formation of a special search and recovery team from various Navy activities. While this team was enroute to Key West, EOD Detachment Key West commenced diving in the area. The buoy that had been dropped was not found, so dives were commenced on MAD contacts provided by a P-3 aircraft. These dives yielded negative results and showed the bottom to have poor visibility because of a silt-laden thermocline near the bottom. The depth throughout this area ranged from 80 to 95 feet.

COMSERVRON EIGHT received tasking via the chain of command to conduct the recovery. Harbor Clearance Unit Two (HCU-2), Norfolk, Virginia, was given the salvage responsibilities; LT Page, RN, served as SERVRON EIGHT's coordinator for the operation. The services of the Naval Explosive Ordnance Disposal (EOD) Facility, Indian Head, Maryland, and EOD Group TWO (EODGRUTWO), Ft. Story, Virginia, were requested for the search portion and also to augment diving operations if required.

The Naval EOD Facility is presently developing an Area/Point Search System (APSS) to locate ordnance and other lost objects. This system is made up of a precise navigation system and various towed sensors, including magnetometers and side-scan sonar. For aircraft searches, only the sonar is used because of the lack of ferrous metal in an aircraft. This system was first used in





Left: LT Pilling supervises lifting of tail section. Above, l-r: TM1 Reeves and BMCM Davis set up shore station on Marquesas Key.

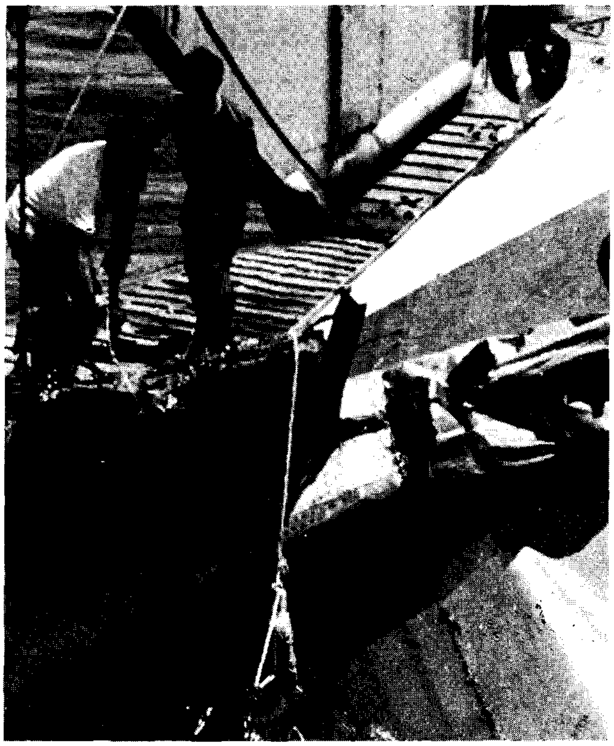
the clearance of the Suez Canal, in Operation Nimbus Moon, Water (see FP, Winter 1974), and has since been used in various searches to gather performance data and to gain operational experience. This is the third aircraft search in which the Naval EOD Facility has provided search assistance to SERVRON EIGHT in the past 3 months (an F-14 off Kitty Hawk, North Carolina, and an A-4 off Virginia Beach, Virginia).

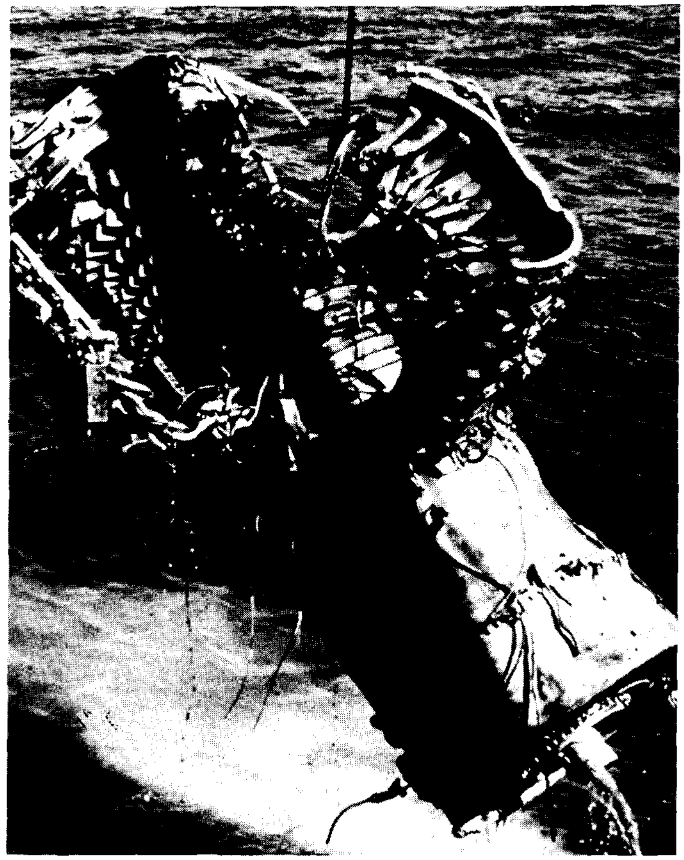
EODGRUTWO, one of the operational commands for which this system is being developed, is assuming the search responsibilities from EODF using another prototype APSS. This recent F-4N operation served as a transition period during which EODGRUTWO personnel received final training in the system.

USS SALINAN (ATF-161), commanded by LCDR H. R. Bankert, USN, was tasked to sail from Roosevelt Roads, Puerto Rico, to Key West to load the special team and act as the salvage vessel. The search and fly-away diving equipment was assembled in Norfolk and loaded onto trucks for transport to Key West. LT Robinson, from EODF, flew to Key West to interview the pilots and other cognizant personnel regarding the position of the aircraft and to investigate sites for establishing shore stations for the navigation system. The combined team arrived, and, while awaiting the arrival of SALINAN, shore stations were set up on Marquesas Key and Smith Shoal Light; and the initial search plan was established.

With the exception of an 8-hour down period during which the shore station batteries were not serviced during the passage of Hurricane Anita, the search continued around-the-clock for 5 days with no significant contacts. On September 4, a probable contact was detected. Passing over the area again brought another contact; thus, it was decided to make confirmation runs over the area to ensure that this was the wreckage and to ascertain the spread of debris. Divers reported that the aircraft was broken into several large pieces in a debris area of 30 x 50 meters. The water depth in the area was 80–85 feet. The ship was then placed in a two-point moor over the site and diving operations were secured because of darkness.

For communications purposes and as a safety measure because of the water depth and the distance to the nearest chamber (30 miles), it was planned to carry out a majority of the dives in the Mk 1 mask, using the fly-away kit's compressors. However, problems were encountered with exhaust from the ship's generators foul-





Above, l-r: LT Pilling, LT Page, and BMCM Davis guide the tail section aboard LCU. Right: F-4N engine is recovered.

ing the intake for the compressor, machinery noise interfering with the communications, and the large amount of debris on the bottom. During the first three dives using the Mk 1 mask, the largest pieces (1 wing and both engines) were recovered onto an LCU (supplied by the Naval Air Development Center). The rest of the dives were conducted using scuba.

The recovery of several small components originally in the cockpit area was essential to the accident investigation board. However, the cockpit had disintegrated upon impact and the components were strewn about the bottom. The complete absence of current on the bottom caused visibility problems because of silt; and the search for the components proceeded slowly for several days. At this point, it was decided that enough of the components had been recovered; and SALINAN was detached to proceed to Mayport, Florida. Upon further investigation, however, it was deemed necessary to recover two more items. Therefore, HCU-2 divers, augmented by the EOD Detachment, Key West, continued diving operations off the LCU until all the required parts were found. In all, 63 dives were conducted with a total bottom time of 56 hours; over 50 million square meters were searched.

This operation proved the feasibility and effectiveness of the combined search and salvage capability within the Navy and provided valuable cross-training in various tasks for the personnel involved. The commands involved worked smoothly together, enabling the expedient location and recovery of the aircraft. The following message was received from COMNAVAIRLANT, commending the participating commands:

"ACFT Salvops—

Once again, surface units have responded to requests for ACFT salvage in order to determine the cause of the mishap and prevent future occurrences of a similar nature. As before, the response was rapid, highly professional, and superb in all respects. Please convey my sincere appreciation to all concerned for typically outstanding jobs well done.

—VADM Greer."

# Learning the Lure and the Lore of the Depths

Liz Jacobs Falvey, Pat Davis
*David Taylor Naval Ship Research and Development Center*

Several employees of the David Taylor Naval Ship Research and Development Center (DTNSRDC) completed a 4-week scuba course at the Naval School, Diving and Salvage. They were selected from 40 Center volunteers to be trained as support personnel for the DTNSRDC Diving Team. In preparation for the rigors of open-water scuba operations, the Navy school screened candidates through a vigorous schedule of physical training, classroom study, and pool and open water diving projects.

*It's 7 a.m. and the sun is just a pale orange ball shining bleakly through early morning D.C. haze. The temperature is already a sticky 83°F, and is expected to climb well into the upper 90's by noon. Sleepy-eyed and hungry, I tugged on still-sweaty socks and damp running shoes and fell in to muster with our steadily dwindling class.*

*One last deep breath of freedom as our instructor sauntered over, then we were half-heartedly contorting our weary bodies through sit-ups, push-ups, flutter kicks, and other calisthenics, dreading the inevitable 8-count body builders. Soon came the equally dreaded command, "Columns of two, double time."*

*The prospect of running several miles seemed dismal indeed; but, after a few minutes of muscle aches and labored breathing, I settled into the pace and tried to daydream. When the instructor barked, "Slow it to a walk," my initial relief became apprehension as I realized we were far from the Yard—a sure sign of more exercises to come. "On your bellies!" "On your feet!" "On your backs!" "On your feet!" . . . The sweat and dew and dirt clung to my legs and T-shirt as we finally started the long jaunt back.*

*Wearily climbing the stairs to the locker room for the 10-minute race to shower, dress, and get to the classroom, I tried to console myself that there were only 11 days of this left; but my weary mind and aching body shot back the challenge, "Why?"*

Two weeks of intensive classroom work ingesting physics and medicine familiarized the candidates with gas exchange laws under pressure, decompression times and tables, and the numerous symptoms of and treatments for diving related casualties. Homework, written exams, and a multitude of classroom assignments ensured that the students retained knowledge and appreciation of this life saving information.

The midpoint of the course found only one-third of the Navy, Marine Corps, Coast Guard, and civilian students left. Failing either a written exam or the physical training requirements led to automatic expulsion from the course, before ever putting a scuba tank on. The harshness of this policy was realized during the third week, as students were running up to 5 miles a day, hauling heavy tanks and other scuba gear on their backs, and spending hours under water in the pool practicing methods, safety procedures, and the importance of the buddy system in all diving situations. The final test for "Pool Week" was two 20-minute periods of underwater harassment by a group of instructors, designed to test the student's reaction to panic situations.

*"Get your gear out of the boat and fall in . . . hurry up, we haven't got all day!" After a mile run across the river, we struggled with the gear brought over by boat. With twin 72-cubic-foot scuba tanks on our backs and a gear bag loaded with wet suits, regulators, weight belts, mask, fins, and other paraphernalia slung over our shoulders, we trudged the eighth of a mile to the pool under this staggering weight, never moving fast enough for the instructors. Despite the fast pace, every piece of gear had to be handled gently, as it was drummed in that this was a life support system. Dropping a piece of equipment incurred the wrath of instructors and brought on endless sets of push-ups or flutter kicks.*

*Buddies helped each other suit-up, checking all gear out thoroughly before entering the water. This was "Harassment Day," what we had been dreading all week, and everyone was on edge for the hardest test of the course. It came quickly and hard. As we circled the bottom in teams, the instructors dove down from the surface. They pulled off masks and flippers, turned off our air, pulled regulators out of our mouths and tied them in the tank manifold, and pulled quick-release straps to get our tanks away.*

*We worked solely on instinct now. My buddy and I intertwined our legs to keep from being separated (which would be automatic failure). We didn't allow ourselves to think, which would have caused terror, we simply reacted—turning air valves back on, helping each other rebuckle tanks and untangle regulators. When one tank was finally wrestled from us, we fought the urge to panic and began to "buddy breathe" off our one remaining tank. What had seemed endless rules and monotonous hours of practice during the week now became lifesaving reflex.*

*Finally the harassment ceased for our 5-minute break. We circled the bottom again, collecting our strewn around gear and preparing ourselves for the next period of harassment before returning to the so near, but, oh, so far away surface 10 feet above us.*

The final week of training took place in the Anacostia River. The skills learned in the pool were now practically applied, as students completed compass swims, bottom searches, hull inspections, and night dives. One work project included changing a gasket on a flange in the zero visibility murkiness of the river.

The last day of the school included a 130-foot qualifying dive in a hyperbaric wet pot. The graduating class, which numbered four of the original 18 class members, received a well-earned handshake and Navy Diving Card from the Commanding Officer of NSDS.

*Lights from the barge cast a pale glow over the river. A recent thunder storm and steady breeze all evening had deposited an assortment of debris around the barge. It was not a very appetizing sight to see as we suited up for our final night dive, a hull inspection.*

*The thought of night diving only seemed jittery because of the psychological factor of entering the water in darkness. Visibility under the surface was practically zero, so we had to rely on our sense of touch under water anyway.*

*Ready to enter the water, my buddy and I checked each other's gear thoroughly and signaled that we were ready. A suited up stand-by diver was on hand, ready to enter the water immediately in case of emergency. It crossed my mind that something could happen down there that they wouldn't even know about, but I brushed the thought away quickly. We had learned never to venture out of our buddy's shadow (after a nasty reminder of carrying a 10-foot-long, 3- inch- thick hawser on a 2-mile run), and we would be hooked together with a 4-foot line underwater, so we should be able to manage any problems together.*

*Upon a signal from the instructor, we stepped off the deck together, holding our masks and tank straps as we hit the water 6 feet below. Hooking up our buddy line, we swam to the vessel to be inspected and slowly descended under water. Beginning at the stern, we checked rudders, condition of props, seals, and bearings. The inky blackness was disorienting, and I searched for something recognizable with my hands among the jumble of struts and shafts.*

*A few minutes later we surfaced, and as we pulled ourselves into the boat, I was flooded with a sense of relief. That was it, we had made it. Four weeks of training were behind us. What did I get out of it? Intimidation, frustration, aching muscles, a terminal case of dishpan hands, and chlorine-burned eyes from hours in the pool. There were times when I hated our instructors, when I cursed myself for ever getting into this madness, when quitting seemed the easiest and most sensible thing to do.*

*Now I hold my diploma, which states that I'm a U.S. Navy Scuba Diver, qualified to "disport myself among denizens of the deep, mermaids, and other inhabitants of the realm of Neptune." But this piece of paper says nothing about how I feel, the intense team spirit and personal pride that developed in such a short time and make it all seem worth it. Asking myself "Why?" so many times during the past month, I now know the answer.*

# Waterborne Installations

Mr. Donald Keene
*Office of the Supervisor of Salvage*

The Office of the Chief of Naval Operations (CNO) received a request from the Commander-in-Chief Pacific Fleet in the Summer of 1977 for pre-deployment bottom blow system improvement alterations in single shaft frigates to improve their deployed reliability. CNO then contacted the Naval Sea Systems Command to provide an accelerated installation of improved boiler bottom blow systems. This correspondence included a request for comments on the feasibility and cost of alternate methods of accomplishing this task that would not require docking.

The ships requiring the maintenance were USS HAMMOND (FF-1067) and USS LOCKWOOD (FF-1064), both located at Yokosuka, Japan; and USS OUELLET (FF-1077) and USS WHIPPLE (FF-1062); based in Pearl Harbor, Hawaii.

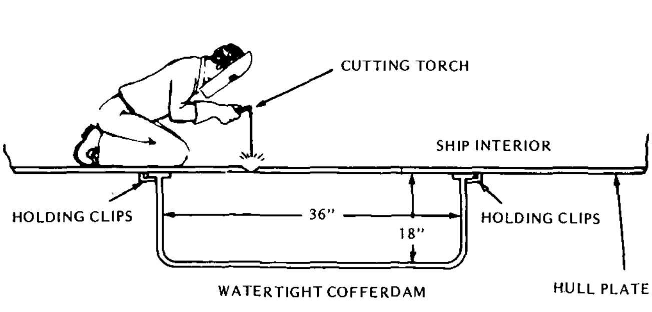
The Diving Operations Branch of the Office of the Supervisor of Salvage (SUPSALV) was assigned this task. Oceaneering International, Inc., SUPSALV's diving services contractor, performed the welding of the boiler blow sea chests under the overall project direction of Mr. Donald R. Keene, SUPSALV Diving Operations Specialist. The diving crew consisted of a project manager, diving supervisor, a diver/welder, and two tenders.

As originally constructed, overboard blow from both "A" and "B" boilers of the FF 1052 class was channeled through a common sea chest to starboard, near frame 90. Failure of this sea chest would effect both boilers and make the ship inoperative. Therefore, the common sea chest was replaced by sea chests for each boiler. At boiler "A," a new chest was installed. At "B," the dual-purpose sea chest was replaced with a spool piece to plumbing for boiler "B" only.

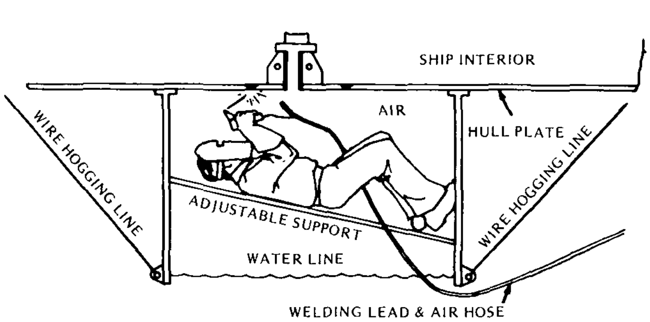
Before the task assignment starting date, sea chests were fabricated according to Navy specifications in Oceaneering's Gulf Coast Division facilities in Morgan City, Louisiana. The procedure for the sea chest replacement for a boiler is as follows:

- Place cofferdam 16 inches square over sea chest outlet on the exterior of the hull to permit the removal of plumbing.
- Cut out the existing sea chest and dress the hole in preparation for a new chest.
- Tilt the new sea chest to accommodate the existing plumbing.
- Weld the sea chest in proper position on the interior of the hull.
- Add supporting gusset plates onto the sea chest and install the valve assembly or blank.
- Remove cofferdam and install underwater open-bottom weld habitat.
- Back-weld the sea chest in the dry environment thus provided.
- Paint the weld within the habitat with Navy-issue bottom paint, or remove habitat and paint weld with epoxy paint underwater.

After removing the deck plates, cleaning the bilges,




STEP – 1 CUTTING HOLE IN SHIP'S BOTTOM FOR INSTALLATION OF SEACHEST



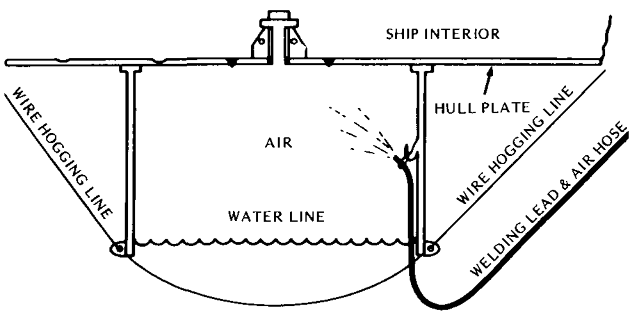

WELDER/DIVER CAPPING WELD FROM OUTSIDE OF HULL (WATERBORNE)

# *Are Economical & Efficient*

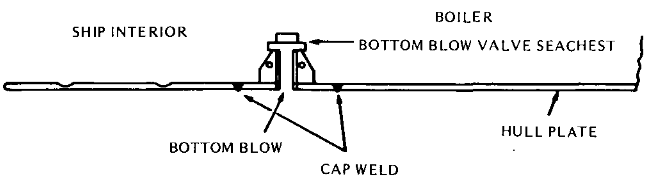
running hogging lines, etc., the method of installing the boiler blow sea chests was as follows:

- The area forward of frame 87 was measured and scribed to establish the exact location for the new sea chest on the interior of the hull.
- A stud was shot through the hull from the inside of the vessel to facilitate locating the installation area. Padeyes were then wet-welded 1-1/2 feet from either side of the stud. The 15-inch cofferdam was centered over the stud, and the dam was secured with a cable come-along.
- After the cofferdam was de-watered, an oxygen/acetylene torch was used to burn a small hole inside the scribed 6-inch area to double check the cofferdam security.
- A hole approximately 6 inches in diameter was cut around the stud at the center and beveled to 35°. The cut was then ground smooth.
- The fit of the sea chest was tested and adjusted with 8-cm clips to a plumb and level position. With the ship's bridge instruments, it was determined that the ship was level starboard to port, forward and aft. A carpenter's level was used in the boiler room to adjust the flange face perpendicular to the ship's keel.
- After it was fitted and marked, the sea chest was cut to specifications with the flange face 10 inches high at center and angled according to the cant of the ship's hull. The 7/8-inch stiffener ring was tacked into place and welded to the spool piece with a 1/8-inch root pass, followed by 10 passes of butt weld. A dye penetrate test was then conducted.
- The sea chest with stiffener ring was welded to the ship's hull with a 1/8-inch root pass and 8 fillet welds. The entire weld was tested with dye after the gusset plates were welded to the sea chest.
- A 1-inch blank-off was installed on the sea chest. A diver then removed the cofferdam and padeyes and installed the underwater welding habitat.
- The diver/welder ground-out the "1A" sea chest outlet with a smooth, V-shaped grind and dry-welded the sea chest outlet flush with the hull bottom.
- After the habitat was removed, all the affected underwater surface was painted with epoxy.

To date, boiler blow sea chest installations usually have been performed in drydock. Considering the associated time and cost involved in drydocking, it is obvious that the success of these waterborne installations will provide substantial advantages to fleet ships. The cost of performing this task in drydock is estimated to be $130,000.00 per ship. (This figure includes a $60,000 to 70,0000 docking fee.) In comparison, the procedure accomplished while a ship is waterborne costs an estimated $22,000 per ship. The savings in time is also considerable. Instead of the usual 7- to 9-day period required in drydock, a ship spends only 3 to 5 days idle while waterborne installations are accomplished. Waterborne ship maintenance procedures are continuing to prove to be the most efficient method.




VALVE IN PLACE – BOTTOM ACCESS
COFFERDAM INSTALLED




VALVE INSTALLED EACH WELD PASS
GIVEN LIQUID TEST

# Deepest [illegible] Dive Completed at NEDU

"Deep Dive 77," the Navy's deepest manned saturation dive using only Navy personnel and facilities, was successfully completed by the Navy Experimental Diving Unit on December 16, 1977. The 37-day dive, which began on November 10, compressed to a depth equivalent to 1,500 feet in the open sea. It was the deepest dive yet conducted in NEDU's Ocean Simulation Facility (OSF) in Panama City, Florida.

The dive team consisted of LCDR John L. Zumrick, MC; HMCS(DV) David J. Ball; EM1(DV) Frederick J. Donlon; BM1(DV) Michael R. Hobbs; MM1(DV) Nelson R. Penn; and HT3(DV) David P. Willette. During that 37 days, some 146 dives were made on 6 different diving rigs, requiring the handling of over 1 mile of umbilical cable in the OSF wetpot. Of those dives, 75 were made on medically instrumented diving apparatus.

The divers also took part in seven ancillary biomedical and psychological studies during the dive. Pulmonary function studies were carried out in cooperation with representatives from the University of Florida. In particular, Dr. John Clark (from the University) collected data concerning airway resistance under pressure. Previous dives to deep depths have indicated what appears to be an increase in airway resistance far above that expected on the basis of gas density alone. The purpose of this experiment was to attempt to quantify airway resistance. Blood studies during the dive involved personnel from NEDU and the Naval Medical Research Institute. LCDR Pat Daily (from NMRI) was primarily concerned with analyzing blood samples for endotoxins. Dr. Dave Uddin, also from NMRI, used the same samples to study enzyme changes in the blood under pressure. Under the direction of NEDU psychologist LTjg John I. Brady, Jr., MSC, USNR, taste sensitivity tests were conducted because of the common complaint about the taste of food at deep depths. Initial test results suggest that instead of a diver's taste becoming dulled at depth, it appears to double in sensitivity. Thus, food that has a moderately salty taste at the surface might taste excessively salty at depth. After studying saltiness in this dive, LTjg Brady hopes to investigate other areas of taste (sweet, sour, bitter) in future dives. In addition to these tests, dive participants also took part in dry thermal experiments, SINDBAD cognitive tests, Unlimited Duration Excursion tests, and two hardware related studies.

The primary purpose of Deep Dive 77 was to evaluate the Mk 14 Closed-Circuit Saturation Diving System. This system is designed to be used with a personnel transfer capsule in deep ocean diving (see *Faceplate*, Fall 1977). In addition, the Mk 12 Surface Supplied Mixed Gas Diving System, the Swimmer Life Support System Mk1

Above, left: Mk 14 diver on ergometer. Above: NEDU watch personnel during dive. Below: Two areas of medical deck.

with full-face mask, a deep dive experimental version of the SLSS Mk1, the Divers Mask Mk 1 Mod S with Kinergetics heater, and the Low Resistance Breathing System (LRBS) were also examined at depth. LRBS is not a diving rig per se. Instead, it is a system that is used as a research tool to study a diver's breathing while he is submerged. With LRBS, NEDU measures the volume and flow rate of each breath during immersed work tasks to help define various respiratory parameters that could affect the standards of breathing rig design. LRBS also ties in with thermal studies in regards to measuring respiratory heat loss. LRBS studies during this dive were primarily under the management of LCDR Robert K. O'Bryan, MC, USN, a member of the NEDU medical staff.

Very few instrumentation and equipment problems arose during the dive. This was due in large part to the exceptional pre-dive training the divers received, which was under the direction of MMCS(DV) Richard L. Pershin, the day watch Dive Supervisor. With the help of HMC(DV) Wilmer "Doc" Boyce of NEDU's Medical Department, the training (which began on August 26) proved to be invaluable to the dive's success. There were four separate watch sections during the dive, reflecting the accomplishment that more NEDU personnel were qualified on more systems than in any other dive.

# A-7 FOUND OFF SOUTH KOREA

A U.S. Navy A-7 aircraft crashed into the waters off South Korea on March 30, 1977, after a failure during a routine catapult launch from the USS MIDWAY (CV-41). The pilot jettisoned his ordnance stores and ejected from the aircraft but apparently failed to separate from the ejection seat and deploy his parachute and was subsequently drowned. The accident occurred 50 miles WSW of Tsushima Island, Japan, in approximately 350 feet of water.

The Supervisor of Salvage, U.S. Navy, was tasked to locate, examine, and, if possible, retrieve the ejection seat for the accident investigation by the Naval Air Systems Command.

The Supervisor of Salvage (SUPSALV) tasked its search contractor, Seward, Inc., to conduct a precise underwater search for the lost aircraft and ejection seat. The Seward team was headed by R. E. Kutzleb of Seaward, Inc. Mr. T. B. Salmon was the acting Supervisor of Salvage representative (SUPSALVREP).

After arriving in Pusan, Korea, on April 7, Mr. Kutzleb and Mr. Salmon proceeded onward to the U.S. Navy facility at Chin Hae, Korea, for liaison with both U.S. Navy and Republic of Korea Navy (ROKN), personnel. USS DELIVER (ARS-23) arrived at Pusan on April 8; and Mr. J. W. McDonald, of Seaward, Inc., commenced the installation and checkout of all search equipment.

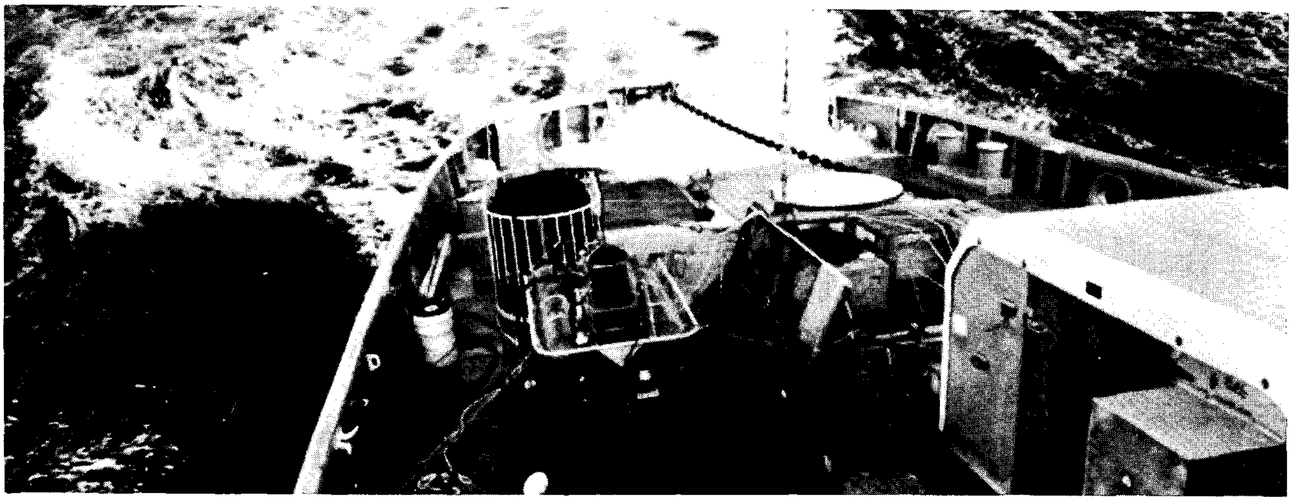
Enroute to the search area, DELIVER transported the shore navigational equipment and personnel to their stations on the islands of Sori Do and Kuk Do.

DELIVER began a sonar search on April 11 and continued it through April 12, 1977, when probable targets representing the aircraft wreckage and seat were located and precise navigational fixes of these areas were made. The water depth at the site was approximately 340 feet.

Alcoa Marine Corporation, operator of the U.S. Navy tethered remote controlled submersible, DEEP DRONE, was tasked on April 4, 1977 to proceed to the search area, identify the sonar targets, and examine and recover the ejection seat. Mr. R. N. Hamilton was the Project Manager from Alcoa Marine Corporation assigned to this operation.

Having completed the towed side scan sonar search, USS DELIVER arrived at Pusan on April 14; and the DEEP DRONE system was loaded aboard the ship, installed, and tested. During the in-water, pier-side checkout, an oil-filled cable on the vehicle was cut and required replacement. After further tests and adjustments to the vehicle, DELIVER got under way and proceeded to the search area. A CTFM transponder was deployed to mark the site of the probable wreckage and DELIVER anchored in 345 feet of water at that site. The weather deteriorated, with winds to 50 knots; and on the morning of April 18, DELIVER's starboard anchor chain parted. DELIVER steamed throughout the day with the wind holding at 45 to 50 knots and with the seas 12 feet to 15 feet and departed that night for Pusan to wait out the storm.

A message from CTF 73 then ordered DELIVER to proceed to Chinhae, South Korea, and the DEEP DRONE system was transferred to USS GRAPPLE (ARS-7). While en route by sonar navigation to the CTFM transponder, two sonar targets were investigated. The first was a small unidentified piece of wreckage and the second was the ejection seat. It was determined that the pilot had remained strapped to the seat. After video taping and photographing the seat, DEEP DRONE deployed its grapnel, hooked the seat, and proceeded to surface. GRAPPLE's divers then secured the seat and pilot to the ship's work boat.



The seat and pilot were transferred to GRAPPLE. DEEP DRONE was brought aboard for rerigging and was redeployed to retrieve the CTFM transponder. With the transponder recovered and DEEP DRONE secured, GRAPPLE steamed for Pusan, concluding the recovery operation.

Search Vessels:

USS DELIVER (ARS-23) was furnished by the U.S. Navy for use as a search and recovery platform. DELIVER, a 213-foot heavy salvage and towing ship, was ideal for the task, having good sea-keeping and steering qualities, plus ample space for the search equipment installed.

USS GRAPPLE (ARS-7) was substituted for DELIVER when scheduling requirements dictated. This vessel was also suitable for the task and was employed until the successful conclusion of the task.

Shore Support:

Ample logistic support was supplied by the U.S. Naval Facility at Chin Hae, Korea; and the Republic of Korea Navy representatives, who made every effort to assist and support this mission. Two Korean interpreters were furnished through the aid of the Chin Hae Facility and the ROKN staff. They were, of course, invaluable in the communications exchange between the navigation technicians and village personnel.

Search Techniques:

The sea-floor searched was relatively clean and flat, thereby affording a distinct advantage and probability of success to the search team. The search was set up on a 24-hour per day basis to ensure the best ship utilization with overlapping sonar sweeps to guard against steering, weather induced errors, or "holidays" in the search pattern.

Above: DEEP DRONE sits on deck. Below: Preparing to launch DEEP DRONE overboard.

# Oil Spill Equipment Tested

To determine the capabilities for at-sea recovery of spilled oil using the Marco Class V Skimmer, the Supervisor of Salvage conducted a series of tests at Treasure Island, San Francisco, California. The test included the Marco skimmer, Goodyear boom, and various support equipment in actual offshore conditions. Although oil was not used during the project, the results obtained are applicable to a typical spill situation.

The systems were tested for sea keeping capability, durability, and operating characteristics in varying sea states. In addition, the exercise was designed to evaluate the human factors involved. This included studying the ability of personnel to transfer to and operate the skimmer and also to test the levels of operator endurance. The training of operator and supervisory personnel involved in the exercise at all levels was an additional but equally important objective.

Test One—"V" Tow:

Test One involved a "V" shaped tow using one Marco skimmer, two 220-foot sections of Goodyear boom, one YTB, two Coast Guard 41-foot rescue craft, one barge, and 200 feet of debris boom.

During the tow to the test site, speeds of approximately 8 knots were obtained. A chain bridle arrangement was used between the skimmer and barge, causing moderate surging because of the chain's rigidity. Consequently, plans were made to test a nylon bridle for additional flexibility in the tow. The debris boom, which had been attached at the ends of the first 110 feet of boom, separated at the end connectors under the load. The support members at the debris boom end had become considerably bent, and the attachment cable had pulled loose through the wire clips. The debris boom was then detached completely and removed from the water.

At the test site, the YTB released its tow, allowing the Coast Guard 41-foot craft to recover the towing ends of the boom to prepare for the test runs. In the "V" configuration, the 41-foot craft remained between 50 and 200 feet apart and averaged speeds between 0 and 2 knots. Because of the sea state, moderate chop, and the turbulence created inside the "V", water splashed up into the recovery well and occasionally onto the skimmer deck. These conditions could hamper efficient oil recovery.

Many factors determine the effectiveness of the "V" configuration—sea state, current, operator experience, debris conditions, etc. Generally, the test showed that the "V" configuration can be a successful method of oil recovery.

Test Two—Double "J" Tow:

The double "J" tow configuration included two skimmers, 220-foot and 110-foot sections of boom, and the necessary support vessels. The transit tow went much the same as the "V" tow, but with less surging. Once put in the oil recovery mode, however, significant differences were noted. The skimmer with the 220-foot section of boom had little success in maintaining a position away from the barge that would allow for oil pick-up. The skimmer could only manuever into position when the YTB was stationary. As soon as headway was made, the drag on the boom forced the skimmer behind the barge, eliminating any possibility of recovering oil. The skimmer with the 110-foot section of boom was somewhat more successful, but not enough to be of practical use. The skimmers are insufficiently powered to maintain a recovery position when towed by a YTB. Since a YTB has difficulty in maintaining speeds of less than 2 knots, a ship capable of low speeds would probably improve the effectiveness of the double "J" tow.

One advantage of the double "J" over the "V" tow is that the turbulence in front of the skimmer is greatly reduced. This increases recovery efficiency by reducing losses from emulsification and splash-over. Another advantage of the double "J" is that the skimmer can avoid the large pieces of debris that are usually associated with oil spills. However, unless a tow vessel capable of maintaining low speeds (less than 1 knot) is used to tow the barge and skimmers, the double "J" tow would be of little practical use because of the limited power of the skimmer.

Test Three—"W" Tow:

The "W" tow is, in most respects, almost identical to the "V" tow. The different is that two skimmers are used in the "W," and the barge leads the boom and skimmers instead of trailing astern. One short leg of boom on each skimmer is attached to the barge and one longer leg is attached to a Coast Guard 41-foot boat. During this test, however, only one skimmer was tested.

To simulate a constant skimmer offloading situation, a 6-inch hose was rigged from the skimmer to the barge. Some problems were encountered because of the weight and rigidity of the hose. Hose floats were used to prevent sinking, but manhandling the hose was difficult because of the limited working and rigging areas on the skimmer.

The "W" tow, since it is so similar to the "V" tow, can be used in most of the same situations, especially in a large spill. The "W" tow has a potential for a greater recovery rate for each tug/barge combination, but it is not as manueverable. It is also possible that a disturbance of the slick by the leading barge could negate the potential increase in recovery rate. Further study or operational experience is required to determine the effectiveness of the "W" tow.

Debris Screen:

The debris screen consisted of light guage wire fencing with approximately a 2-inch opening. The strength members were nylon line longitudinally, with vertical pipe stiffeners at the ends. Floats were attached approximately every 2 feet. The purpose of the boom is to prevent large pieces of debris from approaching the skimmer and obstructing the flow of oil or damaging the recovery belt.

Circumstances prevented proper testing of the debris screen, but the basic concept appears sound. With adequate reinforcement and strengthening, the screen could prove to be an asset to the recovery system.

Conclusions/Recommendations:

For the "V" Tow:

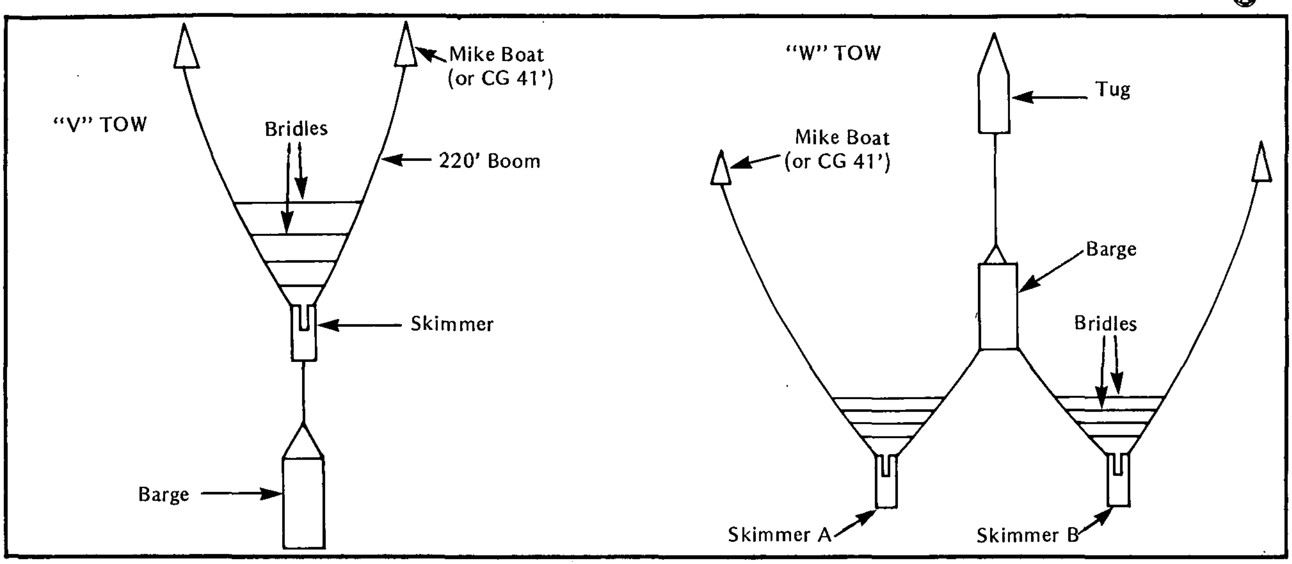
- Use nylon bridles every 55 feet on the entire length of boom to maintain "V" shape.
- Use a towing vessel capable of maintaining low speeds of less than 1 knot.
- Strengthen debris boom end connectors and strength members.
- Use long tow line behind 41-foot craft, connecting to boom end connectors.
- Safety shackles should be used throughout rigging.
- Boom adapter skirts need improvement in design to prevent ripping during normal use.
- Add rings to bottom chain on boom for simple connect and disconnect of bridles.
- Use tow vessels of similar power—a Coast Guard 41-foot craft is ideal.
- Modify the method for holding skimmer doors in the recovery well closed.
- Modify boom towing ends. Possibly change from double to single point tow.

For the "J" Tow:

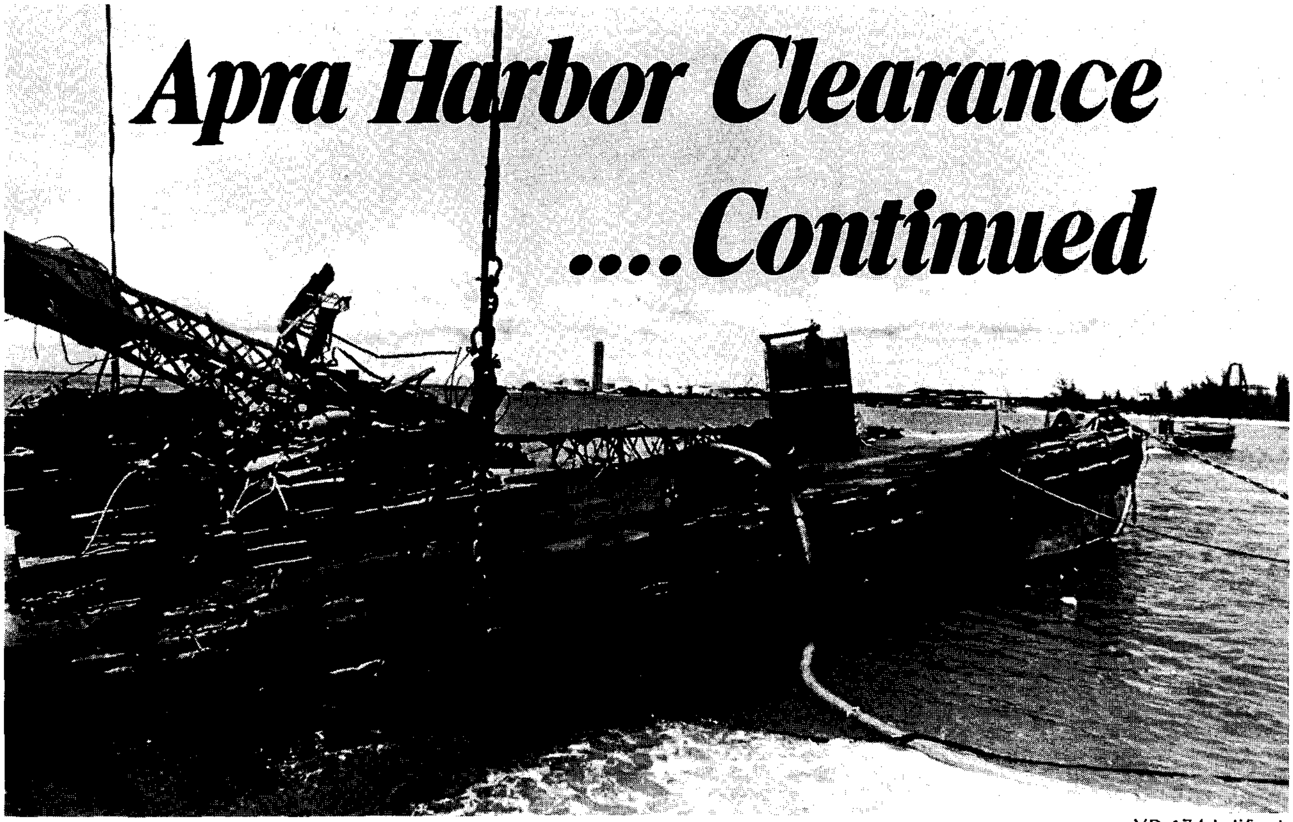
- Determine optimum boom length for low speed tow.
- Improve rigging arrangement for boom/barge attachment.
- Develop method for changing from towing to skimming mode.
- Determine flow path of oil past barge.
- Determine method for holding skimmer in "J"-mode, possibly using Coast Guard 41-foot craft.
- Operator experience is essential in efficient oil recovery.

For the Adapter Skirt:

- Consider the use of nylon web instead of wire at top of skirt.
- Total skirt design needs improvement to increase durability.
- Pressed seams are not strong enough. Stitching seams may be required.
- Rubber bands suffer greatly because of chaffing.



# Apra Harbor Clearance ....Continued



YD-174 is lifted.

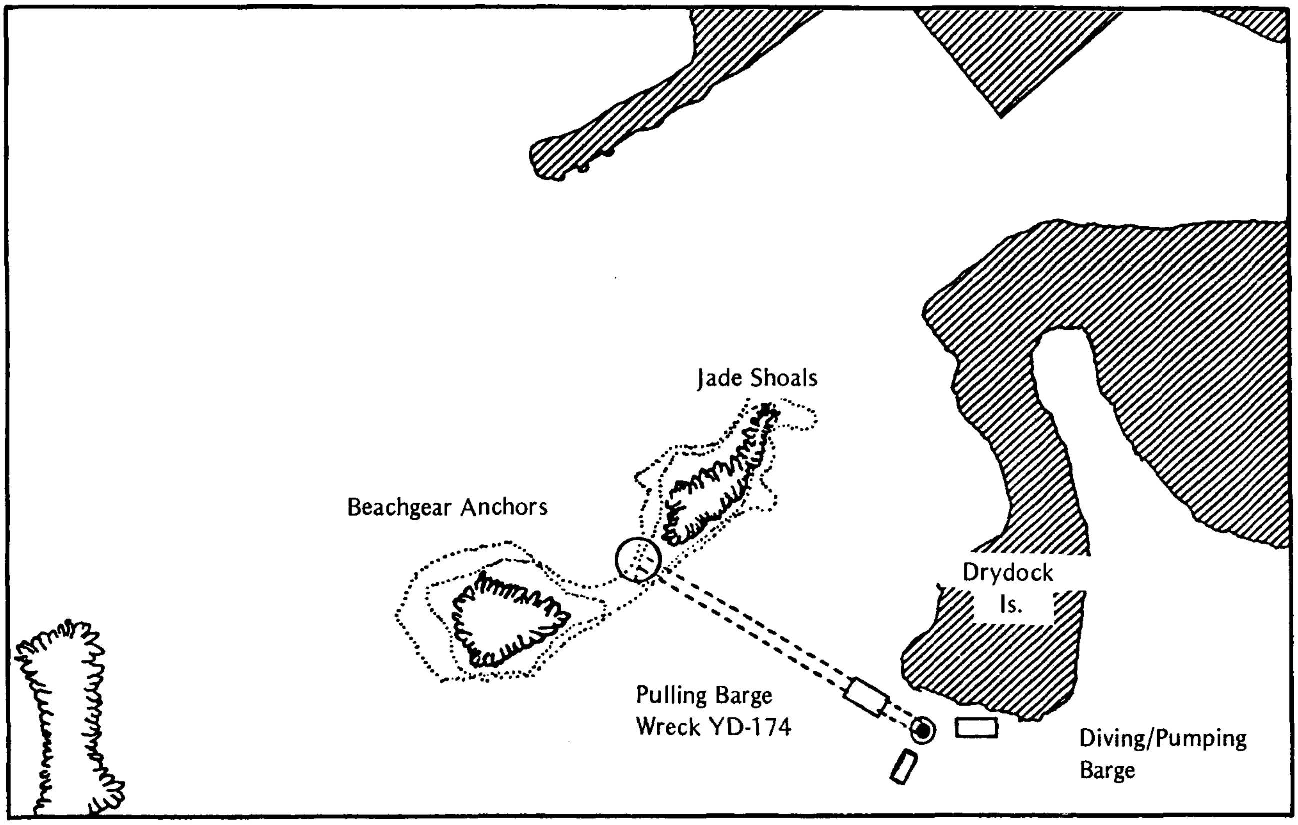
LT Roy Abshier, III
*Harbor Clearance Unit One*

Super Typhoon Pamela hit Guam in May 1976 with terrific force, doing extensive damage. One of the many craft that was sunk or damaged was an army crane barge designated YD-174, which was moored at Drydock Island in Apra Harbor. The barge was in an inactive state and was under the custody of the Naval Ship Repair Facility (NAVSHIPREPFAC) Guam. When the "smoke had cleared" from Pamela, the bow of the YD-174 was visible, but the stern was resting on the bottom in 65 feet of water. There was approximately 10 feet of the bow out of the water at low tide.

After the successful salvage of YSD-42 (another vessel sunk during the typhoon) in August of 1976, TE 73.4.2.1, under the command of LCDR P. W. Wolfgang, turned its efforts to the YD-174. After installing submersible pumps forward, it was discovered that the barge could easily be lifted off the bottom by pumping. However, the stern would remain at depth and the trim angle could not be overcome since buoyancy could not be applied to the stern. The problem was approached by passing a saddle chain under the stern so that a floating crane could lift on the stern. Before this plan could be developed fully, however, (and at the conclusion of a test pump) the YD-174 capsized and sunk with the bow in 12 feet and the stern in 85 feet of water. Efforts to parbuckle the wreck with one floating crane were unsuccessful, and the salvage was postponed until another YD could complete its project and join the efforts. With the YD-120 out of overhaul and the YD-226 equally ready for action in June 1977, preparations for a revival of these salvage efforts began.

The main force of Harbor Clearance Unit One (HCU-1) Detachment 2 arrived in August 1977. The first step was to set up and parbuckle the YD-174. This was done by placing beachgear on the western side of the wreck so that after the YD-120 had rotated the wreck 90°, the direction of pull could be shifted to horizontal and the beachgear could pull the wreck over to an upright position. The power for the beachgear was provided by the YC-1458. The YC-1458 had been specially outfitted by the Ship Repair Facility, under the direction of the then Commanding Officer of HCU-1 (see *FP*, Spring 1977, "Pulling Barge: A Salvor's Tool"). Through the use of standard purchases, clyde winches, modified ground legs, and a doubled 1-5/8-inch bullrope, the desired horizontal pull was obtained and the wreck was successfully parbuckled. The extensive rigging and other setup efforts accomplished by the advance preparations team was largely responsible for the quick results on the parbuckling operation.

Efforts then turned to raising the YD-174. For the initial attempt, the following preparations had been made,




using the USN Mk 1 mask as the primary diving outfit:

1. The forward hatch was patched and a 6-inch suction hose was installed.

2. Divers patched the third compartment scuttle and a 6-inch suction hose was installed as well as a 1-1/2-inch air hose.

3. The fourth compartment scuttle had been patched and a 4-inch submersible pump had been installed. This pump was modified by lengthening the power cable.

4. The fifth compartment scuttle had been patched and a 4-inch submersible pump had been installed. Similar modifications were made to this pump as to the pump in the front compartment. Divers installed an air hose to this compartment.

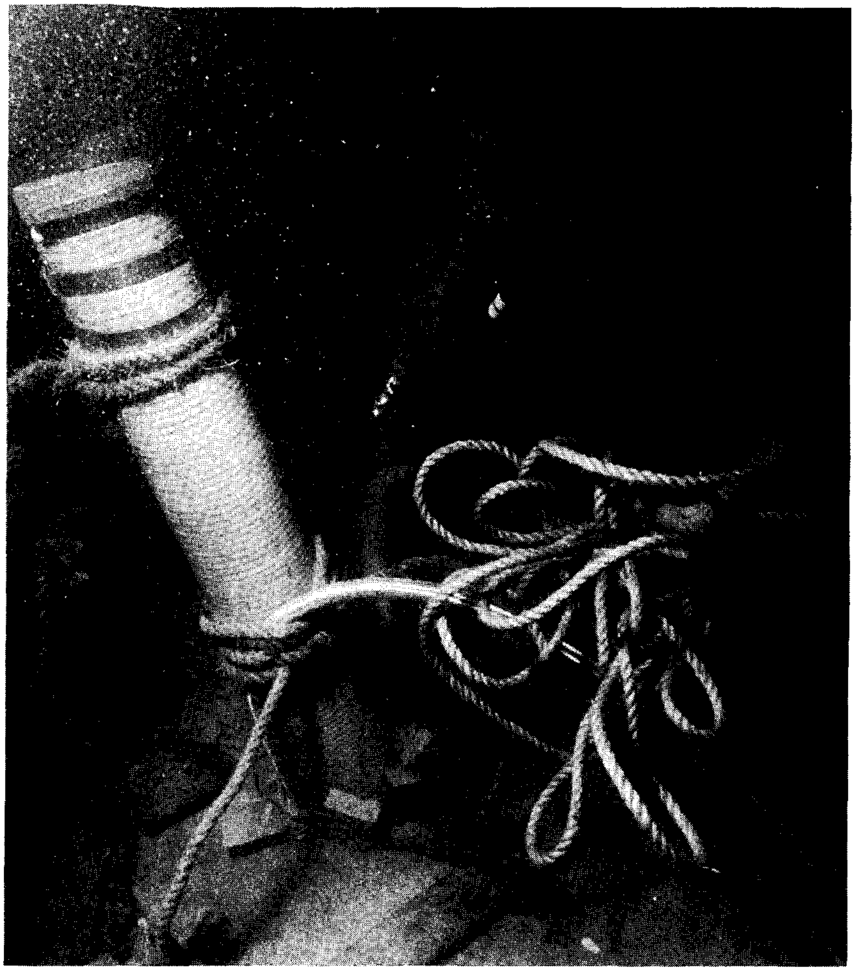
5. Various small holes (3) were plugged with wedges, rags, and DC plugs.

6. Saddle chain (passed in the previous year's efforts) was outfitted on both ends with two 3-inch lift pendants. One pendant on each end was connected with a 50-ton shackle; another pendant on each end was connected with a pelican hook. These two pendants were then connected to the main lift hooks of the two YDs with a bridle outfit that allowed the tension to equal-out on each. The saddle chain was held in place by wire straps that were "made-off" to cleats on the deck.

The first attempt was unsuccessful. The bow of the wreck surfaced under the force of buoyancy after pumping and blowing for 45 minutes. There was an undesirable list that was lessened by lifting on the starboard lift pendant. Continued lifting on this pendant parted the retaining strap and the saddle chain slipped forward, severing one 6-inch suction hose and one submersible pump power cable. (These two mishaps were not discovered until after the wreck was allowed to settle to the bottom.) Continued lifting raised the forward patch almost clear of the water. At this point, the weight of the suction hose and patch pulled the patch off of the hatch and water began to enter. Further attempts at this point were considered useless, and the wreck was allowed to settle to the bottom again.

Another attempt to raise the wreck could not be made for 4 weeks. A full week of work was lost during the preceding week because of bad weather. Preparations and alterations made between attempts were as follows:

1. A submersible pump was installed in the first and fourth compartments. It seemed unwise to put both electric pumps (powered by the same 75-kw generator) into the same compartment, and there was only one internal watertight bulkhead, located between the third and fourth compartments. (Making this bulkhead watertight had been done in the previous year's attempt.)



LT Abshier makes final adjustments before lift is made.

2. Six-inch suction hoses were installed in the third and fifth compartments.

3. Divers re-plugged all minor holes and searched for and plugged others.

4. Patches were secured to scuttles and hatches with strongbacks. (The first attempt might have been more successful with secure patches.)

5. A spanner chain was passed and attached athwartships and aft of the crane cab. The bitter ends of this chain were pelican-hooked into the bitter ends of the saddle chain to prevent it from forward motion. The spanner chain would fetch up behind the crane cab and allow only minimal sliding of the saddle chain.

6. Restraining chains were attached to the starboard and port bow. The port chain led to the pulling barge and the starboard one led to a deadman on the beach.

The surface swimmers then hooked up lift pendants to both the YD-226 and the YD-120. The pumps were started and began pumping along with the blowing of air from the 600 cfm compressor after setting both cranes to a tension of 50T. The bow of the wreck surfaced with zero list. Continued pumping/blowing produced a large starboard list because the starboard restraining chain held down the starboard bow. The pulling crew heaved around on the beachgear in an attempt to reduce the list. After some reduction, the port restraining chain pulled off of the wreck and the upper deck of the wreck came to a near-vertical position, almost resting up against the starboard lift pendant. At this point, tension was increased on the starboard lift pendant, the port was slacked, and pumping/blowing was continued. A mooring line that had been previously attached to the port bow of the wreck was threaded through the wreckage with a lizzard line and passed to a pusher boat that exerted a force outboard and forward from the port bow of the wreck. A combination of pumping/blowing/lifting coupled with the pull of the pusher boat produced a favorable attitude, bringing the YD-174 abruptly to a zero-list condition after 40 minutes of pulling.

As buoyancy took over, the crane cab and after portions of the wreck began to surface. Both YDs reached a maximum lift height when stern bitts of the wreck were just on the surface. The stern was then stopped-off by passing wires from the decks of the YD-120 and YD-226 to the stern bitts. The cranes slacked their strain and the lift was re-rigged to provide a single-YD lift bridle to the base of the wreck's crane cab. During rigging, it was discovered that the port side of the saddle chain had cut into the hull. This greatly reduced confidence in the soundness of the wreck's hull and the decision was made to beach the wreck instead of mooring it, as previously planned.

The YD-120, now freed from lifting on the wreck, placed a 75-kw generator and a 6-inch pump on the deck of the wreck for continued pumping during transit to the beaching site. With a pusher boat on each side, aft of YD-174, the YD-226 released the lift wires and the wreck was moved due east to shallow water. When it ran aground, the stern was discovered to have 25 feet of water beneath it. To avoid the necessity for future salvage operations, the wreck was extracted and moved around the shoals to reach the eastern side of Drydock Island. After several groundings and extractions, the YD-174 was left aground in 9 feet of water at a location east of Drydock Island. NAVSHIPREPFAC Guam then assumed custody.

# RECOVERY Salvages F-14 Aircraft

USS RECOVERY (ARS-43) was tasked with the salvage of an F-14 aircraft after it had crashed approximately 5 miles north of Kill Devil Hill, North Carolina on June 21, 1977. Before the ship left Little Creek, Virginia, she was given two "high probability" positions to search. One location was where the chase plane pilot reported he saw the plane hit the water; the other site was from an ACMR radar fix. A third area was later added according to information gathered from eyewitnesses on the beach by Harbor Clearance Unit Two representatives who had gone to the scene ahead of RECOVERY to collect as much data as possible.

RECOVERY arrived at the general crash area on June 23, and began a side scan sonar search while the navigation system was set up. Diver searches on several suspect areas in addition to the around-the-clock search efforts by RECOVERY brought negative results for 4 days. On June 27, however, a large sonar contact was observed on one of the outer limits of a pass. Further sonar investigation of the site resulted in several large and promising contacts. A diver search of the area confirmed that they had found the F-14 wreckage.

After an extensive underwater survey of the crash site (which was located in 70 feet of water), it was determined that the aircraft had broken behind the wings, probably on impact. The engines and tail section were located approximately 150 meters seaward from the main section. The bottom between these two areas was heavily strewn with smaller pieces of the plane. RECOVERY went into a three-point moor over the main fuselage sections in preparation for wreckage recovery.

Full scale salvage operations began with the lifting of the starboard engine, which had broken free of the tail section. The port engine, still attached to the tail section, was hoisted aboard next and, with the starboard engine, was secured to the forecastle of the ship. This left the fantail free for the main fuselage section, the last portion to be raised.

The main fuselage was lifted nose first, using a 20-ton boom and a choker. It was turned as it reached the surface so the aircraft's underside would be against the port side of the ship. With the plane lifted as high as possible, however, the ship experienced an 8° port list, and 4-1/2 feet of the aircraft was still in the water. Fuel was shifted and the starboard work boat was lowered to the rail to put the ship on an even keel and to bring more of the wreckage out of the water. Though approximately 18 inches of the aircraft still remained in the water, the ship rode well under way at a speed of 4 knots.

When the main fuselage had been secured, the VF-101 representatives onboard decided that sufficient wreckage had been recovered; and, because of another assignment, RECOVERY had to expedite her return to Norfolk, Virginia. The salvage operation concluded on June 29 with all the major components recovered and only scattered wreckage remaining.

**Equipment Used:**

The side scan sonar was an effective search device for this operation, but it did have a few shortcomings. The navigation system was only marginally operational during the first half of the search phase. The side scan does not register a contact until the transducer is abeam of it, making contact-marking difficult since the ship has essentially passed the contact and the contact itself may be many yards abeam. A careful application of the geometry of the installation (ship's head, distance/direction of contact, distance/direction from navigational receiver antenna to transducer) must be made to obtain the exact coordinates of a contact so that the ship may be maneuvered to the proper position.

The side scan sonar system was operated by the ship's company after a short period of indoctrination. It was, in fact, being operated by ship personnel when the aircraft wreckage was found. It is believed that the side scan system is compatible with the abilities of salvage ship personnel, and that a set should be obtained for use in similar missions.

### DIVING SUMMARY

Number of Dives: 12

Total Bottom Time: 38 hours and 12 minutes

Equipment Used: Scuba, Mk 1 band mask

Depth: 50-70 feet

Temperature:
Air: 75°-85°
Water: 58°-70°

Visibility: 10-30 feet

Type Bottom: Sand

Diving Personnel Involved:

| | |
|---|---|
| LTjg Querry | EN1 Tyler |
| LTjg Foley | HT2 Levin |
| LTjg Sechrist | EN2 Hiest |
| ENS Davis | QM3 Wright |
| BMCS(MDV) Rinehart | HM1 Stone |
| BM1 Farris | |

# Are You Ready for Metric?

Mr. Eric Lindbergh
*Office of the Supervisor of Diving*

The Metric System of measurement—what is it, what will be its effect, and how can one adjust to its use—are very timely questions. The metric system is rapidly gaining a strong foothold in America and cannot be ignored.

First—what is it? Briefly, "The International System of Units" (abbreviated SI) is the modern form of the metric system that is becoming the international standard. SI is comprised of base units (Table 1) and derived units (Table 2) and uses the prefixes in Table 3. A complete listing of SI units can be found in ASTM E 380-76e 19 January 1976, which was adopted and approved for use by the Department of Defense (DoD). A brief list of conversion factors is given in Table 6.

What will be its effect? In recognition of the world wide adoption of SI, a DoD directive has been issued.

## UNITS AND CONVERSION FACTORS

### TABLE 1:

| Quantity | Name | Symbol |
|---|---|---|
| | SI base units | |
| Length | meter | m |
| Mass | kilogram | kg |
| Time | second | s |
| Electric current | ampere | A |
| Thermodynamic temperature* | kelvin | K |
| Amount of substance | mole | mil |
| Luminous intensity | candela | cd |
| | SI Supplementary units | |
| Plane angle | radian | rad |
| Solid angle | steradian | sr |

*Celsius temperature is defined in the text.

### TABLE 2:
### SI derived units with special names

| Quantity | SI unit Name | Symbol | Expression in terms of other units | Expression in terms of SI base units |
|---|---|---|---|---|
| Frequency | hertz | Hz | | $s^{-1}$ |
| Force | newton | N | | $M.kg.s^{-2}$ |
| Pressure, stress | pascal | Pa | N/m | $m^{-1}.kg.s^{-2}$ |
| Energy, work, quantity of heat | joule | J | N.m | $m^{2}.kg.s^{-2}$ |
| Power, radiant flux | watt | W | J/s | $m^{2}.kg.s^{-3}$ |
| Quantity of electricity electric charge | coulomb | C | A.s | s.A |
| Electric potential, potential difference, electromotive force | volt | V | W/A | $m^{2}.kg.s^{-3}.A^{-1}$ |
| Capacitance | farad | F | C/V | $m^{2}.kg^{-1}.s^{1}.A^{2}$ |
| Electric resistance | ohm | Ω | V/A | $m^{2}.kg.s^{-3}.A^{-2}$ |
| Conductance | siemens | S | A/V | $m^{-2}.kg^{-1}.s^{2}.A^{2}$ |
| Magnetic flux | weber | Wb | V.s | $m^{2}.kg.s^{-2}.A^{-1}$ |
| Magnetic flux density | tesla | T | $Wb/m^{2}$ | $kg.s^{-2}.A^{-1}$ |
| Inductance | henry | H | Wb/A | $m^{2}.kg.s^{-2}.A^{-2}$ |
| Luminious flux | lumen | lm | | cd.sr (²) |
| Illuminance | lux | lx | | $m^{-2}$.cd.sr (*) |

(*) In this expression the steradian (sr) is treated as a base unit.

This directive (4160.18 of 10 December 1976) establishes the policies for use of SI within the Department of Defense. A primary objective of this directive is to establish a policy that allows the Department of Defense to keep pace with, but not push, private industry as they switch to metric. A SECNAVINST on metrication is in the mill; however, it has not been issued to date.

Realistically, there is no actual target date when the entire United States will be 100 percent metric; in fact, this may never happen. However, enough products will be metric in the near future that one should have a fundamental knowledge of SI. Private industry and government are going metric to some extent. Automobiles, road signs, weather reports, some new ship construction, etc. will all be influenced in some way by SI.

What should one be doing now: Begin learning the system now, and starting to think metric.

Here are a few pointers for "thinking metric":

First: Try to avoid direct conversion. That is, one should think that 24°C is a comfortable temperature, not that 24°C is almost equal to 76°F, which is comfortable. In the latter case, one is not "thinking metric."

Second: One should measure directly in metric units and estimate when possible, avoiding direct conversion. Conversion takes longer and will not aid in learning the metric system.

Third: One should work with rough equivalents and round off as much as possible; i.e., 15 meters is approximately 50 feet.

Thinking metric is a big step. However, there is also another potential problem. As industry starts to convert to SI, there will be "hybrid" products being manufactured, items with both SI and inch/pound components. Some examples are as follows: Ford Motor Company in 1978 will design all new components in SI; Ingersol-Rand will also develop all new equipment in SI. This will be a problem only if one is not aware of the change. When a new item of equipment arrives, one should determine if it has metric components before working on it. Another guideline is that tools should be color-coded.

A word of caution is appropriate here. As the country progresses further along towards metric, more and more material will become available that professes to teach the metric system. One should beware of the type of books that have a myriad of conversion exercises; it is the hard way to go.

If one starts now to think metric, the transition should not be too painful. Waiting it out and/or trying to resist the inevitable change will only cause unnecessary complications.

**TABLE 3:**
**SI prefixes**

| Factor | Prefix | Symbol | Factor | Prefix | Symbol |
|---|---|---|---|---|---|
| $10^{12}$ | tera | T | $10^{-1}$ | deci | d |
| $10^{9}$ | giga | G | $10^{-2}$ | centi | c |
| $10^{6}$ | mega | M | $10^{-3}$ | milli | m |
| $10^{3}$ | kilo | k | $10^{-6}$ | micro | $\mu$ |
| $10^{2}$ | hecto | h | $10^{-9}$ | nano | n |
| $10^{1}$ | deka | da | $10^{-12}$ | pico | p |
| | | | $10^{-13}$ | femto | f |
| | | | $10^{-15}$ | atto | a |

**TABLE 4:**
**Units in use with the International System**

| Name | Symbol | Value in SI unit |
|---|---|---|
| Minute | min | 1 min = 60 s |
| Hour | h | 1 h = 60 min = 3,600 s |
| Day | d | 1 d = 24 h = 86,400 s |
| Degree | ° | 1° = ($\pi$/180) rad |
| Minute | ′ | 1′ = (1/60)° = ($\pi$/10,800) rad |
| Second | ″ | 1″ = (1/60)′ = ($\pi$/648,000) rad |
| Liter | l | 1 l = 1 $dm^3$ = $10^{-3} m^3$ |
| Tonne (metric ton) | t | 1 t = $10^3$kg |

**TABLE 5:**
**Examples of SI derived units expressed in terms of base units**

| Quantity | SI unit | Unit Symbol |
|---|---|---|
| Area | square meter | $m^2$ |
| Volume | cubic meter | $m^3$ |
| Speed, velocity | meter per second | m/s |
| Acceleration | meter per second squared | $m/s^2$ |
| Wave number | 1 per meter | $m^{-1}$ |
| Density, mass density | kilogram per cubic meter | $kg/m^3$ |
| Current density | ampere per square meter | $A/m^2$ |
| Magnetic field strength | ampere per meter | A/m |
| Concentration (of amount of substance) | mole per cubic meter | $mol/m^3$ |
| Activity (radioactive) | 1 per second | $s^1$ |
| Specific volume | cubic meter per kilogram | $m^3 kg$ |
| Luminance | candela per square meter | cd $m^2$ |

**TABLE 6:**

| To convert from: | To: | Multiply by: |
|---|---|---|
| Atmosphere | pascal (Pa) | $1.013 \times 10^5$ |
| Degrees fahrenheit | degrees Celsius (°C) | $t_{°c} = t_{°f} - 32)/1.8$ |
| Foot | meter (m) | 0.305 |
| Foot of water | pascal (Pa) | 2989 |
| Gallon (U.S. liquid) | $meter^3$ ($m^3$) | 0.00378 |
| Inch | centimeter (cm) | 2.54 |

# RHCU UPDATE: First Reserve Group Earns Second-Class Diver Status

LCDR Richard H. Wells
*Commanding Officer, HCU One Det 110*


Reservists learn how to dress a Mk 5 diver.

Although it is hard to imagine anyone going to school for 3 years to be qualified as a second-class diver, that is what 17 reservists have done as part of the first Reserve Harbor Clearance Unit program. Following 3 years of intensive training at weekend drills, numerous hours of homework, and three rigorous ACDUTRAs, the divers received their new NECs this past summer. The summer's last ACDUTRA culminated a 3-year training cycle, which had started with many of them having no previous diving experience of any kind.

The reserve trainees spent their first two summer ACDUTRAs in San Diego, California, where instructors from the Naval School, Diving and Salvage (NSDS), Washington, D.C. provided classroom and diving instruction. Following the first 2 weeks, those who completed the course successfully were awarded the Navy scuba diver NEC.

The second ACDUTRA continued the trainees' learning in diving with an introduction to the Jack Brown shallow-water outfit and an orientation in the Mk 5, Mk 1, and Mk 12 diving rigs. To ensure maximum learning and retention rate for the diver candidates, NSDS personnel set up a special condensed version of the standard second-class diver curriculum. This program was under the guidance of CDR Frank Richards, Commanding Officer of NSDS, and LT Mike Duignan, NSDS Training Officer.

Above: Reservists give "ok" after entering water. Below: Trainees study "tucker patch" topside before it is submerged in river.

Written tests began early Saturday morning with examinations in underwater physics and medicine, Mk 5 nomenclature, diver-tender communications, and cutting and welding. A 4.0 (perfect score) standard was set; any grade less than that required evening and night study. NSDS personnel split the duties and held comprehensive classes in each subject to clear up any deficiencies or questions. Leading instructor CPO George Power began with a discussion of several aspects of Mk 5 diving. Mk 5 dry-dressing practice also began the first day.

The Sunday morning after the reservists arrived included an early morning physical training test. This set a pace that would continue every morning with standard calisthenics and a long-distance run, standard at NSDS.

The first week took shape as "barge week," with the reservists setting up their diving stations for diving projects in the river. Each station was assigned a different task, and reservists began the long and arduous task of completing what would normally be a 2-week set of dives reduced to 1. Assignments included the hose stretch/search, two-man flange, one-man flange, angle descent, hogging line, and Tucker patch. As is the current NSDS practice, the score was timed and either a "SAT" or "UNSAT" score recorded, with a second try given if necessary. Many of the reservists found the going a little rough at first, since it had been over 1 year since they had been suited up in the hard-hat rig.

Above left: Reservist takes a break after Mk 5 dive. Right: Trainee completes first half of the hogging line under NSDS barge.

Instructors emphasized all phases and aspects of the work of a diving team. Special attention was given to communicating by phone, dressing and undressing a Mk 5 diver, responsibilities of the supervisor, and proper tender procedures.

Chief Power continually stressed the importance of safety on the diving station. His instructions on handling a "blow-up" were brought home when one of the candidates caught his air-control valve on the hogging line, blew up under the barge, split his suit, and dropped to the bottom on the opposite side of the line. Quick action on the part of an instructor wearing shallow water gear brought the diver safely to the surface despite a suit full of water up to the top of the breast plate. During the action, the diver was clearly heard yelling over the phone by everyone within listening distance, a procedure Chief Power had advised them to do to lessen the chance of an embolism.

At the completion of each day's exercises and projects, the staff discussed with the reservists any deficiencies noted by the instructors during the day, in addition to giving general diving hints to make the diving and tending easier for the trainees.

During the first week of diving, the reservists set an NSDS record for the number of dives made by a single class on the barge in 1 week, 112 Mk 5 dives. (The previous class record was 96.)

During the second week, the divers moved into NSDS's open tanks and chambers. One group immediately began the long process of making 200-foot-depth qualifying dives in the "wet pots" wearing Mk 5 air rigs. Joining them were divers from an EOD officer's class and, for requalification purposes, CDR Richards (NSDS C.O.). The other group performed timed underwater cutting and welding projects in the open tank. Under the close scrutiny and direction of the instructors, each trainee was carefully taught and tested on the use of oxy/arc techniques. Each reservist participated in the work of both groups.

As each trainee finished his testing satisfactorily, it was obvious that they felt that the 3 years was worth it. The training does not stop there, however, for either the RHCUs or the recently graduated second-class divers. The RHCUs have personnel presently involved in all levels of the phase training, and NSDS will continue to train each group during their ACDUTRAs. The new second-class divers will go into their next phases—salvage techniques, demolition, underwater tools, new diving systems, and more operational diving.

CAPT Tom Petzinger, Commanding Officer of Diving and Salvage 1006 Reserve Component, commented that the graduation of this first group of second-class divers proves that the reserves can provide viable support to the active diving and salvage Navy.

# The Old Master...

With winter upon us and its requirement to dive in cold water either in the open sea or through the ice, I would like you to take a few moments to think of cold water diving operating procedures. Environmental conditions of low water temperature (29/30° F) combined with freezing ambient air temperatures produce specific hazards for diving. Of paramount importance is a thorough pre-dive checkout of equipment.

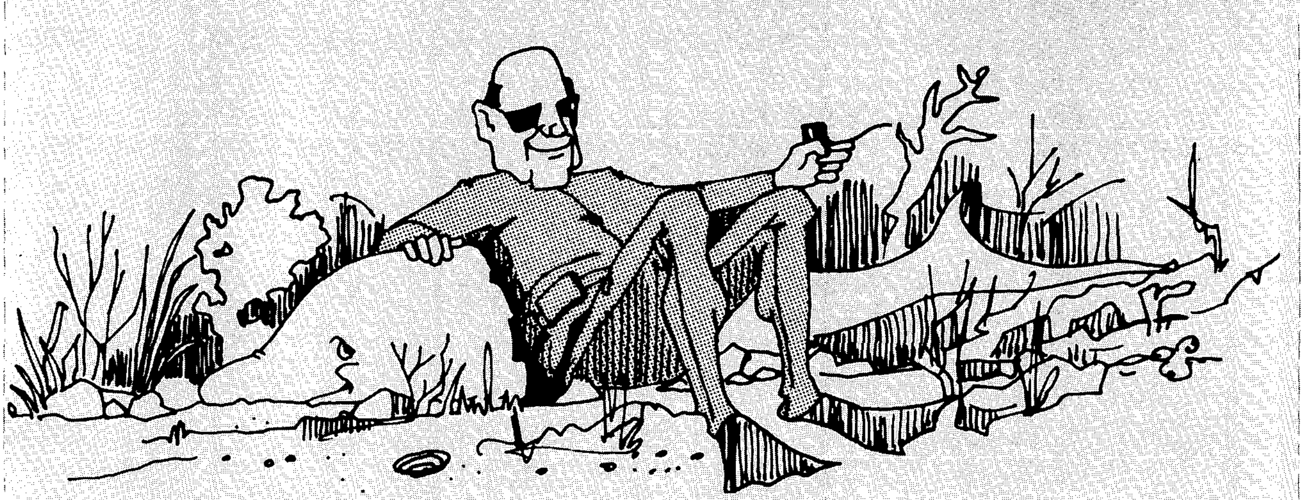
When using scuba, extra precautions must be taken. The choice between single hose or double hose regulators is difficult. The single hose has superior breathing characteristics, is easier for buddy breathing, and is less bulky. However, it has a greater tendency to malfunction from freezing than the double hose regulator. With the single hose regulator, the first stage will freeze up from the expansion of high pressure gas and from breathing wet air. As this occurs, ice will start forming around the first stage housing. Next, the water around the pressure reducing spring will freeze. As ice forms around the spring, friction and subsequent jamming of the spring may occur. This could jam the valve open, resulting in an increased gas pressure. When the pressure increases, the second stage valve pin lifts off its seat and a free flow may result. Freeze-up of water around the first stage spring can be eliminated by covering the chamber surrounding the spring with a flexible rubber cap filled with glycol or 100-proof alcohol.

Even with this modification, however, if the second stage is purged or allowed to free flow, the demand mechanism may freeze up. Extra precautions must be taken to ensure that moisture does not get into the second stage of the single hose regulator. The high pressure reduction mechanism on the double hose regulator is protected from contact with water by the metal body, so ice cannot form around the pressure reducing spring.

Double hose regulators can and do malfunction when used in cold water, though. Moisture from the diver's breath can freeze on the regulator housing; and, if it becomes thick enough, it can prevent the diaphragm from operating properly. A loose retainer nut on the regulator will allow moisture inside the housing where it can freeze and cut off the air completely. When post diving the regulators, you must ensure that all water and moisture is removed from the internal working parts. Make sure that your air supply is clean and dry.

Thermal protection for the diver is very important. A diver suffering from hypothermia (significant loss of body heat) presents a potential hazard when diving in cold water. A hypothermia diver loses muscle strength and the ability to concentrate. Severe hypothermia can result in collapse or unconsciousness. The treatment of hypothermia, of course, is to rewarm the diver. How do you know when the diver is warm? Studies have shown that a diver will report that he is warm when in fact he has regained less than half of his body heat. A good indication that the diver in fact has been rewarmed enough is when he starts to sweat. Before doing repetitive dives, make sure a diver has been rewarmed sufficiently. Use good thermal protection, preferably a hot water suit. If not, use a good wet suit that provides the best protection against cold. Try to avoid repetitive dives.

Remember, *safety* is the name of the game. Until next issue, Safe Diving!



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