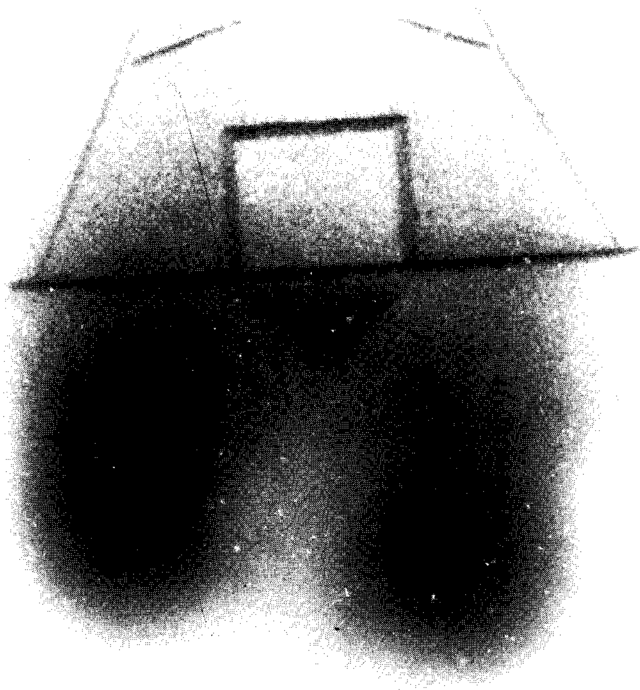

FACEPLATE

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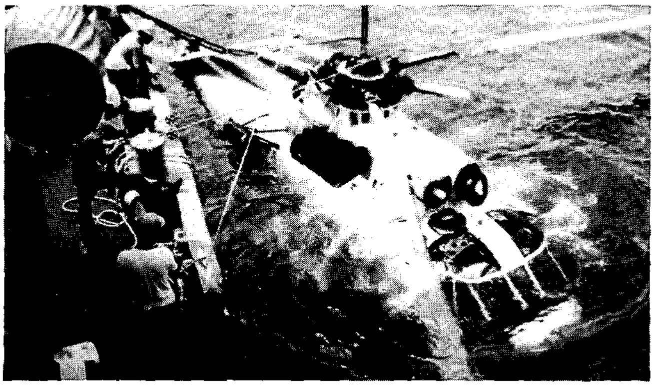
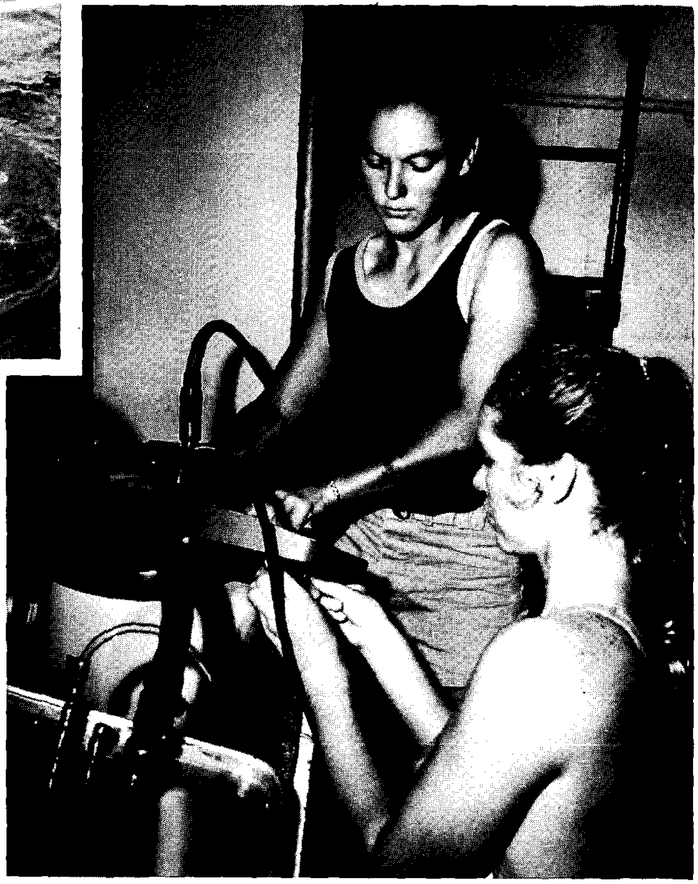
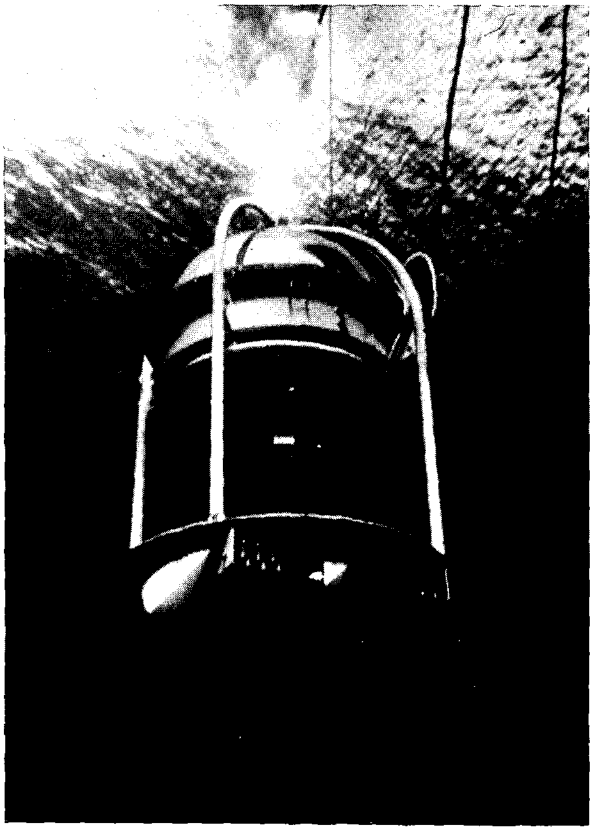
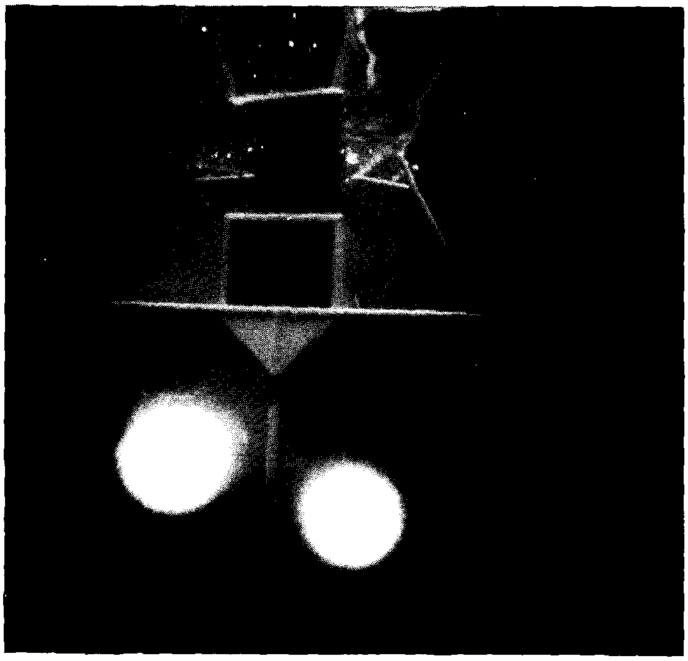








FACEPLATE

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

VOLUME 7, 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.

Requests for distribution copies or for changes in distribution should be directed to FACEPLATE, Supervisor of Diving, Naval Sea Systems Command, Washington, D.C. 20362. Telephone (Area Code 202) OX7-7386 or AUTOVON 227-7386.

Front cover photo shows an unusual view of DEEP DRONE at depth. See story on page 20.
Inside front cover shows various photos from this issue's stories. From top left, going clockwise: Helo is brought aboard SALINAN (ATF-161) during recovery ops (page 30). Mk 12 SSDS is evaluated at NEDU by female USN divers (page 8). The open bell is a valuable item in the Flyaway Air Diving System (page 24). DEEP DRONE hovers just below the surface (page 20). BOLSTER (ARS-38) diver goes over the side during cruise diving ops (page 28).
Back cover photo was taken by CURV III at a depth of 530 feet in Lake Superior. See story on page 26.

SOUNDINGS

UPDATE ON SECOND MK 1 DIVER'S SYSTEM PROCUREMENT

Contract N00024-76-C-4184 is the second procurement of the new standard lightweight diving outfit based on the Mk 1 Mod 0 diver's mask. Rework required to bring Government-furnished molds up to the standards of U.S. industry has postponed the start of delivery of production diving outfits until May 1977. The delivery of on-board repair parts sets to fill out the issue of the original procurement (being procured under the vehicle of this contract) also is expected to start during May 1977. The second procurement is scheduled to be delivered to all AS, ARS, AD, and AR ships.

ARGUS ISLAND POSTSCRIPT

Faceplate has received several comments regarding the proposed use of air diving to its maximum limits as stated in the "Argus Island Demolition" article published in the last issue of *Faceplate.* The "maximum limits" alluded to in the statement made in that article should not be construed to include exceptional exposure dives. Further, any deep air dives should be carefully planned along the following guidelines:

Bottom times should be minimized by identifying discrete work tasks.

Diving platform should be moored directly over work site using a multiple point moor to minimize transit times to work site.

A program of training and work-up dives should always precede the actual operational dives.

The Supervisor of Diving believes that deep air diving, when prudently conducted, remains a valuable fleet capability. Exceptional exposure diving should be conducted only when the urgency of operational requirements justifies such procedure.

ESSM STUDY RESULTS IN COLOCATION OF ASSETS

A recent study was conducted to determine the most appropriate composition and management of the Emergency Ship Salvage Material (ESSM) System. With the current paucity of funds, the study carefully balanced the costs of prepositioning salvage assets in a number of locations versus the cost and attendant efficiency of air transportation. The study concluded that the mission of the ESSM System can be accomplished more efficiently from a fewer number of ESSM Bases than those presently in existence, with substantial savings in associated costs.

Accordingly, a single east coast location has been established at Cheatham Annex, Williamsburg, Virginia, where all east coast salvage assets will be stored. ESSM bases at the Naval Shipyards in Charleston, South Carolina; Norfolk, Virginia; and Philadelphia, Pennsylvania; have already been disestablished. A single west coast location is planned to be established in the central California area.

New ESSM plans also include colocating oil pollution abatement equipment with the standard salvage equipment and with the submarine salvage equipment. The merging of assets has already been completed at the Cheatham Annex base. The present target date for the total completion of this consolidation effort is March 1, 1977.

Faceplate will feature a complete discussion of the new ESSM System organization in the next issue.

LT CHANDLER RECEIVES LETTER OF COMMENDATION

LT Donald R. Chandler, MSC, USN, received a Letter of Commendation during an inspection ceremony at the Naval Medical Research Institute (NMRI), Bethesda, Maryland, on May 7, 1976. The award was presented by CAPT Ken Sell, MC, USN, NMRI's Commanding Officer, upon LT Chandler's detachment from that facility.

During his duty there as Special Projects Officer, LT Chandler was assigned the task of coordinating the construction and management program for NMRI's new Hyperbaric Research Facility. Because of his efforts in this area, "an effective management program has been developed and implemented through which present construction and future operational management are delineated as a coordinated program of maximal resource utilization and continuity of effort in every aspect."

LT Chandler is now serving as the Officer-in-Charge of the Naval Dispensary at the Naval Ordnance Station, Indian Head, Maryland.

BACON REPLACES SWANSON AT OOC AS EOD OFFICER

LT Raymond P. Swanson, USN, has detached from the Office of the Supervisor of Diving, where he served as the Explosive Ordnance Disposal Officer for the Special Warfare Division. LT Swanson held this post since February 1974. He was selected for the Navy Degree Completion Program, and is now completing the requirements for the Bachelor of Science Degree in Mechanical Engineering at Catholic University, Washington, D.C. LT Swanson was relieved by LT William B. Bacon, who was previously attached to the Explosive Ordnance Disposal Facility, Indian Head, Maryland, as the Underwater Projects Officer.

GIVING CREDIT WHERE CREDIT IS DUE

The name of EN/FN Scott Miers was inadvertently left off the list of ESCAPE divers who took part in the Argus Island Demolition. *Faceplate* regrets the error; EN/FN Miers was an active participant in the operation.

Faceplate recently learned that RECLAIMER (ARS-42) played a vital role in the repair of NEW ORLEANS (*FP*, Summer 1976). NEW ORLEANS was under tow by RECLAIMER for 5 days during the transit to Pearl Harbor. *Faceplate* would like to repeat its former requests for fleet inputs.

It has come to *Faceplate's* attention that Mr. Tom James should have been recognized for his efforts in the completion of the underwater ergometer project at NEDU (see last issue). Mr. James played a vital role in the development of this valuable research tool.

NEWS FROM THE "HEAD SHED"

The following instructions are being revised and are expected to be distributed in the near future:

SECNAVINST 12000.20A: "Civilian Diving in the Navy."

OPNAVINST 10560.1A: "Hyperbaric Chambers in the U.S. Navy; use of."

NAVMATINST 9290.1:"System Certification of Deep Submergence Systems."

NAVMATINST 9940.1B: "Navy Diving Program."

Diving has been recommended for inclusion as a Command Inspection item of special interest. This means that when your Immediate Superior in Command (ISIC) conducts an inspection, you will be expected to comply with the following directives, as well as with the ones listed in paragraph 1 above:

OPNAVINST 9940.1F: Defines policy and assigns responsibilities for the Navy diving program, which encompasses all Navy and Navy-sponsored diving.

OPNAVINST 3120.32: Article 630.18 provides an operational diving bill to be used as written or as a guide to assist TYCOMs/unit commanders in formulating an operational diving bill.

U.S. Navy Diving Manual (NAVSHIPS 0994-LP-001-9010): Assembles all technical information now available, provides a vehicle for rapid dissemination of new developments, and authorizes the use of specific practices that assist personnel in the field to perform their duties.

NAVSEASYSCOMINST 9597.1: Promulgates diving equipments that are authorized for Navy use and/or are service approved.

Remember, the Navy Safety Center provides informal safety surveys to all diving activities on request. This informal survey will assist you immensely in preparing for administrative, operational, or INSURV inspections.

"Get Well Program": A two-phased program directed by the Chief of Naval Operations has been commenced by NAVMAT and NAVSEA. This program is designed for the following: To assist individual diving commands in evaluating their present safe diving parameters based upon equipments installed, to assist in the initiation of system certification documentation, and to identify SHIPALTS or other modifications required to adequately support a diving mission. Ideas for establishing a "get well program" were solicited from fleet divers. These inputs were well thought out and were extremely useful. When we identify difficulties/deficiencies and then proceed to correct these problems, it shows that fleet divers are dedicated and interested in diving safely. Thanks for your efforts.

The Divers Mask USN Mk 1 operational parameters have recently been re-examined by the U.S. Navy Experimental Diving Unit, the U.S. Navy Supervisor of Diving, the Chief of Naval Material, and the Chief of Naval Operations. This was requested and carried out at the request of COMNAVSURFPAC. The U.S. Navy Supervisor of Diving is updating the Diving Manual. Watch for forthcoming changes.

Keep your comments and requirements coming in. That's how you can be properly supported in your diving evolutions.

C. G. MILLER, LCDR, USN
OPNAV (233)
WASHINGTON, DC 20350
(Autovon 227-2040)

AIG MESSAGE SUMMARY UPDATE

As of October 1, 1976, all AIG 239 Messages will be numbered in accordance with OPNAVNOTE ser 09B13/1164 of May 18, 1976. The following messages have been issued since the last issue of *Faceplate* and are provided here for your information.

NAVSEA 251905Z FEB 76: Scuba charging lines.
NAVSEA 182005Z JUN 76: Use of the forstat system for reporting diving equipment.
NAVSUPSYSCOMHQ WASHINGTON DC 011936Z JUL 76: Do it yourself moving program.
NAVSEA 082203Z JUL 76: Ball type stop valve for recompression chamber.
NAVSEA 121452Z JUL 76: Reporting of diving capability/equipment status.
NAVSEA 202135Z JUL 76: Mk 1 Diver's System.
NAVSEA 281639Z JUL 76: Diving procedures for work in mud tanks and confined spaces.
NAVSEA 292045Z JUL 76: Lubricating oils in divers' air compressors.
CNO WASHINGTON DC 301937Z JUL 76: AIG modification 239/3.
UDT TWO ONE 101934Z AUG 76: Divers' inflatable life preserver CO_2 cartridges.
NAVSEA 201303Z AUG 76: Defective CO_2 cartridges.
CNO WASHINGTON DC 251748Z AUG 76: AIG 239.
NAVSEA 162327Z SEPT 76: USN Diver's Mask Mk 1 Mod O/S/T revised restrictions.
NAVMAT 241257Z SEPT 76: Surface supported diving and hyperbaric system certification.
NAVSAFECEN 061225Z OCT 76: Diving Safety Advisory (AIG 237 FY77-2).

NEDU REPORTS:

Navy Experimental Diving Unit Report 1-74. *Technical Evaluation of the Battelle Portable Recompression System.* S.D. Reimers, B.S. Lebenson, L.E. Lash, M.D. Reynolds.

Abstract: A one-man Portable Recompression System (PRS) developed for the U.S. Navy by Battelle Memorial Institute was subjected to evaluation testing at the U.S. Navy Experimental Diving Unit. The PRS was designed to serve principally as a vehicle in which a diver suffering from decompression sickness could be transferred under pressure to a regular treatment facility, and, secondarily, as a treatment chamber itself. The basic elements of the PRS are a 100 psi working pressure aluminum cylinder, 22 inches in diameter by 86 inches long with a semi-eliptical self-energizing hatch, and a venturi powered semi-closed-circuit CO_2 removal system.

The PRS is designed to maintain the CO_2 partial pressure in the chamber below 1.0 percent S.E. with air consumption rates of 0.5 scfm during semi-closed circuit operation, and 2.0 acfm (2 scfm x depth pressure in atmospheres) during open-circuit operation. The PRS was found to adequately support the ventilation requirements of the occupant at the design air comsumption rate. It was also found to be quiet and comfortable. Subject to certain recommendations, it was recommended that the PRS be moved on to service approval as quickly as possible.

Navy Experimental Diving Unit Report 2-74. *Some Basic Considerations Governing the Sizing of Hyperbaric Chamber Life Support Systems.* S.D. Reimers.

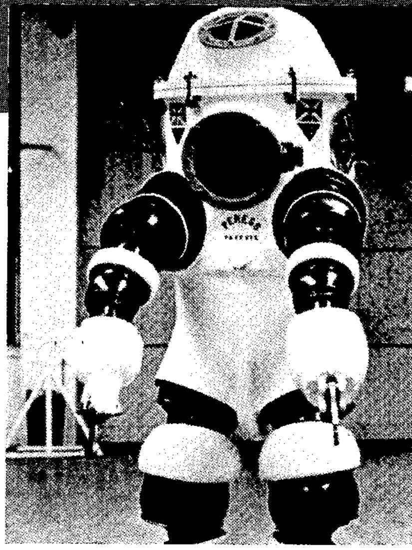
Abstract: The services provided by hyperbaric chamber life support systems are described in very basic terms. The fundamental equations which govern the performance of the CO_2 removal system are presented and described in terms understandable to personnel unfamiliar with the principles of engineering. The basic relationships which govern the performance of the temperature and humidity control systems are also described. This report is designed to foster a better understanding of life support system operation by chamber operators and by non-engineering end users in the position of specifying the performance capabilities of new construction systems.

Navy Experimental Diving Unit Report 3-74. *Operational Experiences With and Reasons for Removal of the Closed Circuit Television and Wetpot TV Camera Positioning Systems Installed in the Navxdivingu Hyperbaric Complexes August 1968 to June 1971.* S.D. Reimers.

Abstract: In late 1968, a closed-circuit television system was installed in the hyperbaric complexes at the Navy Experimental Diving Unit. The system used cameras mounted inside the hyperbaric chambers with external monitors and power supplies. The two cameras installed in the wetpots of the hyperbaric complexes were mounted on remotely controlled positioning systems capable of vertical movement and horizontal pan. The operational experiences with the closed circuit TV system and the wetpot TV camera positioners are described. Also described are the reasons why, in 1971, both systems were removed as a direct consequence of unreliable performance.

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.

JIM Sets Diving Record



A world diving record was set recently during simulated wellhead task performance in the High Arctic using the articulated, 1-atmosphere diving suit, "JIM." Oceaneering International's Canadian subsidiary, Can-Dive Oceaneering, worked on the project in cooperation with DHB Construction, Ltd., of England and Panarctic Oils, Ltd., of Canada. Divers from Oceaneering and DHB completed four test dives totalling 14 hours 48 minutes at a depth of 905 feet on Panarctic's Hecla M25 well offshore Melville Island. "JIM's" Arctic dives were made through 16 feet of ice into 27.4°F waters.

"JIM," a magnesium and fiberglass suit developed by DHB Construction, Ltd., has been described as a practical and economic means of performing underwater work at depths beyond the range of conventional divers. "JIM" allows divers to work at depths of up to 1,500 feet while remaining at normal surface pressure within the suit. Gas costs are eliminated. Drilling rig or construction barge deck loads are greatly reduced because "JIM" and its support equipment are only a small fraction of the size and weight of conventional diving systems.

The first dive, performed on April 5, 1976, by Walter Thompson of Oceaneering London, set a record for the world's longest working dive below 500 feet. The duration of the 905-foot dive was 5 hours 59 minutes. Nearly all of this time was spent working on the Hecla M25's blowout preventer (BOP) stack.

Three additional dives were conducted on April 7 to perform simulated wellhead tasks and bottom walking exercises. Wellhead tasks included connecting an Otis union and making and disconnecting hydraulic connections on the collet connector at the base of the BOP stack. During the final dive, "JIM" was equipped with snowshoe-type devices to improve mobility along the soft and variable bottom surface.

The dives demonstrated that divers working in the "JIM" suit can perform oilfield tasks in very deep, very cold water without the need for decompression. The tests also indicated that even in ultra-deep water, divers will be able to ascend and descend in a matter of minutes. Further, they provided evidence that the optimum duration of such dives is limited only by operator fatigue.

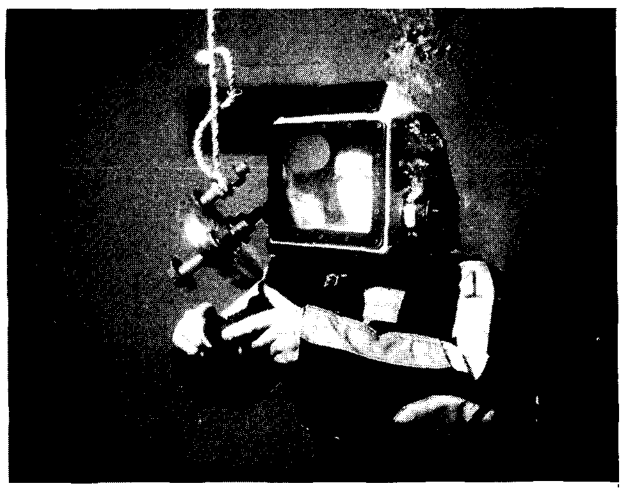
If the dives had been conducted using conventional diving equipment, the divers would have had to undergo a decompression of at least 8 days. With "JIM" they were able to surface directly with no decompression.

Test results also indicated a great potential for "JIM" in contributing to the development of subsea production systems. Most of the research work to date has been in drilling operations, but future plans hope to realize the completion of a well in the Hecla Field ready for production. The next step is to come up with a system to complete subsea wells for future petroleum production. Such systems would involve sending men below the ice, either in diving suits or manned diving capsules, to install and connect sophisticated wellhead equipment.

The Arctic test dives showed that the low water temperature is no problem with the "JIM" suit, which, in addition, can also be mobilized quickly. Once on the site, a diver can be lowered to the bottom or retrieved in a few minutes' time. These are important advantages that would contribute to the installation, servicing, and maintenance of a seafloor system.

Mk 12 Evaluated by Female USN Divers

Above: HT3 (DV) Tobias, PH3(DV) Peden, and LCDR Ridgewell, CF, inspect Mk 12 SSDS test set. Below: HTC3(DV) Tobias during test swim in Mk 12.



"Comfortable and mobile" were the words used to describe the Mk 12 Surface Supported Diving System (SSDS) by two Second Class Divers during recent evaluation dives at the Navy Experimental Diving Unit (NEDU), Panama City, Florida. The description was not new to the Mk 12, but for the first time it came from two of a growing number of female salvage divers in the U.S. Navy.

HT3 (DV) Donna M. Tobias, USN, of Harbor Clearance Unit TWO, Little Creek, Virginia, and PH3 (DV) Natoka Peden, USN, of the Explosive Ordnance Disposal Training Evaluation Unit ONE, Pearl Harbor, Hawaii, visited NEDU for 1 week in mid-July, 1976, to study the Mk 12. Petty Officer Third Class Tobias has over 1 year of experience as a salvage diver with approximately 100 hours of diving time. Petty Officer Third Class Peden graduated from diving school this past spring and has some 15 hours working time in the water. Both had sport diving experience before joining the Navy and are enthusiastic about their Navy diving assignment.

After diving the new Navy salvage diving rig for 4 days, the two Petty Officers had several comments. Petty Officer Peden said that she preferred it to a scuba rig since the system is comfortable, dry, and allows excellent verbal communication. Petty Officer Tobias stated that the Mk 12 is a great improvement over the Mk V. In addition, she particularly liked the fit of the Mk 12 suit. Both divers commented that they had the usual problems with the Mk V rig because it is heavy and massive. They liked the Mk 12 because the diver can dress practically unassisted, unlike the Mk V. In the water, they agreed that it was easier to handle underwater work, since the Mk 12 air mode is simple to adjust and operate. They both would prefer the Mk 12 to any other diving system they have used for any underwater work, shallow or deep.

MMC (DV) William Yarley, USN, Assistant Mk 12 Project Officer at NEDU, supervised the dive series and was impressed with the performance of these trainee divers. He remarked that they "learned the rig quickly and, taking into account experience, are up to the par of any Navy diver I have seen."

In addition to qualifying in the new Navy diving system, the two divers gave NEDU an opportunity to evaluate the new equipment from a female human engineering point of view. As the two divers returned to their respective units, they both indicated that they looked forward to seeing the Mk 12 in the fleet.

A Few Words from SUPDIVE

CDR Charles A. Bartholomew,USN
Supervisor of Diving

Following the Working Diver Symposium at Battelle Memorial Institute, Columbus, Ohio, on March 2-3, 1976, a meeting was convened among key senior players in the Navy diving community to discuss real or potential problem areas and to map out recommended long and short term solutions. No formal transcript of this meeting will be distributed; however, I think *Faceplate* is the appropriate forum to highlight the many important topics which were discussed and to state what steps "Headquarters" is taking in dealing with these matters. It must be recognized that Headquarters does not have all the answers and that many of the working Navy diver's apparent problems result from the inner workings of the Naval Establishment itself, both in the fleet and at Headquarters.

Restrictive Regulations: The conservative theme of the *U.S. Navy Diving Manual* came under sharp criticism for allegedly restricting the Navy diver from using his equipment effectively and from exercising prudent judgement on scene. One of my objectives as the Supervisor of Diving is to stand back and assess that issue (especially for conventional air diving) and formulate appropriate changes to the Manual, if warranted. Constructive recommendations in this area from all levels are most welcome.

SUPDIVE Master: The desirability of establishing a new Master Diver (E8 or E9) Billet here in Headquarters was generally supported by the diving community. In keeping with established policy, however, BUPERS will not create a billet without forfeiting an existing one; I am hoping to get same when the next diving locker goes on the blocks. In the interim, Ex-Master Diver, Ex-EOD Diver, Ex-Shipyard Diving Supervisor, Ex-Saturation Diver, Ex-Commercial Diver Donald "Blackie" Keane has been assigned the diver's ombudsman role at NAVSEA. Blackie can be reached at Autovon 227-7403 or Commercial (202) 697-7403 (call collect).

Approved Diving Equipment List: The NAVSEAINST 9597.1 of March 18, 1976, identified all diving equipment as either service approved or authorized for Navy use. This instruction is updated annually, and new equipment has already been added by using the AIG 239 message procedure. Requests for the addition of any diving equipment to that list, with supporting rationale and justification, should be sent to the Supervisor of Diving.

SHIPCHECK Program: NAVSEA has been conducting a two-phase fleet diving inspection program intended to identify and ultimately resolve shipboard diving support systems deficiencies, both long and short term. At this writing, most of the Navy's 48 diving ships have completed the air system SHIPCHECK program. The data collected shows, as expected, wide variation in similar systems and generally poor supportability. Initial results have formed the basis of my emphasis on ships' diving air compressors. They also show a much greater need for more standardization of filters, plumbing components, and air stowage concepts. The next step is a close examination on an individual ship class basis. This is not intended to make all diving ships exactly the same, but to upgrade their diver support capabilities to conform to the established missions of that ship class. The more difficult part comes in interfacing with ships' schedules to provide (in stages if necessary) near term improvements. I realize that this can happen only through close coordination and cooperation of the ships and staff. Some of the major points uncovered so far, in addition to the air pressure inadequacies, include a higher than tolerable frequency of unsatisfactory air quality and a wide variation in pressure regulation and filtering procedures. There is also a good deal of misunderstanding over the concept of the minimum safe criteria under which the performance capability of the ship is initially defined in relation to the measured data. Many of you have pointed out that the criteria used do not conform to all requirements of the Diving Manual and do not represent good diving practice. To a large extent, that is exactly true. The criteria used are "*minimum* safe to dive" criteria to which your training and good common sense must be applied to the variables affecting each dive situation. It is the level below which waivers would probably not be granted if requested. The following caveat is deliberately included in all Phase I diving capabilities messages to emphasize this point:

> It must be emphasized that the above capabilities are based upon minimum criteria to safely conduct diving operations during an interim period until inherent system inadequacies can be corrected. In no instance should these capabilities be considered inviolate if operational factors indicate more conservative doctrine should be followed.

I have assigned a Project Officer whose only duty is the management of SHIPCHECK. Direct all questions to Mr. George Michelson, USNR, at Autovon 227-7606.

Shipboard Air Compressors: The lack of availability of adequate shipboard and boatboard air compressors is one of the most pressing problems now facing the diving fleet, particularly with the ARS and AD/AR/AS ships. This was an obvious inadequacy long before the SHIPCHECK Program was initiated. Both the Mk 1 band mask, now being distributed, and the Mk 12 deep sea rig, scheduled for fleet distribution in 1978, aggravate the problem by requiring greater pressure/flow rates than current Jack Brown and Mk V equipment. The solution for the ARS appears near at hand; the Flyaway 250-psi 100-cfm air compressors with console-filter have been recommended for procurement and delivery in 1977 as an ARS allowance item. No SHIPALTS, no major delays, just good air! A reliable, service approved air compressor for universal diving boat use is farther away and will be more difficult to justify to the all-powerful budgeteers. The results of the SHIPCHECK Program should ultimately justify this need, however.

Scuba Life Jacket: No one likes the UDT life vest or the Mk III, and there are no plans at this time to redesign either. The Mk III goes with the Mk 6 scuba like big watches go with divers, and the Mk III is planned for Navy use with the Mk 6 until the latter's eventual replacement by the Mk 1 Swimmer Life Support System (SLSS). For conventional scuba diving, a plan to evaluate commercially available life vests, select one, service approve same, and procure/distribute it in quantity is a reality. The bad news for the fleet is money, which is not likely to come until 1979. If reprogramming of funds can accelerate the above, I will let you know through *Faceplate*. In the interim, NAVSEAINST 9597.1 of March 18, 1976, authorizes the use of the Fenzy M3, Nemrod SCUBAVEST, RFI 110669 and the Waverly SUPERVEST as life preservers approved for Navy use with conventional demand scuba.

Diving Hose Longevity: Testing to date indicates that hose life can most likely be extended to 5 years. Final resolution is expected shortly pending a decision on a practical requalification test standard. Extension beyond 5 years probably would be limited to special cases and would involve more extensive requalification testing. Life history is not available on new "smooth bore" hose, but testing concurrent with its fleet usage is expected to confirm at least equal longevity.

Underwater Cutting/Welding: The credibility of the *Underwater Welding and Cutting Manual* was questioned. I agree that it is overly conservative in part, and I intend to update the manual to reflect more realistic constraints upon our underwater artificers, especially with the newer equipments becoming available.

Underwater Ship Husbandry: The state-of-the-art and state-of-the-fleet regarding underwater ship husbandry was questioned. It was also noted that implementation of previous recommendations by Shipyard or fleet divers was not apparent. That is a fact! NAVSEA is plodding ahead, however; a "blue ribbon" task force has been created that is currently managing an effort to develop an underwater ship husbandry master plan, which is expected to be completed early next calendar year. It examines not only ship husbandry as we have come to recognize it, but it also looks at additional waterborne tasks related to extended dry docking intervals with an increased emphasis on underwater repairs and painting. The plan studies the state-of-the-art of hull preservation, including its environmental impact, and closely examines what is being done commercially. My hope is that this is not just another paper drill, but that it will generate priorities in development and testing, immediate and long range procurement, and organizational structure. The potential cost savings in lower fuel consumption is well recognized. Translating such savings into visible dollars to support procurements and routine rather than just emergency underwater tasks is going to require a great deal of support from Admirals and divers alike.

Air and Mixed Gas Dive Tables: The most significant recent change in the diving tables is the addition of the Navy Experimental Diving Unit's (NEDU) new saturation excursion tables, which have been approved for use in selected fleet units and which should be incorporated into Change 1 of Volume 2 of the Diving Manual. However, there is a real credibility problem in the current surface tables. Fleet units have reported "takusan" bends with selected air and helium tables and we are working with the Navy Safety Center's statistics to separate fact from fiction. I anticipate the reworking and reissuing of certain tables, particularly the longer duration profiles.

Wireless Scuba Communications: Recent tests to evaluate prototype and commercially available sonic communicators found that there were no units that satisfied the established operational and safety requirements. Problems ranged from generally poor reliability to high interference at lower frequencies because of ambient noise. We are now wrestling with a two-phase approach. The short term objective is to bless as authorized for Navy use a satisfactory full facemask with a commercially available communicator; a slightly modified AGA is the prime candidate at this time. In the long range, I expect to reexamine the performance requirements and initiate a full-blown research and development program for a militarized, service-approved unit.

Portable Recompression System and Chambers: There are two independent but related chamber programs at OOC. The first, the Portable Recompression System (PRS), consists of a one-man, single-lock recompression chamber with a recirculating semi-closed-circuit life support system and a communications system. It is intended to serve as a pressurized mode of transporting an injured diver to a treatment facility while providing immediate relief from diving-related illnesses during the transportation. The system can pass through a submarine hatch when the skids and cylinders are removed. Also, with the use of a to-be-provided mating adapter, the system will link with 28-inch-diameter double lock chambers. In the event that a treatment facility is not available or a timely transfer cannot be effected, the PRS can be used to administer (under medical supervision) the treatment schedules of Tables 1A, 2A, 3, and 4 of the *U.S. Navy Diving Manual.* Oxygen treatment procedures with the PRS are also being developed at NEDU for a probable upgrade.

The portable recompression chamber, the two-lock aluminum variety, has undergone a very rocky engineering/contracting path. (To begin with, the contracts for these chambers have been terminated recently.) The uncompleted chambers are now planned to be transferred to the Naval Surface Weapons Center, Dahlgren, Virginia, where we should be able to maintain more direct control of the remaining work. We expect to see the first of these chambers dedicated to the "Flyaway System," completed next calendar year.

High Pressure Portable Diesel Air Compressor: The need for a transportable, diesel driven, ESSM compatible, H.P. air compressor capable of sustained operation has been stated repeatedly. Procurement of a standardizable unit is planned next year with quantity production in 1978. There will be more information in *Faceplate* when the engineering/contracting details become more firm.

Publications: Volume 2 of the *U.S. Navy Diving Manual* is undergoing its first change and should reach you no later than December. The *Recompression Handbook* is our next publication scheduled for official revision, and your recommendations again are requested. Please remember that *your* input to change NAVSEA diving publications is the major source. If you fail to send something substantial, then the change is made by a desk-bound diver like myself rather than an active fleet diver who should know from day to day experience where changes are required. Make sure you are receiving diving AIG Message traffic because this provides important direction in advance of formal publication changes.

Gas Sampling: The present status of gas sampling and its analysis is very confusing. It will get worse without some sort of positive action as environmental health standards become more of a way of life than a threat. One action planned is to issue an instruction to standardize the sampling technique. The new low pressure sampling concept used on the recent ship survey will be the basis of this instruction. It is expected to help control the cost of obtaining gas analyses. We have further proposed that NAVSEA be designated as a central agency for conducting all routine gas analysis similar to the lube oil testing program. This is dependent on favorable action on an FY 79 funding request. For the long term (FY 79 is "short term" by Washington standards), we are looking for a simple yet reliable shipboard monitor to actually sound an alarm when there has been a significant enough change in the gas quality to require a more detailed analysis. The choice of which contaminant can be detected simply and still be representative of any problem is the key to the success of this approach.

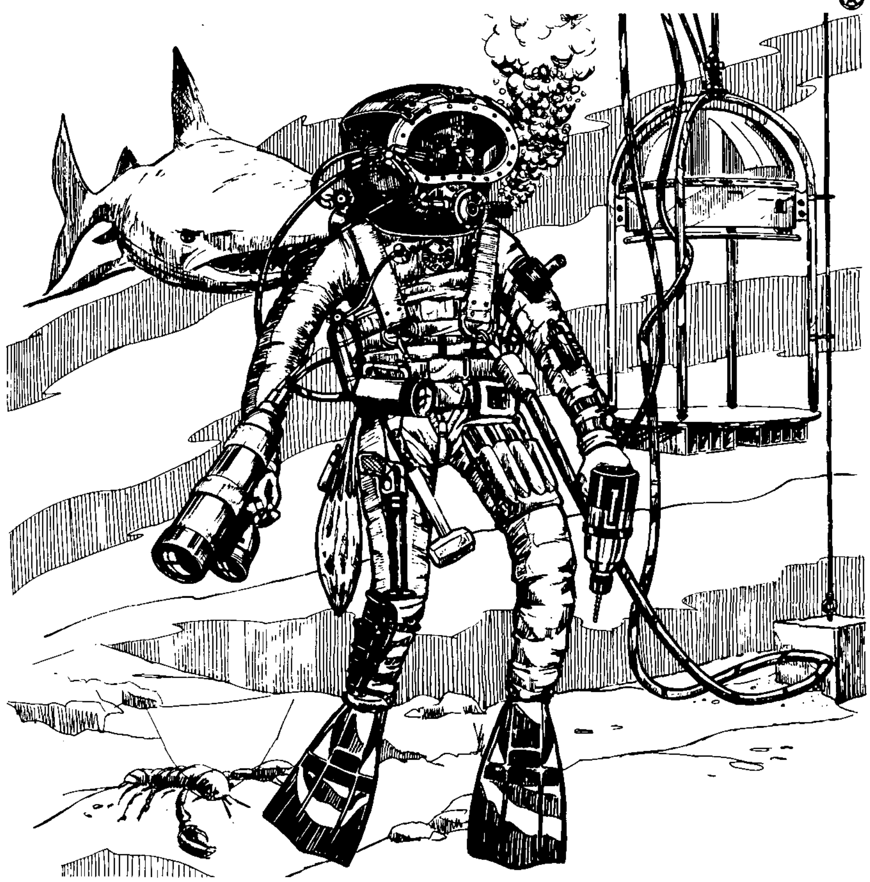
Standard Umbilicals: A program to develop a standard umbilical for use with either the Mk 1 mask or the Mk V or Mk 12 hardhat is underway. Hose commonality is a reality with the new 1/2-inch "smooth bore" hose. Commonality of the electrical and strength portion is still being studied, but it is expected to be resolved in time for consideration as part of reoutfitting with the FY 78 major fleet procurement of the Mk 12 hardhat.

Points of Contact: There appears to be some confusion regarding the OOC contacts for various diving related matters. The following list should solve the problem.

Subject	*Contacts*	*Phone Ext. Autovon: 227- Com: 202-697-*
Certification	CDR Klorig	-7386
	Mr. Dietrich	-7412
	Mr. Snyder	-7412
Diving Waivers	Mr. Bergman	-7386
Diving Procedures	Mr. Bergman	-7386
Diving Publications	Mr. Bergman	-7386
General Diving Matters	Mr. Keane	-7403
Diving Engineering	Mr. Pfieffer	-7606
SHIPCHECK Program	Mr. Michelson	-7606
UDT/SEAL	LCDR Schropp	-7386
	Mr. Milner	-7386
EOD	LT Bacon	-7386

In summary, I would like to emphasize two points. First, communication between the working diver and this office, both on an informal basis and by formal means via the chain of command, is essential if NAVSEA is to provide responsive service to the fleet. Secondly, and this is extremely important, the entire Washington climate is super competitive concerning money. There are many very worthwhile programs, and the cost of all these greatly exceeds the total funds available. Without specific and defendable justification, it is difficult to try to obtain compressors, for example, when someone else needs guns or missiles or radar or whatever. Would you believe that orderly programming of funds requires 3 to 5 years? To obtain additional funding for a newly identified (i.e., less than 3 years) requirement is, for all practical purposes, impossible. The only alternative for me is to reprogram funds from within the existing diving and salvage budget. This can be risky, however, because the ever-present budgeteer sees this as an opportunity to save money by dissapproving the reprogramming action. He then removes the funds in question from the diving and salvage budget with the rationale that if I were willing to divert money away from one item, then it could not be that important and thus should not be funded either.

The primary point here is that it is not easy to travel the rocky roads of the nation's capitol. This fact makes it even more imperative that the Navy diving and salvage community "get its act together" and keep it there. We cannot fight the system, but we can try to understand it and make it work for us.



Many fleet divers feel over-burdened by an abundance of equipment and/or rules, and they are ready for proposed changes. This artist's concept shows a "well-equipped" diver in a Mk 1 Diver's Mask at 190 feet, ready for anything but moving from that spot.

Argus Island in Retrospect

LT Ken Edgar, USN
COMSERVRON EIGHT

As noted in "Argus Island Demolition", *Faceplate*, Summer 1976, COMSERVRON EIGHT planned portions of and executed the demolition of the Argus Island Tower in May 1976. Some of the highlights of the operation as well as lessons learned are contained here.

Inasmuch as diving on air is not the best way to conduct a salvops in 192 feet of seawater (fsw), special steps were taken to minimize risks for the operation. The first step was to make the Mk 1 Deep Dive System (DDS) operational for the project. When this proved to be impossible, preparations were made to accomplish the job on air. Subsequent preparations included mandatory classroom and physical training of all divers taking part, and aquisition of Mk 1 band masks and the Flyaway Air Diving System to provide the quantities and pressures of air that none of the Atlantic Fleet ARS's are capable of providing. With the aid of LCDR Ken Mewha,MC, USN, preparations and training were made with the intent of having both HOIST's (ARS-40) and ESCAPE's (ARS-6) recompression chambers and medical facilities fully equipped for all contingencies. Special refresher training was also given to all divers and topside ordnance personnel by the EOD group at Fort Story, Virginia.

When all preparations were made and rechecked, ESCAPE and HOIST set forth for the Virginia Capes operational area on April 19 for wet training in 150 fsw. During this time, all divers performed at least one dive, and all of the prefabricated devices were checked on mock-ups of the tower legs. This included explosive charge testing for the charges originally intended for use as cleaning charges. A total of 20 dives encompassing 8 hours 56 minutes of bottom time were conducted without incident.

On April 26, with explosive technical representatives, DEEP DRONE, and explosive anchors onboard, HOIST and ESCAPE departed for Argus Island. Discussion and planning in the use of the explosive cutting charges continued enroute to the site.

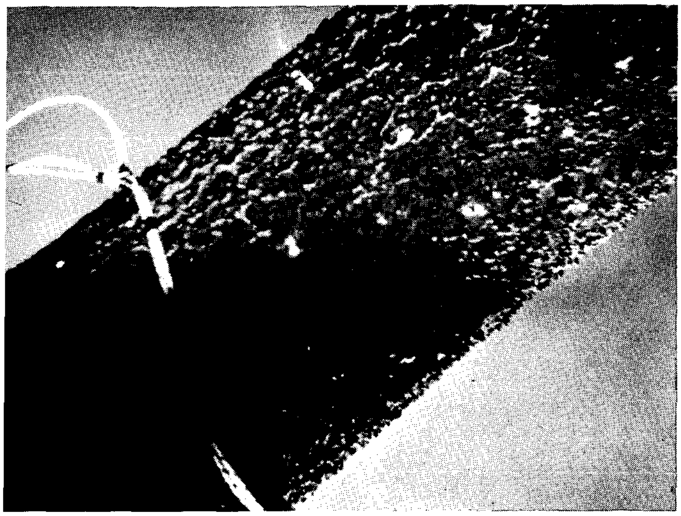
After the first day of diving operations, it was determined that the prefabricated cleaning charges were not going to work as planned. This was because it took too long to install them, they were extremely cumbersome, and the fit of the charge was not always adequate because of debris and uneven, heavy growth. (A picture of the original cleaning charge is shown in *FP*, Summer 1976, on page 21.) It was also found during the first day of diving that tieing the charges into the trunk lines after placement was time consuming and resulted in many undetonated charges. On the advice of the explosive tech reps, a procedure used in the oil fields was adopted to remedy this problem. Several new cleaning charges and/or cutting charges were made up on a bridle of detcord and taken down on the bell with the divers. Once on the site, the divers set the charges, decompressed, came onboard, and detonated the charges. Fouling of the detcord trunk line to the tower was a slight problem; but, as long as the divers and the surface tenders of the detcord were cautious, fouling was kept to a minimum. The new cleaning charges consisted of nothing more than a triple lay of detcord that was tied to the tower in the area of the cut. The cleaning charge could be tied on in a matter of seconds. The photo at left on page 14 shows a bridle with the cleaning charges coiled and a block of C-4 used to remove the grout pipes from the main legs. Right photo shows the new cleaning charge deployed.

Diving continued at a very progressive rate with few problems until early May 2, when a diver who had made a dive the previous day awoke with swelling and tingling in both hands. He was treated on a Table 6 and had complete relief after 22 minutes. The only other suspected bends case was finally diagnosed as a turned ankle.

The 50 working dives on the tower equated to total bottom time of 41 hours 55 minutes.

The following comments describe the lessons learned during the destruction of the Argus Island Tower:

1. The divers were highly motivated for this operation, and, because of careful planning and extensive training, they were able to perform in an excellent



Cleaning charge installed on tower leg before detonation.

Tower leg after detonation of cleaning charge.

fashion. It became apparent that 15 minutes bottom time at 192 fsw was optimum and decompression time was minimized. By ensuring that each diver's task was simplified as much as possible and limiting bottom time to 15 minutes or less, the dives were productive and well executed. This operation clearly demonstrated that, with proper planning and clear definition of tasks, diving to depths of 190-200 feet on air can be safely conducted with excellent results.

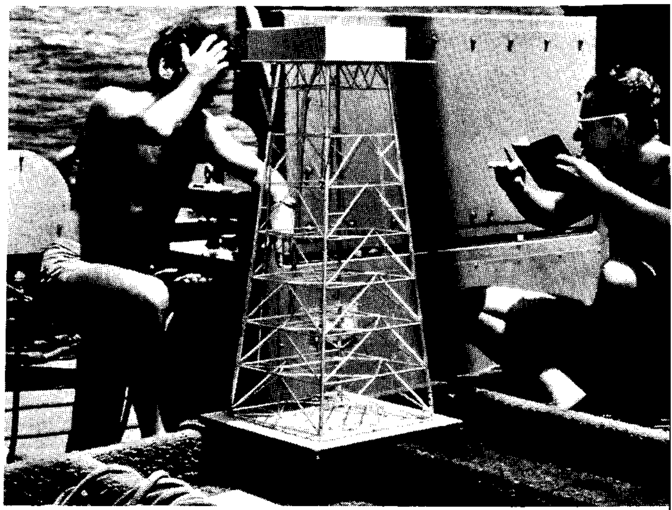
2. Although excellent in a calm sea, the open bell was unsatisfactory as a decompression vehicle in the open ocean with 3- to 4-foot sea/swells. The bell provides a good haven for the diver near the bottom and a good means of descent. It could not be used, however, at the 10-foot decompression stop because ship movement precluded the relatively fine depth control required. To overcome this situation, an ascent line was rigged to the tower, which provided a very satisfactory method of decompression.

3. The prototype flyaway portable air compressors and diving console provided by NAVSEA (OOC) for this operation were reliable and performed well. The drive pulleys on the compressor shaft tended to slip off during initial use, but this was corrected by drilling and tapping the shaft and inserting a locking bolt. This proved to be a successful fix, and no additional problems were experienced with the pulleys. The compressor units should be provided with sound isolation/vibration mounts and they require an improved muffler for the diesel engines. In their present configuration, the noise level is unsatisfactory and can cause confusion at the diving station because of the "shouting" of instructions between personnel to overcome the noise.

The pneumofathometers on the diving console have no snubbers installed, resulting in an over-sensitivity that severely limits their use. Snubbers should be installed so that the console operator can rely on the installed pneumofathometers.

With the above mentioned modifications completed to the flyaway system, it should prove to be a reliable and effective system. It is highly recommended that procurement be expedited, by whatever means possible, so that the fleet will have use of this potentially valuable system in the near term.

4. The handling of the propellant anchor launcher from the fantail of an ARS proved to be one of the most difficult tasks of the operation. The launcher and anchor fluke combined weighed over 8 tons. It was necessary to install the fluke while the launcher was lying on its side, then raise the launcher to the upright position to install the black powder and firing mechanism. Although the launcher measures just 8 feet per side at the base, it was a tenuous maneuver to raise the launcher because it tended to "walk" or slide (caused by the ship's motion) until it was set squarely on its base. A hinging mechanism, using padeyes and bolts, could be designed to eliminate this hazard. In order to lower the launcher to the 200-foot level, it was necessary to fairlead the bull rope through a 2-inch sheave secured to the H-bitts and lead it over the starboard quarter roller. The eye of the



Photos above show topside activities during Argus Island ops.

bull rope was then shackled to the launcher lifting pad. The stern boom was used to lift the launcher free of the fantail and over the side into the water. When the strain was taken by the bull rope, the boom hook was disconnected and the launcher was lowered to depth with the towing engine. Recovery was effected in the reverse manner.

The flukes used for this operation were designed for coral bottom and successfully embedded to provide excellent holding power. A 600-foot, 1-5/8-inch wire pendant was attached to each fluke with a 125-ton, high-strength shackle. After launching, these legs were buoyed off for subsequent recovery when making up to the moors. Underwater pictures of the 1-5/8-inch wire where it penetrated the coral showed considerable chaffing; a means of using chain should be explored.

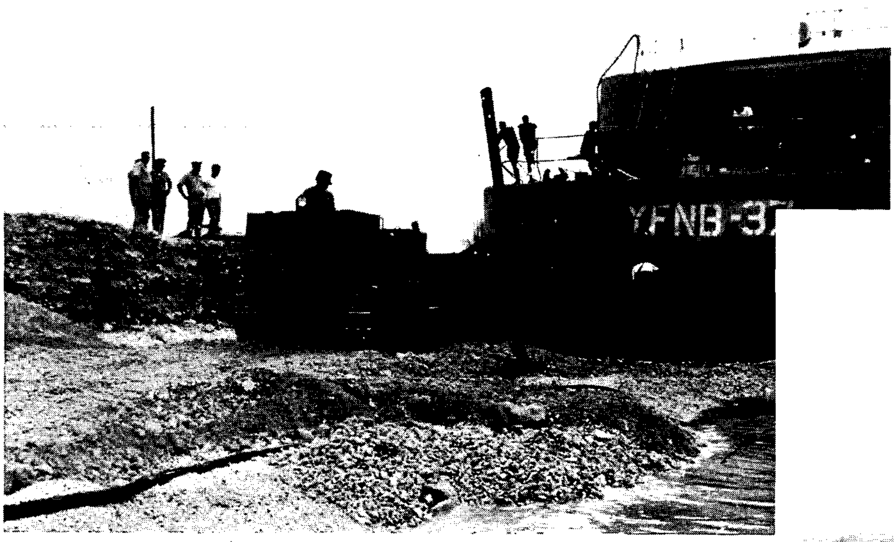
Six anchors were successfully emplanted over a 4-day period, involving a lot of hard work under potentially dangerous handling conditions. With modifications to enhance handling characteristics and reduce overall size and weight, the propellant anchor launcher could be a viable system to deploy from a salvage ship platform.

5. The remote controlled vehicle DEEP DRONE provided excellent underwater video coverage during the operation. Upon completion of each series of detonations, the vehicle was used to survey the results. This saved considerable diver time and greatly assisted the Salvage Officer in planning follow-on actions. In addition, the divers could be viewed while conducting their work, thus providing topside personnel with considerable information regarding their progress.

DEEP DRONE contributed significantly towards reducing the time to complete this operation. A post toppling survey conducted with the vehicle eliminated the need to place divers in the water for this purpose. Continued use of DEEP DRONE in future complex salvage operations is highly recommended. The only drawback is its tendency to foul its umbilical on the structure or bottom and even on another section of its own tether. In the clear waters off Bermuda, clearing was relatively easy; however, low visibility and heavy debris-laden areas could present serious operational and retrieval problems for DEEP DRONE.

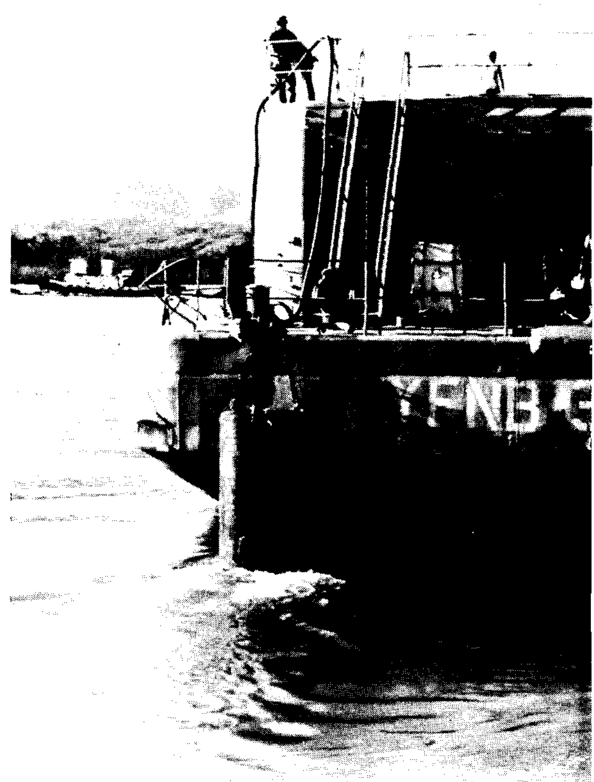
6. The ring charges used to sever the supporting "K" braces of the tower structure were extremely effective. However, the main leg cutting charges placed for the final cuts were not effective. As these charges were slightly too small to fit the inner legs, it was necessary to loosen the hinged end so that the charges could be snapped in place. This resulted in a slight gap and in ultimate failure to produce a clean cut. The use of haversacks proved to be an effective alternative for the final cuts.

7. The Argus Island Operation was extremely valuable in regard to training. It provided a unique opportunity for two ships of the squadron to work together in the planning and execution of a difficult task. Because of the ingenuity and hard work of the assigned personnel and various technical representatives, the operation was successfully completed in a safe and professional manner.



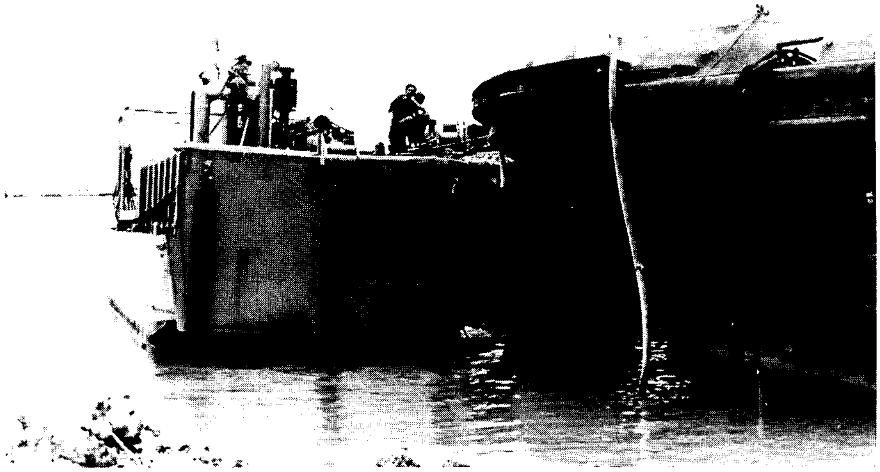
GUAM HARBO
Pha

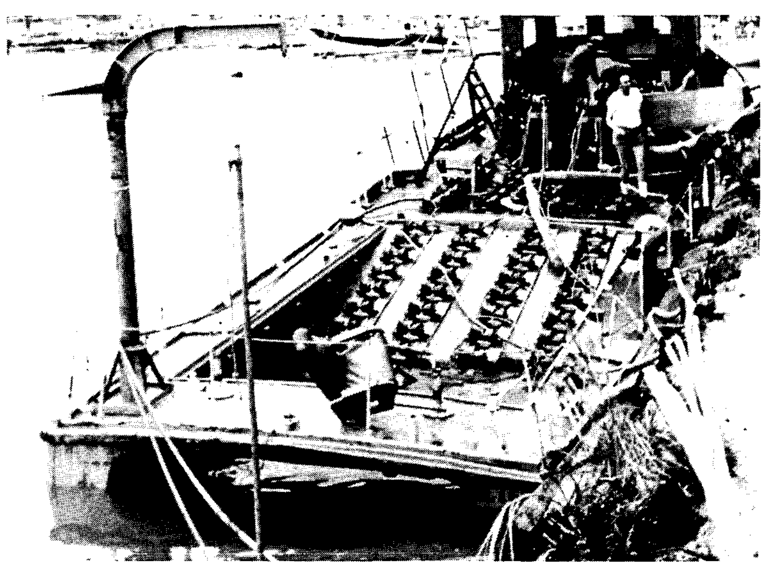
Photos on pages 16-17 show various
ance. Top, middle, and bottom photo
YFNB-37 before it was finally afloa
right photo shows YTM-409 with
beach gear chain that passes under sk
shows TR-1 being pumped out befo
bottom right photo).

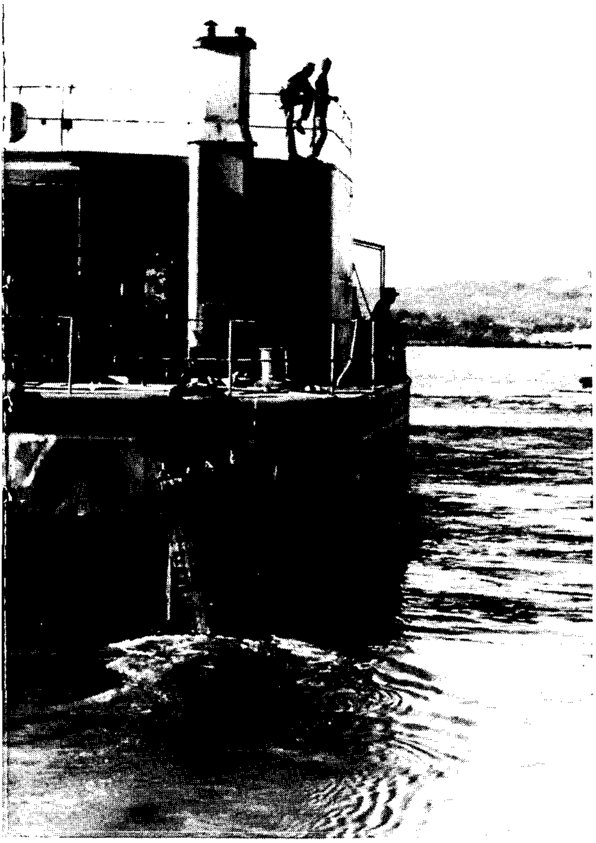


R CLEARANCE:
se 1

enes of phase one of the harbor clear-
at left show dirt removal operations on
(shown in photo below, middle). Top
ROTEUS diving boat alongside (note
eg to pulling barge). Middle right photo
re it was successfully afloat (shown in

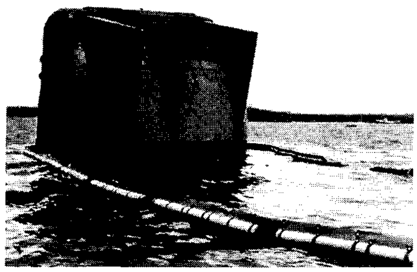


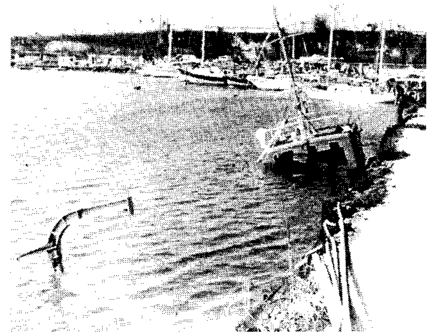




GUAM HARBOR

CDR W. I. Milwee, Jr., USN
Force Salvage Officer,
U.S. Pacific Fleet


YOGN 267 before removal.


TR-1 sunk in harbor.

An unruly and impolite young lady named PAMELA passed through Guam in May 1976, leaving in her wake the largest harbor clearance effort undertaken by all Navy forces since the end of the Vietnam conflict.

When reports began to come in after PAMELA's passage, it was obvious that many craft had been sunk or damaged and that a major harbor clearance effort would be required. To provide an immediate estimate of the situation, this author, accompanied by LCDR Paul W. Wolfgang, USN, the Commanding Officer of Harbor Clearance Unit ONE, arrived in Guam on the second plane after the storm.

Meanwhile, LCDR Art Anderssen, Chief Andy Heyden, and the divers from the Ship Repair Facility (SRF) Guam had been busy. AFDL-7 had been removed from Glass Breakwater; YOGN-267, a serious pollution hazard, had been raised; and YC-1435, the SRF sludge barge, had been boomed and plans had been made for raising it.

As with any salvage job, the first steps were to survey the wrecks to establish priorities and to evaluate and organize the resources available.

The initial survey showed several wrecks that could be salvaged fairly readily, some that would be long term projects, and others that were so badly damaged or in such bad condition that salvage was not warranted. Of the vessels that were needed for immediate return to service, SRF Guam divers had three in hand. This left the TR-1 sunk in Sumay Cove; YFNB-37, a berthing barge for USS PROTEUS (AS-19), east of Wharf Alfa; YRDH-2, a floating shipfitter shop aground on western shoal; and YTM-409, high and dry at the south end of inner Apra Harbor. Salvage of other craft could be delayed.

There were adequate resources available in Guam for the immediate salvage work. Two YTB's were available, as were all the facilities of the ESSM Base. In addition, SRF divers, PROTEUS divers (LTJG Carl Albury and BMC(MDV) D. H. McKenzie), and USS DIXIE (AD-14) divers (Chief Smaltz) were available. USS JASON (AR-8) (Senior Chief Cason) was due soon. With all available divers combined in one salvage crew but working in their own gangs, the salvage plans were set.

TR-1: DIXIE divers would break out pumps, both diesel and 4-inch submersibles, build cofferdams, and cofferdam and pump.

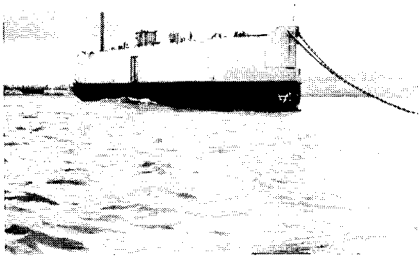
YFNB-37: PROTEUS divers would begin preparations for refloating, including the removal of sand and coral from under the twin skegs to reduce the ground reaction.

JASON divers would commence surveying other wrecks. It was obvious that several jobs would require the use of beach gear. Accordingly, with the help of the SRF Design Division and Production Department, work was started to convert YC-1419 to a pulling barge capable of pulling two legs of beach gear. Because of the nature of the bottom (mostly mud), tandem legs with mud plates would be used.

Parallel work was undertaken in preparing TR-1 for pumping and in reducing the ground reaction on YFNB-37 by removing ground near her stern. Ground removal was accomplished by shovelling, by jetting with a 6-inch jetting pump, and, finally, by using earth moving machinery. The dual effort paid off on May 28. TR-1 was pumped dry; and when it was afloat and secure it was turned over to PROTEUS. On Monday, May 31, YFNB-37 was easily pulled off by two YTB's and turned over to PROTEUS.

CLEARANCE: Phase 1

YFNB-37 aground.



YRDH-2 aground.

YTM-409 aground.

DIXIE and JASON departed at this time and SRF divers became involved in other work necessary to get SRF back in full operation. The bulk of the salvage then fell to PROTEUS divers.

YRDH-2 turned out to be particularly easy. When flood water was removed, it floated off its strand. However, YTM-409, hard aground near the gate to the Naval Station, was another story. In addition to the salvage difficulty was the urgency of completing the salvage on this tug, because it was needed for harbor operations as soon as possible.

YTM-409 was broached starboard side to nearly high and dry. The craft was intact, so no patching was necessary. Calculations showed that the pull required was barely within the pull available from the pulling barge and two YTBs. Two tandem legs of beach gear were dropped, and the barge was attached to the YTM-409 with two 1-5/8 inch bull ropes. To reduce the ground reaction, the bottom was jetted out along the port side.

The first pull was made on June 5 with two legs of beach gear and two YTBs. The vessel rotated and moved longitudinally toward deep water, but stopped and heeled hard to starboard as the propeller and bilge keel dug into the loose coral bottom. It was immediately apparent that the tug would have to be "walked" toward deep water by successive washings and pulls. Washing was difficult because the loose material would easily fall back into the hole from which it had just been washed.

A second pull was made after 2 days of washing. The tug again moved into the hole and dug in. This pull became exciting when a 7-inch nylon towing hawser parted and the starboard quarter bitts on YTM-409 carried away.

In both pulls of YTM-409, the wreck had dug in and begun to heel after initial movement. The beach gear, the main pulling force, was rigged directly to the H-bitts and over the port side. In this position, the pull tended to increase the list and assist the vessel in digging in. By rigging the beach gear chain out, freeing parts in the bulwark and under the skeg, the pull would tend to right the vessel and act against the desire to dig in. This rigging was done; and, after more washing, a pull was made at high water on June 10. The pull was successful; at 8:25 p.m., the tug floated free.

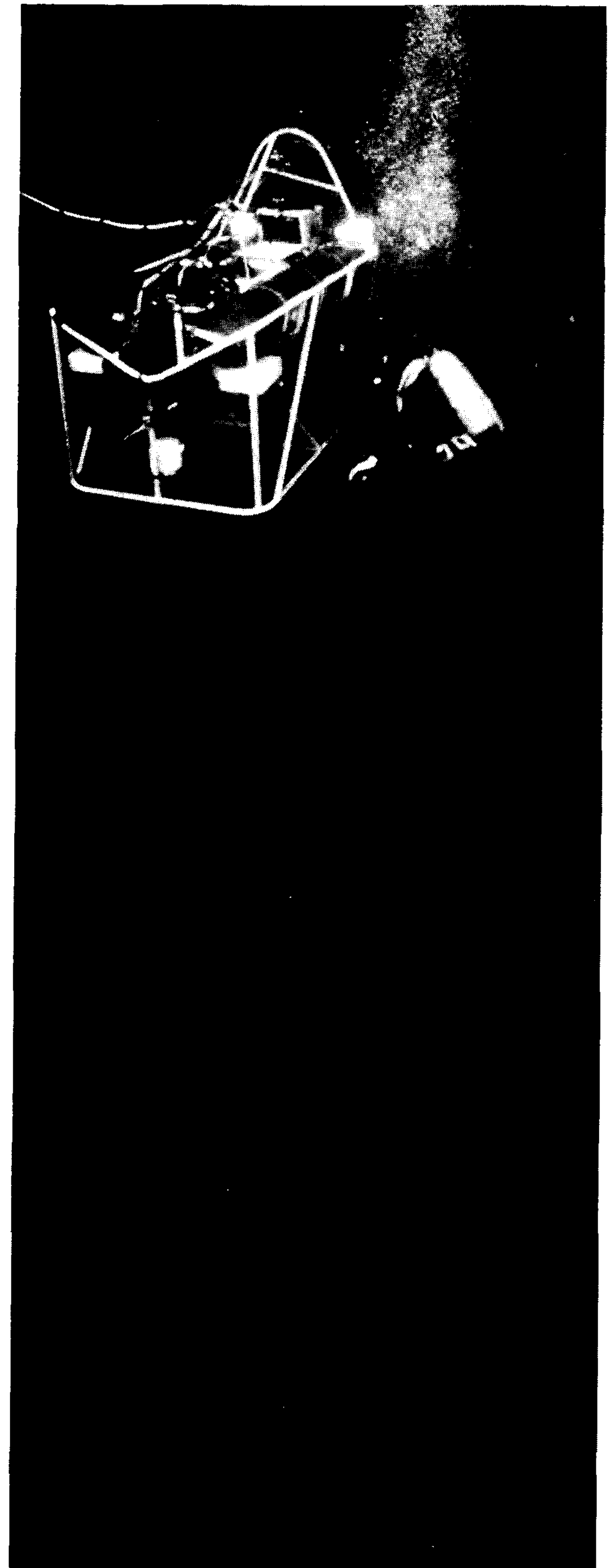
With the completion of the YTM-409 salvage, all the wrecks that were to be returned to service, presented a pollution hazard, or were in an exposed position were cleared. The first phase was over.

Guam was not cleared, however. There were three merchant vessels that would be removed by commercial salvors; two Navy wrecks, YFNB-22 and YT-408, which would be disposed of by sale "as is where is," and three sunken wrecks, YSD-42, YD-174, and YTM-419, which would be removed as "Phase Two" of the operations.

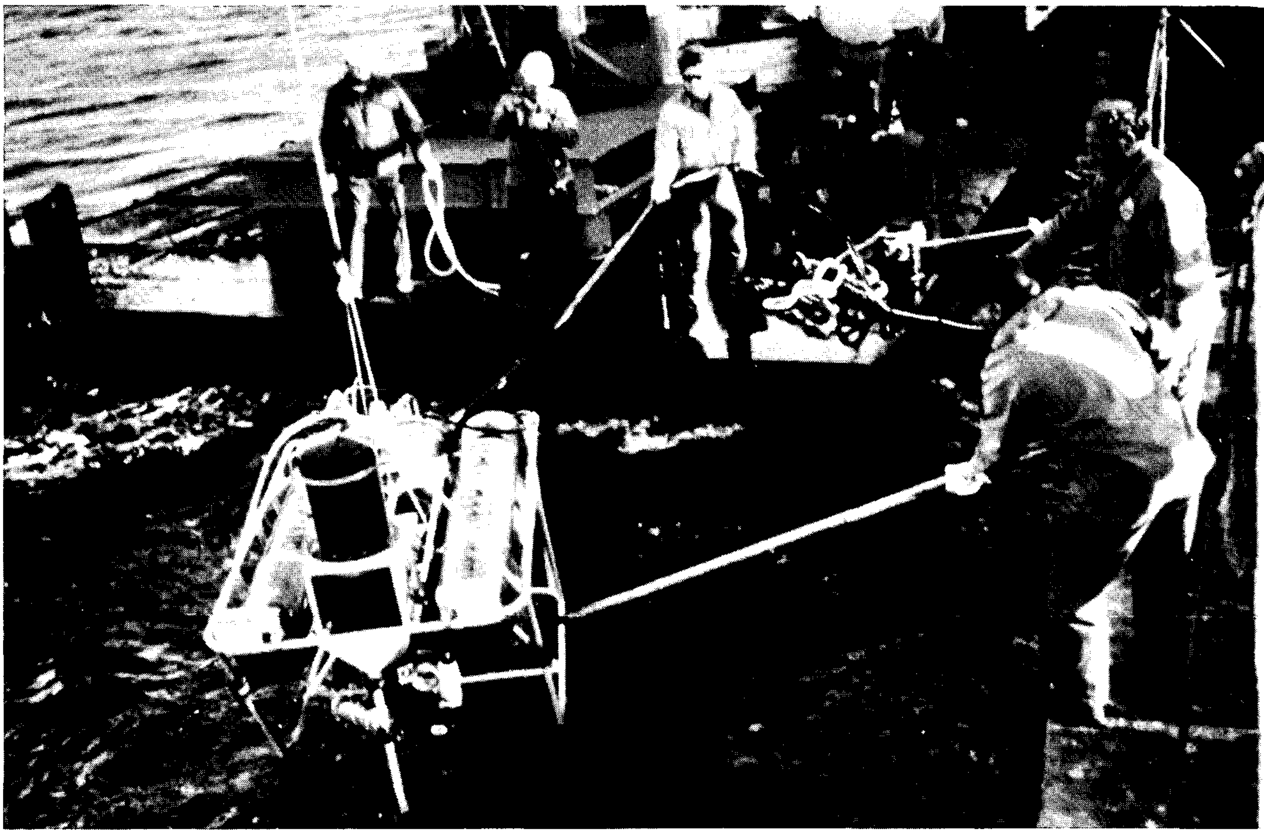
Many salvage techniques were employed during "Phase One." These included pulling with tugs and beach gear, pumping, cofferdamming, ground removal, jetting, and lifting. The most important aspect of the job was that it again proved that a few trained salvors working with a minimum of equipment can accomplish a major salvage operation.

DEEP DRONE is Valuable Deep Ocean Vehicle

Mr. Thomas B. Salmon
Office of the Supervisor of Salvage



Diver tends DEEP DRONE at depth.



DEEP DRONE is brought onboard after operational dive.

During the past decade the number of military and commercial manned submersibles has increased proportionately to the expanding scope of ocean exploration. Dwindling world resources will no doubt escalate submersible operations.

The vulnerability of such submersibles to entanglement and/or mechanical failures created an urgent need for a reliable, readily transportable search and rescue system capable of performing simple work tasks below the depths attainable by working divers.

Recognizing this need, the Supervisor of Salvage (SUPSALV) contracted with the Ametek/Straza Corporation to develop a small, lightweight, remotely controlled search and rescue vehicle. The ultimate product of this task is the SUPSALV DEEP DRONE. The vehicle and cable design take full advantage of the knowledge and experience gained from existing remote controlled vehicles (such as CURV III). SUPSALV's DEEP DRONE offers many advantages for rescue operations at sea. It can be easily maintained on line for emergency service, airlifted by a variety of aircraft to any port in the world, and deployed from most ships of opportunity.

The basic components of the system include a remotely controlled, highly maneuverable vehicle, operator console, control cable, support line, vehicle locater, and power source. Maximum operating depth is 2,000 feet. The system provides a 360° CTFM search sonar, two TV cameras, and a 70-millimeter still camera.

With the delivery of the DEEP DRONE system in October 1975, an intensive program of testing and evaluation began. This program was designed to operationally evaluate the system and subsystems under actual conditions that could arise. The vehicle was thoroughly tested at the Naval Undersea Center, San Diego, California, and at the San Clemente Island, California, Test Facility. Numerous problems were encountered during this evaluation, but it was readily apparent that the system had the potential to become an excellent search and recovery tool. Once all of the problems were rectified, the system was retested. This test proved to be very successful, and the system was placed on-line ready to respond to emergency situations as they arose.

In May 1976, the DEEP DRONE system was assigned its first task. SUPSALV was involved in the demolition of the Argus Island Tower (see *FP*, Summer 1976). Because of the limited bottom time allowed for divers, SUPSALV used DEEP DRONE to monitor and document the operation. Aside from the obvious advantage of having video tape recordings (VTR) and 70-millimeter color slides of the work as it was accomplished, an additional benefit was discovered. While a team of divers was working, the relief team was able to observe their progress topside on a remote TV monitor set up on the fantail. As a result, the need for a thorough briefing between dive teams was eliminated, thereby cutting the surface interval between dive teams to a minimum.

As the operation progressed and the explosive cutting was performed, DEEP DRONE was used to inspect the results. The reason for this was twofold. First and foremost, if during a given cutting sequence one of the charges malfunctioned and subsequently went off while being inspected, no lives were at stake. Secondly, due to the depths involved, it proved time-effective to use DEEP DRONE for the inspections and then take time for the accomplishment of the work identified during the DEEP DRONE inspection.

Two weeks after the successful demolition of the Argus Island Tower, DEEP DRONE received its second task. On May 16, 1976, a CH-46F helicopter crashed onto the flight deck of USS GUADALCANAL (LPH-7) approximately 18 miles east of Crete. Unfortunately, the majority of the wreckage went over the side, sinking in 50-65 fathoms of water. The Navy Safety Center was tasked with investigating the cause of the accident. In order to accomplish the investigation, a request was made to SUPSALV to locate and recover the helicopter debris. On June 3, the DEEP DRONE system was placed aboard a MAC flight and shipped to Naples, where it was loaded aboard USS RECOVERY (ARS-43).

Upon arrival at the salvage site, RECOVERY spent a day charting the area with its fathometer. Once this was accomplished, a reference buoy was placed at the calculated position of the debris. DEEP DRONE was then launched to begin searching the area. Following 10 hours of search, some debris was located, but unfortunately the weather was deteriorating to the point that the ship was unable to hold her position and DEEP DRONE was recovered. In the ensuing 2 days of search effort, "Murphy's Law" seemed to take charge and DEEP DRONE was unable to return to the debris previously located.

On the evening of June 17, the search effort was terminated because of urgent fleet requirements. RECOVERY departed the search area and proceeded to Souda Bay, where all search equipment and personnel were off-loaded for the return flight to the United States.

Although no debris was recovered, the system once again proved to be very reliable and effective. As a search and recovery tool, DEEP DRONE has been and will continue to be a very valuable asset to SUPSALV.

DEEP DRONE crew and other ops personnel around vehicle.

SUPSALV Rep T.B. Salmon (top) watches system at depth with other DEEP DRONE personnel on topside TV monitor.

RHCU Update: HCU 420

LCDR Tom Nugent, USNR
Harbor Clearance Unit 420

When California Maritime Academy vessels started grounding due to heavy silt build-up in a channel, HCU 420 was called in to help. When a rafter's companion was drowned in a rock quarry near Rattlesnake Bar, some HCU 420 divers were there to assist the El Dorado County Sheriff's Department in body recovery. San Francisco City Parks and Recreation District needed piers inspected; HCU 420 was the answer again.

In 1974, when the first RHCU's were formed, on-call diving assignments came almost totally from the Navy community. This Northern California unit has provided services for USS ENTERPRISE, USS WABASH,and USS STEIN; performed port services at Treasure Island; and has surveyed a sunken barge for Alameda port services; to name a few.

"But getting the unit manned and ready didn't happen overnight," noted HCU 420's Commanding Officer, LCDR Tom Nugent.

Just two officers and one enlisted man made up the entire roster at the end of the first month, with only the commanding officer carrying current diving qualifications. By the middle of that year, the list still included only 14 names, with just five diver-qualified. Upon completion of Active Duty Training (ACDUTRA) at the 2nd Class Divers' School in San Diego, California, seven men were initially qualified as scuba divers and eight requalified as 2nd class divers or salvage diving officers, "... which prepared us to go on our first unit ACDUTRA with Harbor Clearance Unit One (HCU-1) Pearl Harbor, Hawaii," LCDR Nugent concluded.

Training at HCU-1 consisted of Mk 1 indoctrination and qualification, buoyant and free ascent training, raising and floating a Mike 6 boat, rigging beach gear, and salvaging USS BUTTERNUT.

In order to maintain a high performance level, the 28-man unit undergoes continual training. Classroom training, salvage training, and in-water training are included in each weekend's activity.

During the last part of August 1976, the unit again went on ACDUTRA with HCU-1 at Pearl Harbor. In a 16-day period HCU 420 accomplished nine of 11 FXP Exercises; when through orientation and qualification on the Mk 1 band mask; and aided in the construction of a divers' training tank. In addition, they also performed a major project for HCU-1—locating sunken autos and miscellaneous junk in Pearl Harbor.

Photo at left shows HCU 420 personnel who participated in ACDUTRA at HCU-1. They are [illegible] LCDR Thomas Nugent, CO; LCDR John [illegible], XO; [illegible] Bryan [illegible], [illegible] Kenneth [illegible], BT2 Robert Taylor, BM2 Gregory MacKinnon, [illegible] Stanley; and BT2 Eugene Sherman. Photo at right shows scene during salvage exercise during which forty automobiles were recovered from the bottom; several cars brought to the surface can be seen behind the group in photo at left.

Flyaway Air Diving System Status Report

LT William Hall, CEC, USN
Office of the Supervisor of Diving

The JOHNSON SEA LINK entrapment in June 1973, and the PISCES III sinking in August 1973, have influenced the development of Navy rescue assets. The recovery operations in each of these two incidents centered around "rescue by salvage," in which the only method of rescuing the trapped crew was to salvage the submersible. An examination of these rescue efforts revealed a need for both a rapidly deployable search system capable of locating the lost object and an equally quick response diving support system to support the rescue/salvage effort. The JOHNSON SEA LINK operation clearly pointed to the Navy's marginal ability to mount a timely and coordinated rescue operation. The equipment used in this operation was obtained from the Naval School, Diving and Salvage, Washington, D.C.; the Navy Experimental Diving Unit (NEDU), then in Washington, D.C.; Submarine Development Group One (SDG-1), San Diego, California; USS TRINGA (ASR-13); and the Naval Surface Weapons Facility, Fort Lauderdale, Florida; as well as from other fleet units. This pointed out a crucial fact that the major components of a flyaway diving system were not centrally located in either a single Navy unit or in a single geographic location.

As a result of the JOHNSON SEA LINK entrapment, SDG-1 proposed that certain equipment be assembled from fleet assets. This equipment would be pre-packaged and staged for flyaway rescue missions in a manner very similar to the SRC Flyaway Kit. This Emergency Flyaway Mixed Gas System was to have an air diving capability to a depth of 190 feet of sea water (fsw) and a mixed gas ($He\text{-}O_2$) diving capability to a depth of 300 fsw. This proposal was endorsed by the chain of command. The Chief of Naval Operations (CNO) accepted the plan and designated Harbor Clearance Unit Two (HCU-2) and SDG-1 as locations for the two emergency flyaway systems. The Chief of Naval Material (CNM) developed an equipment list (summarized in Figure 1) from fleet inputs.

It is important to note that it was decided to first establish an air diving capability in each of the two flyaway systems, and subsequently develop a mixed gas capability. The first, or prototype, system was to be established at SDG-1. This decision, which was endorsed by CNM and CNO, was the basis on which development work for the flyaway system was begun. Since 1973, the flyaway concept has been used by numerous fleet activities to meet short lead time requirements. However, much of the impetus to establish two dedicated flyaway systems has been lost because of material, funding, and personnel shortages in the fleet and in the shore support organization.

During the spring of 1976, NAVSEA collaborated with SDG-1 to revise the CNM equipment list (summarized in Figure 2) in an attempt to regain some of this lost impetus. The additional equipment resulted as a response to either a clarification of some point in the original list or a new requirement generated from the fleet scenario. Further, the fleet has elected to delete the word "emergency" from the official name for the system because of the expansion of its uses to include missions other than rescue. Thus, the flyaway system became the "Flyaway Air Diving System" (FADS), with the following operational uses: Recovery of aircraft, submersible rescue/recovery, recovery of objects, recovery of high value equipment, inspection and damage assessment, and assistance to other activities in support of on-going operations.

The equipment listed in Figure 2 that is physically on hand in each of the two dedicated FADS at SDG-1 and HCU-2 is less than 50 percent of the complete approved inventory. In addition, the delivery of the bulk of equipment for which NAVSEA was responsible has fallen beyond their original delivery dates. Critical components which fall into this category are the LP compressor system, double lock recompression chamber, air scuba communication, the portable one-man chamber, and a portable high pressure air compressor. NAVSEA is prepared to reassign some Emergency Ship Salvage Material (ESSM) equipment to each FADS upon letter request from the individual commands. The ESSM items available are a 5KW diesel generator, 5KW diesel light tower, and a 400-amp welding machine with welding and cutting kits.

To aid in the system development of the FADS at SDG-1, NAVSEA and SDG-1 have jointly developed a Flyaway Evaluation Master Plan (FEMP). The proposed FEMP describes the responsibilities of both the fleet and NAVSEA in evaluating each subsystem currently included in the FADS. These subsystem evaluations would culminate in an actual Flyaway Exercise (FLYEX). NAVSEA currently envisions a FLYEX for the SDG-1 FADS that would simulate a rescue by salvage operation at a depth of 190 fsw. The R/V MAXINE D would serve as a typical ship of opportunity. The location would be offshore San Clemente Island, California.

A successful completion of such a FLYEX would establish the FADS as a discrete asset capable of meeting flyaway mission requirements. However, the establishment of a dedicated FADS poses a dilemma for Navy diving managers. During the present austere climate of resources, it is neither cost-effective nor wise to dedicate diving assets and package them in storage to ensure quick response. It would be more prudent to clearly identify all the system components and restrict their use to local operations within a certain radius from the custodial units. This approach would allow the custodial unit to meet local diving requirements with FADS assets, while freeing the unit's organic assets to meet unscheduled deployment requirements. Nevertheless, such action could hamper the ability to respond quickly in time-critical operations, such as the JOHNSON SEA LINK.

The development of the FADS is still within a state of transition from idea to reality. NAVSEA believes the progress for its establishment, however, is favorable. With the conduct of the FLYEX, the lost impetus should be regained to expedite fleet acceptance of the FADS.

In addition, Flyaway Mixed Gas Systems (FMGS) are currently under independent development at the Navy Experimental Diving Unit and at Harbor Clearance Unit One. The NEDU system is being planned around the Biomarine closed-circuit scuba with a surface supplied umbilical as a backup. The HCU-1 system has been developed using components of the Salvage Diving System (SDS 450). Both the Mk V Deep Sea Rig modified for He-O_2 diving and the USN Diver's Mask Mk 1 Mod demand apparatus deployed with an open bell can be used with the HCU-1 system. Both these systems are being considered under various stages of certification. When these systems are finally assembled and certified, the Navy will have the most versatile group of Flyaway assets in the world.

FIGURE 1: CNM PROPOSED EQUIPMENT FOR THE FLYAWAY AIR DIVING SYSTEM

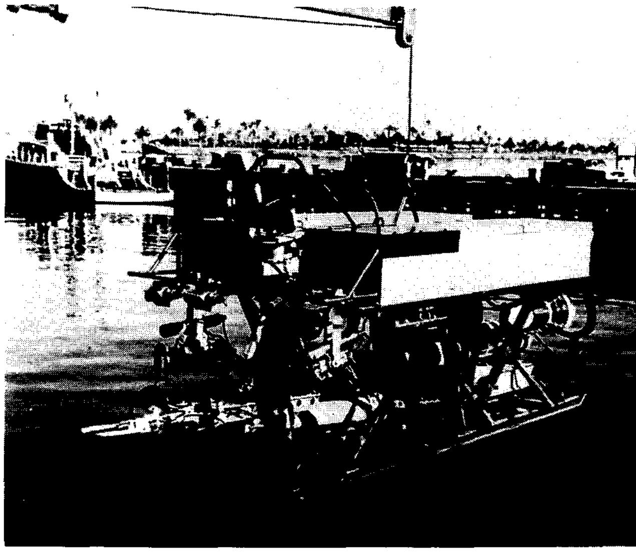
Items	Remarks
Group A: RDT&E Funded Items	
1. LP comp. system	Procurement initiated. Each system is a dual compression system.
3. Two-lock chamber	Assembly of previously proven components.
4. Port. 1-man chamber	Procurement action being initiated.
5. Open bell	Current contract for construction.
18. Air scuba comm.	*Prototypes not tested. Development NCSL.*
Group B: On-Hand Items	
2. Scuba charge comp.	FSN item. Reassign from fleet assets.
9. Underwater TV	UDATS System. Reassign from fleet assets.
10. Hydraulic tool pack.	NCSL Tool Package. Reassign from fleet assets.
11. Generator	FSN item to be reassigned from salvage assets.
Group C: Other Procurement Items	
6. Band masks	Procurement initiated-NAVSHIPS.
7. HP air bank.	Standard Air flasks in rack.
8. HP O_2 bank.	Standard O_2 flasks in rack.
12. Comm. box.	Procurement initiated. For use with band masks.
13. Unisuits	Special purchase.
14. Diver umbilicals	Special purchase. To be certified with band masks.
15. Open bell umbilicals	*Special purchase. To be certified as part of open bell system.*
16. Medical kits	Same as NEDU recompression chamber kit.
17. Air scuba	FSN items. Possible reassignment of fleet assets.
19. Packaging	FSN items with modifications (CONEX boxes).

FIGURE 2: NAVSEA APPROVED FLYAWAY SYSTEM EQUIPMENT LIST

1. One lightweight diving outfit (with longer umbilicals)
2. Six unisuits
3. Four vests with weights (integrated divers vest)*
4. Six life jackets[1]
5. Six twin "72" cylinders with regulators[1]
6. *Two LP air compressors*
7. One filter/console
8. One suitcase console*
9. One 2-lock recompression chamber
10. One portable chamber (one-man)
11. Two HP air banks (16 cylinders)
12. One O_2 bank (8 cylinders)
13. One HP air compressor (15 cfm) and charging whip*
14. One scuba charging compressor (4 cfm)**
15. One open bell with umbilical
16. One hydraulic power unit with tools
17. One generator (5 kw)[2]
18. One (5 kw) diesel light tower[2]
19. *One underwater TV unit with monitor (UDATS) with frequency stabilizer*
20. One wireless scuba communication system (3-diver capability)
21. Two medical kits
22. Three pair lightweight shoes*
23. One inflatable boat (ZODIAC type) with outboard motor (25 hp with short shaft)*
24. Three 100# weights*
25. 600 feet of 5-inch line*
26. 600 feet of 3-inch line*
27. 1,200 feet of 21 thread*
28. Assorted shackles, wire clips, and hoisting slings*
29. Personal equipment (wet suits, fins, masks, knives)[1]
30. Underwater welding/cutting machine and kit*
31. CONEX boxes (packaging)
32. Six underwater hand held lights*
33. Three underwater work lights (110 volts)*
34. Assorted lift bags (50-pound–4-ton)*

*–Indicates additional equipment requirements from Figure 1 list.
**–Indicates Figure 1 equipment marginal for intended use in present concept. Item 14 will be interim equipment until item 13 becomes available in late 1977.
1–Indicates detailed breakdown of AIR SCUBA equipment in Figure 1.
2–Indicates change in requirements for one (30 kw) generator to two (5 kw) generator with one light tower.

CURV III Surveys FITZGERALD Wreckage



CURV III

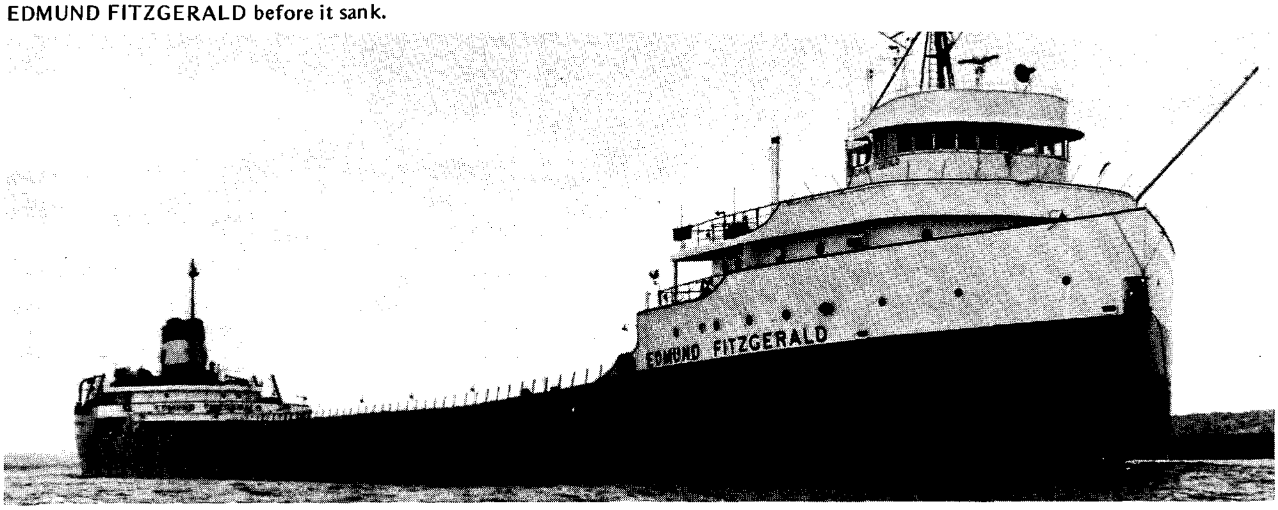
The Great Lakes ore carrier S/S EDMUND FITZGERALD was lost in the southeast end of Lake Superior on November 10, 1975. The vessel had departed Superior, Wisconsin, the preceding day with a crew of 29 and a load of 26,116 tons of taconite pellets. A winter storm moved over Lake Superior during the transit period, with reported winds of 50 to 60 knots and waves of 20 to 30 feet. No distress call was received and there were no known survivors.

At first word that FITZGERALD was in distress, the Coast Guard immediately attempted to contact her and, within the prevailing weather conditions, to initiate surface and aerial search. This search effort was continued through the evening of November 13. Despite the intensive search efforts, no survivors were found nor bodies recovered. A considerable quantity of debris, some identified as being from FITZGERALD, was recovered.

A Magnetic Anomaly Detection equipped U.S. Navy aircraft made a series of runs over the general location on November 14, covering an area of approximately 100 square miles. The aircraft had calibrated its magnetic anomaly detection equipment on a vessel similar to FITZGERALD and carrying the same cargo. One significant contact was made that was later determined to be the FITZGERALD hulk.

Side-scan sonar equipment, owned and operated by the Coast Guard, was brought to the scene to attempt to locate and verify the object on the bottom of the lake. A range-range navigation system was provided for surface positioning (also Coast Guard property). This first search was successful in locating FITZGERALD. Careful laboratory analysis of the sonar traces by the equipment manufacturer revealed that two pieces of a shipwreck were visible on the sonar records.

EDMUND FITZGERALD before it sank.



Shortly after the loss, the Commandant, U.S. Coast Guard, convened a Marine Board of Investigation with RADM Winford W. Barrow, USCG, as chairman to investigate the cause of the sinking. During the period of November 22-24, the U.S. Navy Supervisor of Salvage (SUPSALV) (who had previously been contacted by the Coast Guard to provide search consultation) and its primary search and recovery contractor, Seaward, Inc., conducted a second side-scan sonar search of the loss area to gain as much additional detail as possible for action by the Board. Operations were limited, however, by weather conditions and the onset of the winter season on the lake.

To provide further data in determining the cause of the FITZGERALD sinking, the Commandant, at the request of the Chairman of the Board, authorized the Commander, Ninth Coast Guard District, to form a Task Force that would document by underwater photography and television the verification of the location of FITZGERALD and the condition of the wreck. This Task Force, under the command of CAPT H. H. Kothe, USCG, again requested the services and resources of SUPSALV. These consisted of navigation and side-scan sonar from Seaward, Inc., for the accurate relocation of the wreck and the subsequent setting of a moor over the site; the deep diving, tethered submersible CURV III from the Naval Undersea Center, San Diego, California, which would be used to obtain photographic and television documentation; and the preparation of the technical report that would document the investigation and the observations made.

The CURV III system is composed of an underwater vehicle, cable, surface equipment, and support ship. The vehicle is capable of making recorded observations, recovering small objects, and performing other light work tasks at depths to 7,000 feet. The cable and surface equipment enable the vehicle to be deployed and remotely operated from a support ship of opportunity.

The U.S. Coast Guard Cutter WOODRUSH (WLB-407) served as the survey platform for the sonar search operations and as the support platform for CURV III. WOODRUSH is a 180-foot-long buoy tender classed for ice breaking. It has a 37-foot beam and a mean draft of 12 feet. The buoy deck of the ship carried CURV, the control console, the maintenance van, and the cable carriers. The electrically operated boom, normally used for handling buoys, was used to launch and recover the vehicle.

After a third side-scan sonar search reestablished the wreckage location (during the period of May 12-16, 1976), the Task Force members and necessary equipment were assembled in Sault Ste. Marie, Michigan, to begin a detailed survey. SUPSALV representatives on the Task Force were CDR J. J. Coleman, USN, and Mr. T. B. Salmon. The Seaward Task Force team on board included Mr. R. Kutzleb, Mr. F. Anderson, Mr. M. Kutzleb, and Mr. S. Lilly.

WOODRUSH, with the FITZGERALD Task Force aboard, departed for the wreckage site on May 19, 1976, and moored over the hulk. During the period of May 20-28, CURV III made 12 dives, logging 56 hours and 50 minutes of bottom time. Over 43,000 feet of video tape were recorded and almost 900 35-millimeter color photographs were obtained. In addition, a continuous audio narrative was made, supplemented by specific comments pertaining to specific scenes observed. The position of WOODRUSH over the wreck was changed periodically to allow CURV III maximum accessibility to the major sections of the wreckage.

No conclusions have been reached yet as to the cause of the sinking. An investigation by the U.S. Coast Guard Board of Investigation is currently in progress.

Coast Guard Cutter WOODRUSH.

A Look at SERVRON 5's

USS BOLSTER (ARS-38) (auxiliary rescue and salvage) is primarily designed as a ship salvage vessel with limited repair facilities. Commissioned May 1, 1945, BOLSTER is the first of five ships of the ARS-38 class. Homeported at Pearl Harbor, Hawaii, and commanded by LCDR Kenneth C. Malkus, BOLSTER carries a crew of 7 officers and 86 enlisted men.

The number of diving personnel aboard usually averages at 18. BOLSTER houses a variety of diving equipment, including a double-lock recompression chamber and a crew-modified diving locker that several on board claim to be the best in the ARS community. They have the capability of putting divers down to working depths of 170 feet.

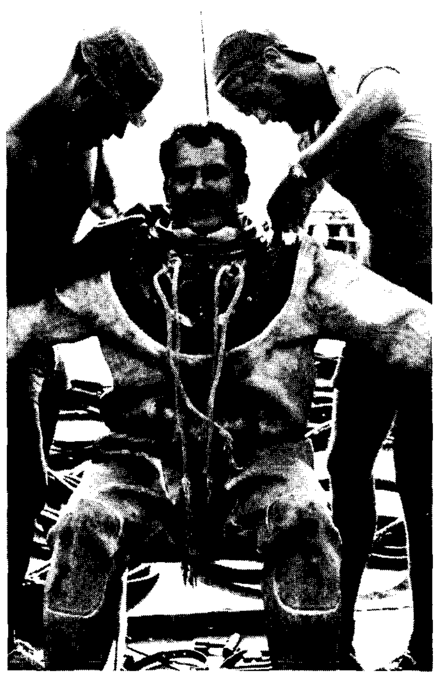
As a rescue salvage vessel, BOLSTER is equipped with eight complete sets of beach gear in addition to various sizes of portable salvage pumps, compressors, generators, welding machines, and auxiliary equipment. The ship also has a 40-ton Johnson automatic towing machine equipped with 2,100 feet of main 2-inch tow wire, and features a 20-ton boom forward and an 8-ton boom aft. BOLSTER carries two 35-foot aluminum, twin screw workboats. Armament on board consists of two single-barreled 20-mm anti-aircraft guns, two .50 caliber machine guns, and various small arms.

BOLSTER has an overall length of 213 feet 6 inches, a beam of 43 feet 11 inches, and a full load displacement of 2,052 tons. Propulsion is provided by a diesel-electric geared drive.

Based at Pearl Harbor since 1952, BOLSTER has regularly made normal deployments to the Far East, visiting Japan, Hong Kong, Korea, Okinawa, Guam, Taiwan, and the Philippines. During the Vietnam conflict, the ship spent the majority of its time as standby salvage ship at Da Nang, conducting salvage and repair work along the Vietnam coast.

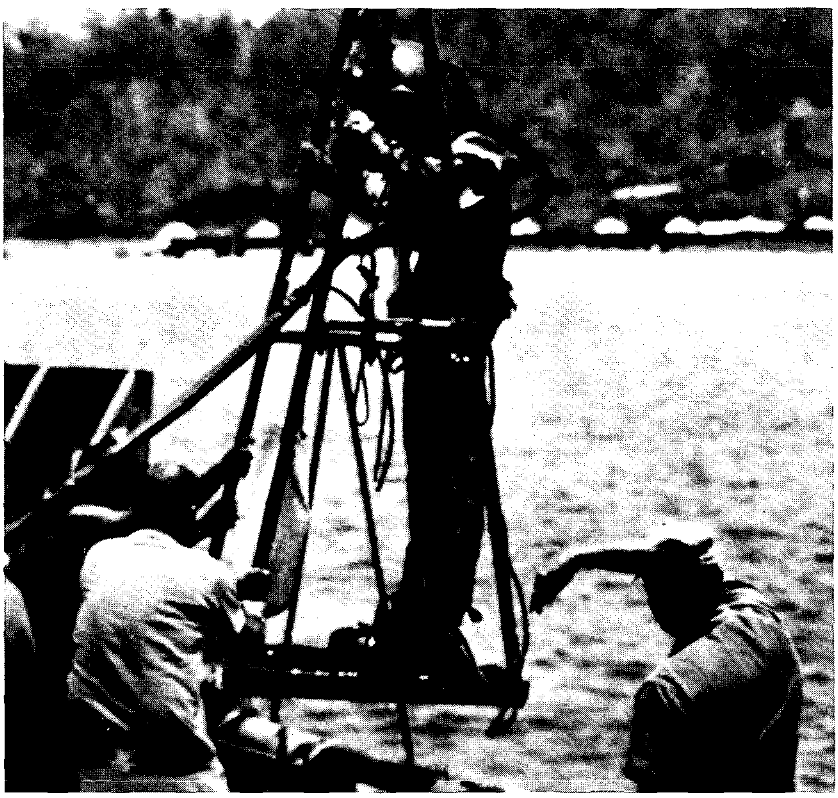
The ship recently returned from a 5-1/2-month deployment that horseshoed the western Pacific from the Fiji Islands to Korea. The cruise began with escorting duties for two Fijian ships and continued with operations in the southwestern Trust Territories. During this deployment, BOLSTER participated in several Seventh Fleet exercises that enabled the ship to practice its primary mission of rescue and salvage operations. The cruise covered over 20,000 nautical miles (see photos).

BOLSTER is assigned to Service Squadron Five, currently commanded by CDR D. D. Boerner. SERVRON 5 consists of nine rescue salvage ships, four fleet tugs, and Harbor Clearance Unit One.



BOLSTER

Above left: ENS Edwards, BOLSTER's Diving Officer, and ENFN Reibold check out the Diving Locker. Above right: LCDR Malkus, CO, suits up with help of GMG3 Niemuller (left) and EN1 Kruk. Below left: Diver in Mk V is lifted over side. Below right: ENS Gilcrist (left) and ENS Edwards help MM1 Tass suit up for dive.



SALINAN/ESCAPE Divers Recover Helo

USS SALINAN (ATF-161) was directed by Commander Service Squadron EIGHT on June 11, 1976, to commence salvage operations on an SH-3H helicopter that had crashed approximately 11 miles east of Ponte Vedra, Florida. SALINAN departed Mayport, Florida, that afternoon with 5 additional divers from USS ESCAPE (ARS-6) and two advisors from Helicopter Anti-Submarine Squadron 1 (HS-1).

After arriving at the approximate location of the crash site, divers boarded the motor whale boat and immediately commenced search operations. The aircraft, which was quickly located and surveyed, was found to be on its starboard side with part of the rotor in the sand. The tail section was severed, but it was still attached by a control cable to the body of the helicopter. The average depth at the site was 70 feet.

The salvage plan called for divers to secure a 4-inch double braided nylon line to the rotor assembly of the helicopter. The line would be fairled to SALINAN's warping capstan and would be used to right the helicopter and to position the ship's stern directly over it. Divers could then install a bridle (provided by HS-1) on the rotor assembly. SALINAN's boom would lower the hook into the bridle for lifting the aircraft onto the fantail.

By early evening, the divers had secured the 4-inch line to the rotor assembly. SALINAN anchored upwind so as to position the fantail approximately 100 yards from the helicopter. The 4-inch line was brought on board and secured. This effectively put the ship in a two-point moor for the night, and salvage operations were secured.

Early the next morning, they commenced heaving around on the 4-inch line with the ship's warping capstan, at the same time veering the anchor chain to allow SALINAN to ease over the helicopter. When the 4-inch line tended straight down, divers were sent to check the helicopter's position. They reported that it was upright, and returned to the aircraft to secure the bridle to the rotor assembly. This task was completed without mishap and the boom was positioned over the aircraft and the hook was lowered. Divers followed the

SH-3H helo onboard SALINAN for inspection after recovery.

hook down, using hand line signals to the surface to position it. Lifting then commenced, using the warping capstan to heave around on the 4-inch line in combination with the hook. The helicopter was brought to the surface carefully and positioned to be lifted on deck. The aircraft was lifted a few feet at a time from the surface to allow water and fuel to drain before it was placed on deck.

SALINAN then returned to Mayport and placed the helicopter on an awaiting barge for transfer to the Naval Air Station, Jacksonville, Florida, thus completing the operation.

During the recovery, seven divers logged a total of 4 hours 35 minutes of bottom time using open-circuit scuba. Participating personnel included the following: ENS R. H. Maurer, USN; CWO2 J. T. Stein, USN; ENS P. E. Stanton, USNR; ENS S. C. Duba, USN; ENC (MDV) J. W. Hayes, USN; EN2 (DV) J. L. Cuchens, USN; HTFN (DV) D. A. Bosserman, USN; SK3 (DV) R. B. Hernandez, USN; and BM1 (DV) C. D. Pate, USN.

The Old Master ...

Some things have been happening lately that make me think I ought to talk some basics. What I've got to say is for you non-diving skippers who work with divers as well as for you divers. It's based on a lot of years of experience on jobs both good and bad.

None of us likes to get "bent." In the first place, it hurts; in the second place, it gives the Master gray hair; and in the third place, it stops the diving operation and takes the diver off the job. Whether a "hit" is going to be a skin bend or a CNS hit with permanent damage just can't be predicted. The doctors can't be absolutely sure that if we follow all the procedures we won't get hits. There are alot of things we can and must do to minimize the probability of hits. Most of these things can be done topside before the dive.

It can't be emphasized too much how important planning is. Planning for a diving operation includes not just the diving but such things as:

> Putting the ship in a good solid moor so that it can be positioned over the wreck. It's just plain stupid for a diver to waste his bottom time going from his stage or descending line to the work site and back. A multi-point moor should be laid and the ship positioned within the moor to give the diver the best work position.
>
> The wreck or object to be worked on should be marked with enough buoys so that its attitude can be ascertained at anytime and the ship can be put in the best position.

Dives should be planned so that the work to be done on that dive can be done in the planned bottom time. Don't get caught up in the "can do" and big hairy-chested diver stuff. Figure on a reasonable amount of work and cut that down for deep air where the diver is affected by inert gas narcosis.

Long dives should be avoided. A lot of short dives using tables that have alot of mileage on them is preferable to a few longer dives using tables of less validity.

About the tables themselves. Some tables are known around the diving community as "bad" (particularly the exceptional exposure tables) because of the large number of hits on them over the years. Others are "good." The point is that all the tables are not of equal value, and all have not had the same amount of testing. Some, particularly the longer, deeper partial pressure tables, have just been calculated—not thoroughly tested. Like Dr. Spaur down at NEDU told me recently, the partial pressure tables for more than 30 minutes don't work very well, stay away from them if you can.

Exceptional exposures are something that should never be taken lightly. In fact, exceptional exposures should be avoided. The Diving Manual in Note (4) on Figure 4-17 says that exceptional exposure dives "are not permitted." This means just what it says. If you have to use exceptional exposures, you have to follow the requirements of OPNAVINST 9940.1F concerning waiver requests.

Some people seem a little confused about exceptional exposures. The Diving Manual emphasizes oxygen exceptional exposure, that is, long exposures to high oxygen partial pressures that are likely to cause CNS oxygen poisoning. This is a hazard in mixed gas diving in particular, but there is another thing which is completely different but which is also an exceptional exposure—long exposure to high inert gas partial pressure. Inert gas elimination, or failure of it, is what causes decompression sickness. The longer the exposure, the more inert gas is absorbed and the greater the danger of a problem with its elimination. Exceptional exposure has two very distinct and different hazards, both of which must be considered in dive planning. When you're within the O_2 limits, you may still be making an exceptional exposure dive. Exceptional exposure dives are likely to hurt somebody.

One more thing that can be done ahead of time is to keep divers worked-up by diving. I realize this is hard to do, but some good can be done by making regular chamber runs, say to 165 feet. Some of these runs should be long enough to require decompression.

Just two more items. During the dive there is often a temptation to extend the bottom time "just 1 more minute." To do so is just plain dumb and you're asking for trouble. When the planned bottom time is up, get the diver off the bottom. Don't fall to the temptation of trying to finish up without making another dive.

The other thing you can do is when the diver is working hard, the water is cold, or you're pushing the limits of the table, jump to the next longer and deeper table.

These are just a few thoughts on some of the things that need to be done. It doesn't include everything, so I make one more suggestion: *THINK!*

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NAVAL SEA SYSTEMS COMMAND
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