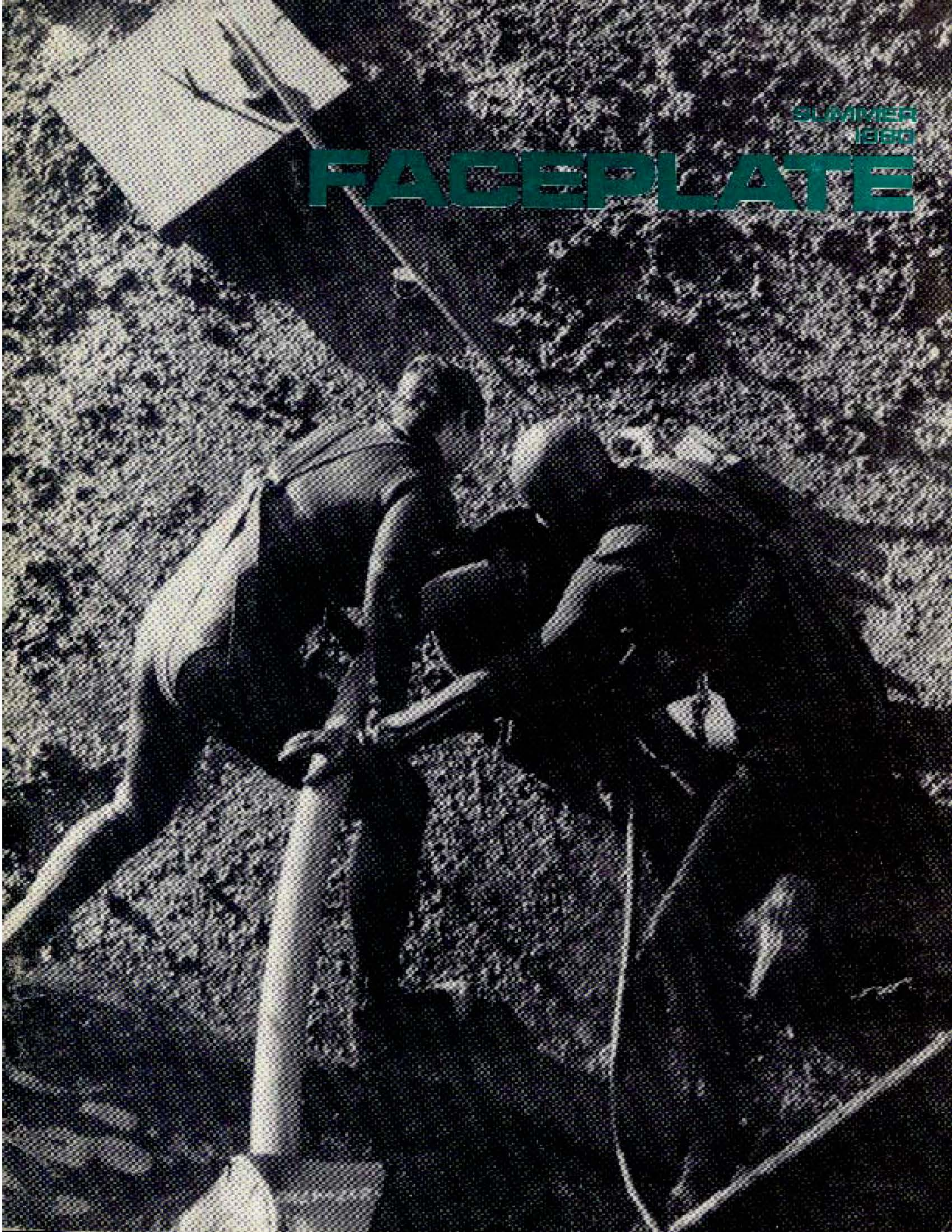
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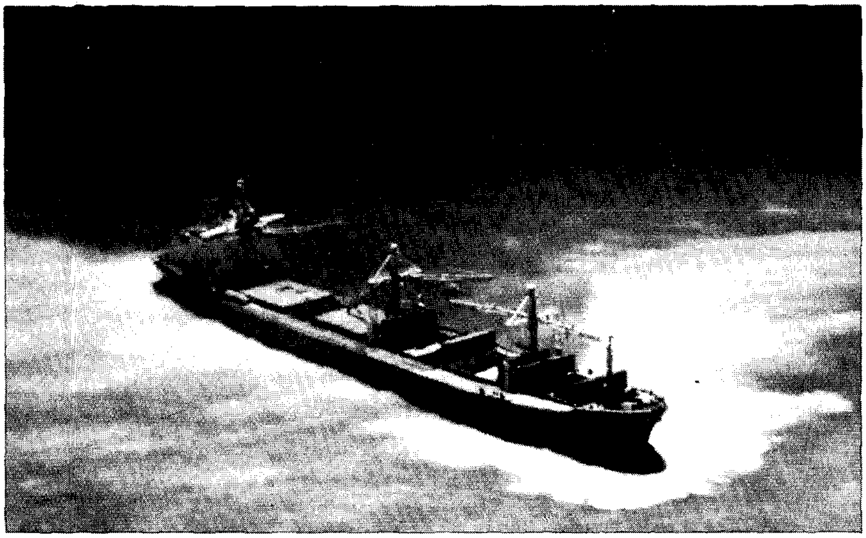


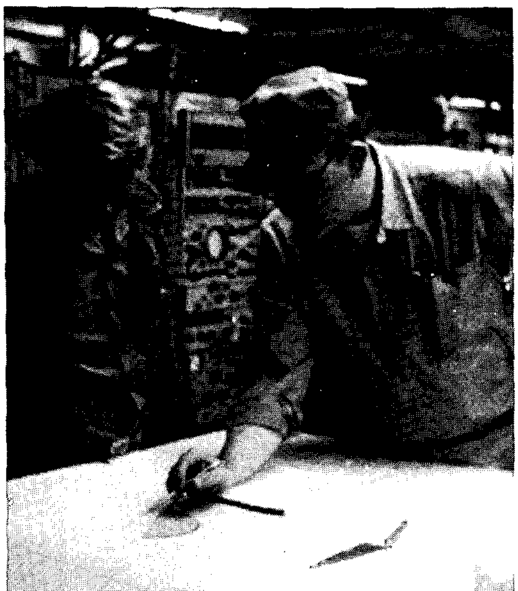
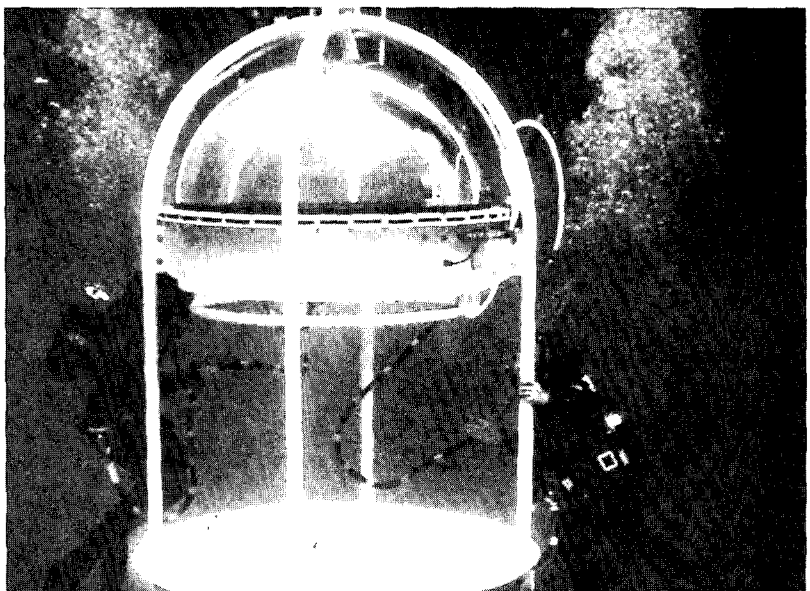

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. . . the official magazine for the divers of the United States

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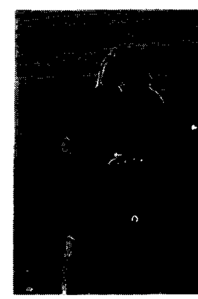

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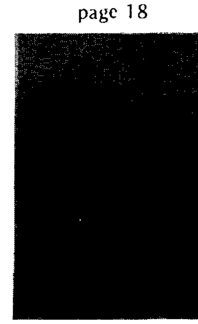

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Front cover shows SRF Yokosuka divers ENFN 1 (DV) Bramblett (left) and BM1(DV) Tonkin at work. (See page 18.) Inside cover, clockwise from top left: stranded M/V ANANGEL LIBERTY; Royal Navy's Sea Pup in Casino Royale exercise; the first four CO's of NEDU–(l-r) CDR Bartholomew, USN, CAPT Jones, USN, CDR Bornholdt, USN, and CDR Ringelberg, USNR; HM2 Prevette, USNR and LCDR Harmon, USNR, l-r, during U/W ERT 107 ACDUTRA; two divers use an open diving bell. Back cover: an EOD diver attaches the Mk 2 Mod 1 flotation bladder to an underwater mine during EOD training. (See page 12.)

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FACEPLATE is published quarterly by the Supervisor of Diving to bring the latest and most informative news available to the Navy diving and salvage 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 from U.S. Governmental Agencies and military activities or personnel 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) OX7-7606 or AUTOVON 227-7386. All other such requests should be directed to the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

NDSTC ARRIVES IN PANAMA CITY

The Navy Diving and Salvage Training Center (NDSTC) was commissioned as a tenant activity at the Naval Coastal Systems Center (NCSC), Panama City, Florida, on June 1, 1980. CDR James R. Nelson, USN, is its Commanding Officer.

The classrooms are ready; the minesweeper used for the ship salvage course rests half sunken in the neighboring bayou; and YDT-14 and YSD-39 are moored at the NCSC quay wall. Completion of the facility comes closer every day. Fifteen first-class divers began training August 1, and another 20 first-class diver students began training on August 22. By October 2, approximately 70 students are expected to be on board.

CDR Nelson has been a Navy diver since 1948, when he graduated from the Naval School, Diving and Salvage (NSDS) in Washington, D.C. He became Commanding Officer of NSDS in August 1979, which was disestablished at the Washington Navy Yard this past May (see *Faceplate*, Spring 1980).

CDR BARTHOLOMEW RECEIVES MERITORIOUS SERVICE MEDAL

CDR Charles A. Bartholomew, USN, was awarded the Meritorious Service Medal "for outstanding meritorious service" as Commanding Officer of the U.S. Navy Experimental Diving Unit (NEDU), Panama City, Florida, from March 4, 1977 to June 6, 1980. The award was presented at the June 6, 1980 NEDU change of command ceremony by CAPT Colin M. Jones, USN, Director of Ocean Engineering/Supervisor of Salvage.

In the citation, CDR Bartholomew is commended for his performance of duty during his tour at NEDU, which was instrumental in the development of various advanced diving equipment and techniques for the Navy diving community. Specifically, the commendation states: "His unique direction, which brought about optimum operation of this [Ocean Simulation] facility, has resulted in accelerated delivery of modern diving equipment such as the Mk 12 and Mk 15 which has greatly enhanced the Navy's conventional and special warfare diving capability."

"His untiring efforts to carry out the duties of his demanding tasks with unfailing good judgement, effectiveness, and total devotion to duty were in keeping with the highest traditions of the United States Naval Service."

CAPT C.M. Jones (left) presents MSM award to CDR Bartholomew.

NEDU RECEIVES MERITORIOUS UNIT COMMENDATION

The Navy Experimental Diving Unit (NEDU), Panama City, Florida, received a Meritorious Unit Commendation from the Secretary of the Navy "for meritorious service in connection with experimental diving in research and development of advanced diving equipment to March 1980." The award was presented by CAPT Colin M. Jones, USN, Director of Ocean Engineering/Supervisor of Salvage, at the NEDU Change of Command ceremony on June 6, 1980.

The commendation cited the successful completion of Deep Dive '79, which went to an unprecedented 1,800 fsw, and the complex manned testing of numerous diving equipment/systems. "These endeavors contributed significantly to the rapid improvement of the U.S. Navy diving capability for all segments of Navy diving." The development of the Mk 12 Surface Supported Diving System was noted in particular as vastly improving the Navy's diving capability in the 0-300-foot water column.

The Unit Commendation also pointed out the wide-ranging benefits of NEDU's programs, stating that their accomplishments "not only benefitted the Navy diving program but also provided heretofore non-existent cost effective methods for U.S. commercial diving companies in pursuit of offshore oil operations."

DIVERS RESCUE TWO FROM ELIZABETH RIVER

Two divers at the Portsmouth Naval Shipyard, Portsmouth, Virginia, rescued two teenagers who had accidently fallen into the Elizabeth River. The divers, James W. Maddox and Casey D. Stone, were traveling by boat to a work site when they heard shouts for help.

One of the youths was able to swim to a life jacket thrown in to him. The other, who had been having problems staying afloat, could not retrieve another life jacket and sank below the surface.

Maddox entered the water and pulled him from the bottom, approximately 15 feet below the surface. The victim's breathing stopped four times enroute back to the boat, at which point Maddox gave him "lung squeezes" to start him breathing again. Once back on board, Maddox administered cardio-pulmonary resuscitation as Stone radioed for an ambulance.

Both Maddox and Casey are Navy-trained deep sea divers. Maddox is also a medical deep sea diving technician, an emergency medical technician, and an instructor in first aid and emergency care.

ROY SEA DEPARTS NAVSEA OOC

Mr. Roy Sea left his position as Head, Operations Engineering Branch in the Naval Sea Systems Command, Code OOC, in June to join a commercial diving firm in Florida.

Mr. Sea joined OOC in August 1969 as an Industrial/Mechanical Engineer with the then newly formed Supervisor of Diving organization. Remaining under SUPDIVE, he then changed to a more specialized position as the Diving and Manned Underwater Systems Engineer. With the Office of the Supervisor of Salvage, Mr. Sea served as Head, Pollution Control Operations Branch before moving to the position he held at his departure.

Mr. Sea's accomplishments at OOC include planning and directing the Navy's first major underwater repair (to the USS ROOSEVELT rudder), playing an instrumental part in establishing and procuring equipment for the Navy's offshore pollution control program, and improving considerably the Navy's capability for recovering objects from ocean depths under high sea state conditions. He was also responsible for engineering improvements to the Mk 1 and SDS-450 deep dive systems.

While working for OOC, he received two superior performance awards and several Letters of Commendation. He is a graduate of the Naval School, Diving and Salvage and the Underwater Swimmers School.

TRANSITIONS

The past few months have been relatively active ones concerning a "changing of the guard" at various commands around the Fleet. *Faceplate* has learned of the following transitions:

CAPT Edward Lyon has relieved CAPT Norman Olson as Commodore, Navy Special Warfare Group TWO at the Naval Amphibious Base, Little Creek, Virginia. CAPT Lyon arrived at Little Creek from duty with Chief of Naval Operations OP 372 G at the Pentagon. CAPT Olson has been assigned to the Rapid Deployment Force, Key West, Florida.

LCDR Tim Brandenburg has relieved LCDR Geoff Cullison as the Officer in Charge of Underwater Construction Team ONE at the Naval Amphibious Base, Little Creek, Virginia. LCDR Cullison has assumed duty as the Resident Officer in Charge of Construction at Keflavik, Iceland.

At the Navy Experimental Diving Unit (NEDU), Panama City, Florida, the following changes have occurred:

LCDR Dennis Baber arrived on June 6, 1980 to relieve LCDR P.T. Smith as the NEDU Special Warfare Projects Officer. LCDR Baber was Executive Officer of Underwater Demolition Team 12 in San Diego, California. LCDR Smith's next tour will be at the Staff Command College, Norfolk, Virginia.

BMCM(MDV) Patrick Behling has relieved MMCM(MDV) Andrew Parfinski as NEDU's Command Master Chief Petty Officer. MMCM (MDV) Parfinski departed NEDU in June for duty at the Ship Repair Facility, Subic Bay, Philippines, as the SRF Master Diver. BMCM(MDV) Behling had served as NEDU's Operations Department Leading Chief since January 1979, when he arrived in Panama City from the Royal Navy Experimental Trials Unit, United Kingdom, after participating in the Personnel Exchange Program.

LT Edwin Pahl, RCN, arrived July 25 to relieve LT Maurice Coulombe, RCN. LT Pahl was with the Canadian Forces Fleet Diving Unit (Pacific), Esquimalt, British Columbia, prior to his assignment to NEDU. LT Coulombe has departed for duty as the Canadian Forces Fleet Diving Unit Atlantic Training Officer.

LCDR Claude Piantadosi left the Navy in June for a fellowship at the Duke University Medical Center, Durham, North Carolina–in the Allergy and Respiratory Disease Division.

CDR John Zumrick, Jr., returned to NEDU effective July 30 as a Medical Research Officer. CDR Zumrick had been on a Fellowship at the University of Florida in Gainesville, Florida.

SUBSCRIPTION REMINDER

This is it. Commencing with this Summer 1980 issue of *Faceplate*, all civilian, ex-military, and commercial firms must pay a subscription fee for the magazine. Those affected include all subscribers with subscription numbers beginning with 5, 8, or 9.

Readers in those areas who want to continue to receive *Faceplate* must fill out the form provided in this issue and return it to the Superintendent of Documents at the address indicated. Subscription forms may also be obtained by contacting the Supervisor of Diving, Naval Sea Systems Command, Washington, D.C., 20362, Attention *FACEPLATE*.

To ensure receipt of the upcoming Fall edition, these cards should be completed and mailed in as soon as possible. Readers who are listed in any of the above categories should not send forms or money to NAVSEA OOC for processing. Subscription prices are $6.50 per year or $2.00 per copy for U.S. subscribers and $8.15 per year or $2.50 per copy for subscribers outside the U.S.

Subscribers in categories other than those listed above will continue to receive *Faceplate* at no charge.

"VIEW FROM OOC" N FROM OOC"

CAPT Colin M. Jones, USN
Director of Ocean Engineering/ Supervisor of Salvage

Several issues ago, I discussed with you my view of the state of our national salvage posture (*Faceplate*, Winter 1979). Since that time, I have had an opportunity to communicate this view to CNM and others and have outlined a proposed program to help us solve some of the fundamental shortcomings.

We have proposed asking the Marine Board of the National Academy of Engineering to review our national salvage posture. I anticipate this project to begin some time this fall, with Professor Jack Flipsey as Chairman of the Review Panel.

We are, at this time, seeing the delivery of the first T-ATF's into the Fleet. These ships were not procured to be salvage vessels—and they are not salvage vessels. They do, however, have a very limited salvage capability when the crew is augmented by a team of trained Navy salvors. These vessels also possess a limited emergency rescue towing capability. However, these ships were purchased primarily as tugs.

We are working on the preliminary design for the ARS-50 class ship and have received a great deal of assistance from a number of you in the Fleet. I want to publicly extend my appreciation to Commodore Campbell, COMSERVRON 5, and to CDR Fred, COMSERVRON 8 Chief of Staff, who have contributed considerable effort in reviewing many of the planning details for this ship. Both of these officers have a great deal of background knowledge in this area, and I appreciate their sharing that with us to help provide the Fleet with a better class of ship.

We are still working in the area of ESSM equipment. Most of the pollution control equipment down in the Gulf of Mexico for the past 6 months has been returned to Stockton and Cheatham, and we are readying some of this equipment for transport to Singapore. It is our intention to keep some of this equipment overseas in case we need it for a major spill in either southeast Asia or the Mediterranean. We are also making plans to move additional salvage equipment to the Singapore base.

As soon as funds are available, we will overhaul any ESSM equipment we have in non-RFI condition. At the same time, we are purchasing new items, including special lighting equipment consisting of towers, lights, and portable generators; hydraulic submersible pumps for unloading POL products; and hydraulic pullers and hydraulic tools. In future years, I hope to purchase additional mobile shop vans, which proved to be extremely useful in the Gulf spill operations. We also will be investigating the purchase of underwater color television systems to document hull cleaning operations. It is my intention not to purchase any more black and white TV systems after the current procurement. Color appears to be worth the additional cost, providing much more valuable and detailed information than black and white.

As I noted in the last issue of *Faceplate*, we are planning to test two hydraulic pullers until either the hydraulic puller or the wire fails. This is to ensure that we know the mode of failure if a hydraulic puller is stressed to the breaking point. We are installing manual hydraulic cutters on the pullers for emergency use.

We have put considerable effort into hull cleaning. For those of you who have not been involved in this area, you may be interested in knowing the significant fuel savings that can accrue from proper hull cleaning maintenance procedures. On a trans-Pacific crossing, the savings in fuel costs more than offset the cost of the hull cleaning itself. However, there have been some problems concerning adequate quality assurance both before and after cleaning. In numerous cases, the paint has not been able to withstand cleaning—something that must be watched carefully. Damage to the anti-corrosive coat of paint on a ship's hull can be an extremely costly blunder—one we cannot afford. Such damage frequently results in the need

“VIEW FRO  FROM OOC”

for extensive clad welding of the hull when the ship is next drydocked. Therefore, it is crucial that for this hull cleaning program to "pay off," we must ensure adequate and correct painting of our ships and, second, must subsequently clean the ships at proper intervals with proper techniques. The necessary information for this is given in the Naval Ships Technical Manual (NSTM), Chapter 081. This Chapter should be carefully studied—using common sense—by all divers.

If hull paint shows blistering, it probably should not be cleaned, since any brushing will undoubtedly remove the blisters and expose bare hull. In fact, whenever and wherever practical, we should avoid using wire brushes in hull cleaning. There are some areas where these brushes are prohibited: specifically, they cannot be used in cleaning fiberglass areas (e.g., fiberglass domes).

Of equal concern is the need for stringent quality assurance to prevent cleaning damage to impressed current cathodic protection systems, rubber sonar domes, and other "delicate" hull appurtenances.

Propellers also deserve special attention and cleaning. Since propeller cleaning results in a far more significant fuel savings than any other similar area, it is naturally cost-effective to clean them much more frequently, especially before hard calcareous growth begins. If they are cleaned that often, it should be possible to clean them with fiber bristle brushes, which precludes any possibility of propeller damage. Fiberglass domes on submarines should not be brushed at all, since this would damage their extremely smooth surfaces. Instead, these domes should be wiped clean using a coarse burlap material.

We need to continue to increase the involvement of Fleet divers in hull cleaning. As we get more equipment approved for service use, Fleet maintenance activities should be encouraged to purchase and use this equipment themselves. I hope that in the not too distant future, we will be able to do a significant portion of hull cleaning operations with our own personnel. As I have said before, *my policy is to use contractor personnel in support of Fleet divers rather than using Fleet divers in support of contractor personnel.* I need everyone's help in making this policy work.

I continue to see portable gasoline-driven air compressors used to supply high pressure air in situations where other systems could be used. I think it is important that each of you understand that the portable gasoline-driven HP air compressors are marginal at best and must be used with a great deal of caution. Certainly, this equipment is not rugged and was not designed—or purchased—to be used as a routine source of HP air, for diving or anything else. They were procured as a light-weight portable source of HP air for those operations where it was not practical to transport larger HP air compressors.

Using one of these air compressors in the Suez Canal clearance (where I had the opportunity to test each tank that I filled for carbon monoxide), convinced me that it is absolutely mandatory that if you fill a tank with one of these compressors, you provide at least 14 feet between the exhaust and the in-take of the compressor. This means that the in-take must be at least 14 feet up-wind from any internal combustion exhaust. If you do not follow this procedure, the likelihood of excessive carbon monoxide is tremendous. You Diving Officers, Master Divers, and other Supervisors must pay attention to this, or someone will get hurt. I might add that while we were in Suez, several cases of carbon monoxide poisoning occurred among the EOD divers. In at least two of these cases, personnel had to be emergency med-evaced—it is not something to take lightly. Wherever a certified shore station HP air system is available for filling SCUBA tanks, it should be used instead of any portable equipment. Small gasoline portable compressors should be an absolute last resort, and it must be recognized that this is exactly why they were purchased.

Until next issue . . .

NEDU Reports

Navy Experimental Diving Unit Report No. 3-79. *Evaluation of Commercially Available Submersible Pressure Gauges.* J.R. Middleton.

Abstract: Fourteen commercially available submersible pressure gauges were evaluated by the Navy Experimental Diving Unit to determine accuracy and watertight integrity. The gauges tested represent a realistic survey of the market. While not every gauge currently sold in the U.S.A. was tested, the results of this test are felt to represent the general state-of-the-art in guage design and manufacturing technique. As a result of unmanned testing, and due to the overall quality of design and construction, it is recommended that submersible pressure gauges be designated as open purchase items on the list of equipment Approved for Navy Use (ANU). It should be emphasized to all divers that submersible pressure gauges should be given the same care as that given other life support equipment. AD No.: A071481.

Navy Experimental Diving Unit Report No. 4-79. *Evaluation of Poseidon Unisuit and O'Neill Supersuit Systems.* J.R. Middleton.

Abstract: The Navy Experimental Diving Unit evaluated the Poseidon Unisuit and the O'Neill Supersuit systems for use with SCUBA, the Mk 15 Mod 0 Underwater Breathing Apparatus (UBA), and the Diver's Mask Mk 1 Mod 0, all in the variable volume mode. As a result of this manned testing, the O'Neill Supersuit has been recommended for inclusion on the list of ANU equipment. The Poseidon Unisuit is already included on that list. In addition, both suits are recommended for use as variable volume dry suits via low pressure inflators powered from the diver's first stage regulator or an independent pony bottle air source. It is further recommended that all diving commands implement comprehensive on-the-job-training programs to ensure that divers are thoroughly familiar with suit characteristics and buoyancy control/blowup prevention techniques. AD No.: A073146.

Navy Experimental Diving Unit Report No. 5-79. *Evaluation of Modified Draeger LAR V Closed-circuit Oxygen Rebreather—Part 1: Unmanned Testing.* J.R. Middleton. *Part II: Manned Testing.* C.A. Piantadosi.

Abstract: The modified Draeger LAR V Closed-circuit Oxygen Rebreather was evaluated by the Navy Experimental Diving Unit to determine its suitability for ANU. Previous evaluation of the German-made SCUBA in its standard configuration found the LAR V technically satisfactory with adequate reliability and maintainability characteristics; however, the clockwise oxygen flow in the breathing loop is the reverse of all U.S. Navy SCUBA equipment. The manufacturer modified 10 units for further NEDU testing. Unmanned CO_2 canister duration tests resulted in canister breakthrough after 48 minutes in cold (39°F [4°C]) water and 3 hours 15 minutes in warm (70°F [21°C]) water. LAR V breathing resistance values at light, moderate, heavy, and extreme diver work rates were acceptable.

In view of the short unmanned canister durations experienced in cold water, a series of 24 manned dives were carried out in the Ocean Simulation Facility (OSF) Wet Chamber at 25 fsw in 70°F (21°C) and 40°F (4°C) water. Canister outlet carbon dioxide levels, breathing resistance, and oxygen consumptions were measured. Mean canister duration was 226 ± 23 minutes and 124 ± 9 minutes in 70°F (21°C) and 40°F (4°C) water, respectively. Breathing resistance was acceptable at all work levels, and no other design limitations were encountered. Differences in unmanned versus manned canister durations in cold water may be partly attributable to slightly higher carbon dioxide injection rates during unmanned testing.

Based upon manned studies at 25 fsw, the LAR V is recommended for ANU status to depths of 25 fsw and time limits specified by Figure 19 or as specified by Table 132 of the U.S. Navy Diving Manual. AD No.: A077451.

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.

In the last few weeks, divers throughout the armed forces have been receiving a hard-bound diving log book, called the Military Diving Log. It does not reference a particular service because it is provided for use by all military divers.

The primary purpose of this log is to establish a satisfactory and permanent personal diving record for all U.S. military divers. And, it in no way replaces or supercedes the 9940/1(s) official diving forms required by the Naval Safety Center.

The diving log has been distributed simply to provide an efficient means for divers to keep an accurate, on-hand record of completed dives. It is hoped that proper use of this log will eliminate the need to "interrogate" divers concerning the number of dives performed in previous duty stations as they transfer to various assignments around the fleet. It is also hoped that widespread use of this booklet will alleviate the demand on the Naval Safety Center diving information bank for this type of information.

As shown in the accompanying illustration, the log provides ample space to record all necessary dive information and any additional remarks desired. It is hard-bound to provide a more permanent format for maintaining an on-going account of diving duty.

The Supervisor of Diving, CDR James Roper, is providing this log as an aid to all divers. The Director of Ocean Engineering/Supervisor of Salvage, CAPT Colin M. Jones, hopes that it will be a beneficial and useful personal record of all dives completed. It must be emphasized again, however, that this log is not a substitute for the Safety Center 9940/1(s) report forms—they still must be completed and submitted as usual.

To reorder or to obtain additional copies of the Military Diving Log, submit your request to: Naval Sea Systems Command, Code OOC, Washington, D.C. 20362.

DIVING LOG

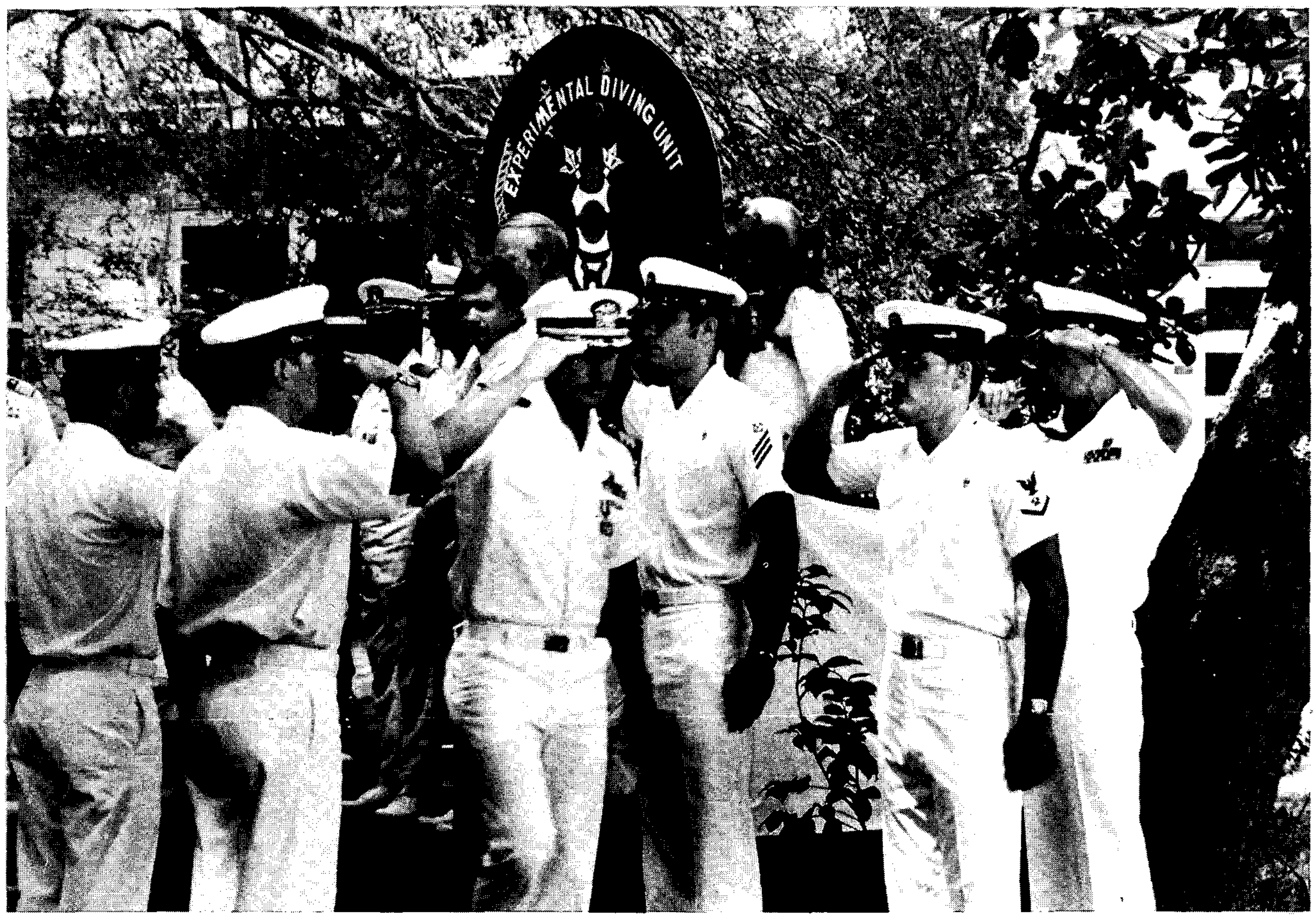
DIVING LOG

DIVING LOG

DIVING LOG

PROVIDED BY SUPDIVE FOR ALL MILITARY DIVERS

DIVE PARTNER/BUDDY	DATE
DIVE SUPERVISOR	DEPTH OF DIVE
DIVING PLATFORM	TOTAL BOTTOM TIME
DIVING EQUIPMENT USED	DECOMPRESSION SCHEDULE USED
BREATHING MEDIUM USED	REPETITIVE DIVE DATA
REMARKS ON DIVE	



CDR C.A. Bartholomew is "piped over the side" following the change of command ceremony in which he was relieved as Commanding Officer by CDR R.A. Bornholdt.

NEDU CHANGE OF COMMAND

CDR Robert A. Bornholdt, USN, relieved CDR Charles A. ("Black Bart") Bartholomew, USN, as Commanding Officer of the Navy Experimental Diving Unit (NEDU) on June 6, 1980. During the ceremony, NEDU was awarded the Meritorious Unit Commendation (MUC) and CDR Bartholomew was presented with a Meritorious Service Medal (MSM).

CDR Bornholdt reports to NEDU from duty as Fleet/Force Diving and Salvage Officer on the Staff of Commander Naval Surface Force, U.S. Pacific Fleet, San Diego, California.

In his remarks, CDR Bornholdt stressed several key points. First—that the United States is the world leader in diving, salvage, and ocean engineering. Second—that the Navy, in general, and the Office of the Director of Ocean Engineering, in particular, should be this country's leading authority on all aspects of these three areas; and, third—that NEDU's mission is to act as technical agent to the Director of Ocean Engineering in all matters involving diving and hyperbaric operations. Continuing, he stated, "I am committed to our mission at NEDU, I am committed to the United States

Navy's leadership role, and I am committed to support our country's lead position in these three vital areas."

Guest speaker at the ceremony was CAPT Colin M. Jones, USN, Director of Ocean Engineering/Supervisor of Salvage, and the first Commanding Officer of NEDU (October 1973 to July 1975). CAPT Jones described NEDU as "a unique command which has a highly technical and specialized mission. ...In many cases, your efforts are not solely for the United States Navy, but for the nation as a whole." CAPT Jones went on to describe various areas of diving technology progress at NEDU under CDR Bartholomew's leadership. These included entering the final stretch in the development of the Mk 12 Surface Supported Diving System, which will result in "the Navy working diver being the best equipped in the world." In addition, the testing/evaluation and on-site improvements made on the Mk 15 Underwater Breathing Apparatus (UBA) "give our special warfare combat swimmers a superiority that is unequalled." CAPT Jones also commented on the saturation excursion tables, which "have greatly increased our deep diving capability and, coupled with the helium-conserving Mk 14 Closed-circuit Saturation System, provide our saturation divers with a capability and safety not envisioned possible only 10 years ago."

"My past assignment as Pacific Fleet Diving and Salvage Officer was fast moving and exciting. But I proudly transfer from the shipwrecks of the Pacific to the realm of diving research and development."—CDR Bornholdt.

"Divers, and those who work to support them, can be rightfully proud—I use that word in the purest sense. Each of you can stand tall in the fact that you are achievers of no small measure."—CAPT Jones.

Considerable progress has also been made in such areas as the Mk 16 UBA for Explosive Ordnance Disposal divers and recompression chamber modifications. For all these achievements, NEDU earned the MUC for the period from March 1978 to March 1980. CAPT Jones made this presentation in conjunction with the MSM awarded to CDR Bartholomew for his "outstanding meritorious service" as the Commanding Officer of NEDU from March 7, 1977 to June 6, 1980. (See Soundings, page 4.)

In his parting remarks, CDR Bartholomew reflected on his duty at NEDU, emphasizing—"as proud as I am of the accomplishments of this Command, I am even prouder of the individual officers, civilians, and crew of NEDU." He had additional praise for the Navy diving community: "In this era of battle groups, strategic missile submarines, and cruise missiles, an unfortunate tendency has been to take for granted our divers. But I have never found Naval men like these at a loss. Ask them to do anything that is not virtually impossible and, depend on it, it will be done."

CDR Bartholomew leaves NEDU for duty on the Staff of the Commander-in-Chief Pacific Fleet, Pearl Harbor, Hawaii.

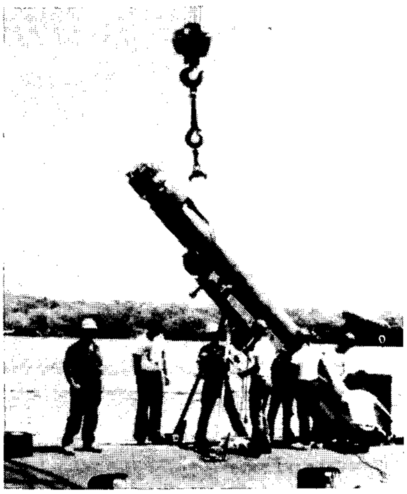
CDR R.A. Bornholt, USN

CDR Robert Alan Bornholdt, a native of Long Island, New York, began his Naval career aboard the USS LORAIN COUNTY (LST 1177) in October 1961, after graduation from the United States Merchant Marine Academy at Kings Point, New York. He was subsequently assigned as Executive Officer of the USS UMPQUA (ATA-209). He then was a student at the Deep Sea Diver's School, Washington, D.C., and Executive Officer on the USS DELIVER (ARS-23). He returned ashore to serve on the SEALAB III Project and at the Naval Ship Repair Facility, Guam.

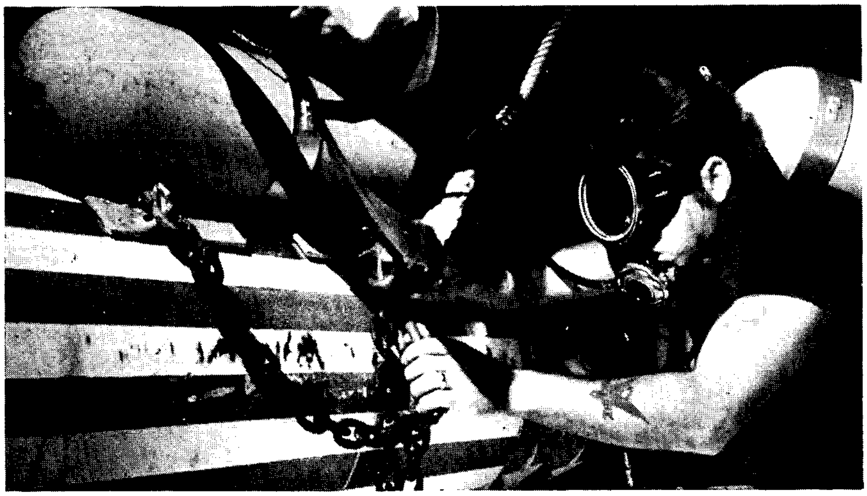
Commander Bornholdt graduated from the Navy Postgraduate School at Monterey, California, with a Master of Science degree in Mechanical Engineering. He subsequently served as the "Knox" Class (FF-1052) Frigate Program Manager and the Diving and Salvage Officer at the Pearl Harbor Naval Shipyard.

CDR Bornholdt's awards include the National Defense Medal, Navy Expeditionary Medal, the Republic of Vietnam Service Medal, and the Humanitarian Service Medal.

"This depth of talent and can-do spirit is synonymous with being a Navy diver. I know of no other segment of the Navy whose enduring consciousness and devoted professionalism are so little known and appreciated."—CDR Bartholomew.



"Loading out" a submarine with a torpedo.



An EOD diver adds the final touches to attaching the Mk 2 Mod 1 flotation bladder to an underwater mine during EOD School training.

1140: A "SPECIAL" OPERATIONS COMMUNITY

LCDR W.B. Bacon, USN
Special Operations Assignment

The establishment of the Special Operations Community–the newest warfare community--has created a new career pattern of opportunity for unrestricted line officers. This new specialty was approved by the Secretary of the Navy in July 1978 in recognition of the need for a sustained, cost effective, progressive, and ready capability in three functional areas: explosive ordnance disposal (EOD), diving and salvage, and expendable ordnance management (EOM).

The Special Operations Community offers a rare challenge to the Naval officer seeking to specialize in a hazardous environment while growing competitively with surface line counterparts. All aspects of career progression--from initial training to command--are included in the organization of the Special Operations Community.

The Special Operations Community (designator 114X/training designator 119X) was founded on a base of approximately 335 billets in EOD, EOM, and diving/salvage. Billets are included aboard salvage and rescue vessels such as ASR's and ATS's, aboard ordnance-related ships such as AE and AOE's, and at Harbor Clearance Units, Naval Magazines, Weapon Stations, EOD Groups, and the Navy Experimental Diving Unit.

The functions of the Special Operations Community require a common understanding of explosives (firing, fusing, storage, and preparation for a delivery platform) and diving (air SCUBA, surface-supplied, and saturation). In fact, explosives and diving provide the common base that assures the compatibility of the three functional areas. With this level of expertise, the community has been tasked with responsibility for Single Service Management of EOD technology and training, salvage and diving, and many aspects of renovating, producing, and logistically supporting nuclear and conventional weapons.

Because of the nature of this community, professional development requires intensive screening and a demanding training program. There are two phases to this program--core and billet specialty training. Newly accessed officers are given the training designator 119X. To obtain the 114X designation, the following prerequisites must be met: complete billet specialty training, qualify as an OOD(U), serve 1 year in an 114X operational billet, and be recommended by the Commanding Officer (of that billet).

Basic core training, 37 weeks in length, consists of three segments: 19 weeks of Surface Warfare Officer's School (SWOS), 13 weeks of basic diving training, and 5 weeks of munitions fundamentals. These last two phases are conducted at the new Navy Diving and Salvage Training Center (NDSTC) in Panama City, Florida. SWOS training can be obtained in either Newport, Rhode Island, or Coronado, California.

After core training, all new accessions report to an EOM billet aboard such ships as AE's and AOE's. In the EOM field, the 1140 officer gains expertise in the management, storage, and handling of both conventional and nuclear weaponry. This includes ordnance safety as well as procurement and logistics. Accessions from other communities may enter EOD or diving and salvage for their first tour. An officer is expected to qualify for the 114X designation during this period.

The second functional tour (preceded by billet specialty training) is in either explosive ordnance disposal or diving and salvage. Specialized EOD training consists of 26 weeks at the basic EOD School in Indian Head, Maryland. An EOD School graduate serves as an EOD team leader and deploys aboard various Fleet units with an EOD team during this tour.

Those officers who participate in diving and salvage billet specialty training complete an additional 5 to 13 weeks of salvage training at NDSTC, which leads to qualification as a Ship Salvage or Deep Sea HeO_2 Diving Officer. Personnel in this group serve a tour as a division officer aboard a diving and/or salvage ship such as an ATF, ATS, ARS, or an ASR.

Subsequent tours are spent in the various functional areas, alternating between shore and sea duty in a pattern similar to the rest of the surface line.

The scope of assignments in which an 114X officer can become involved is almost limitless. In the EOM arena, for example, a Special Weapons Officer can expect duties ranging from ordnance assembly to supervising the torpedo load-out of a submarine.

In diving and salvage, activities can vary dramatically according to current events. In the last year, 1140 Diving and Salvage Officers have been instrumental in several major salvage operations, including ex-USS OZARK, bulk carrier ANANGEL LIBERTY, and the USCG 391 Buoy Tender BLACKTHORN.

Both the OZARK and the ANANGEL LIBERTY operations were classic strandings. OZARK, an Air Force target ship of 6,000 tons, grounded off the Gulf coast of Florida during Hurricane Frederick (see *Faceplate*, Spring 1980). Service Squadron EIGHT, tasked with the retraction, deployed a salvage force that included EDENTON (ATS-1), RECOVERY (ARS-43), SHAKORI (ATF-162), PAIUTE (ATF-159), and a detachment from Harbor Clearance Unit Two.

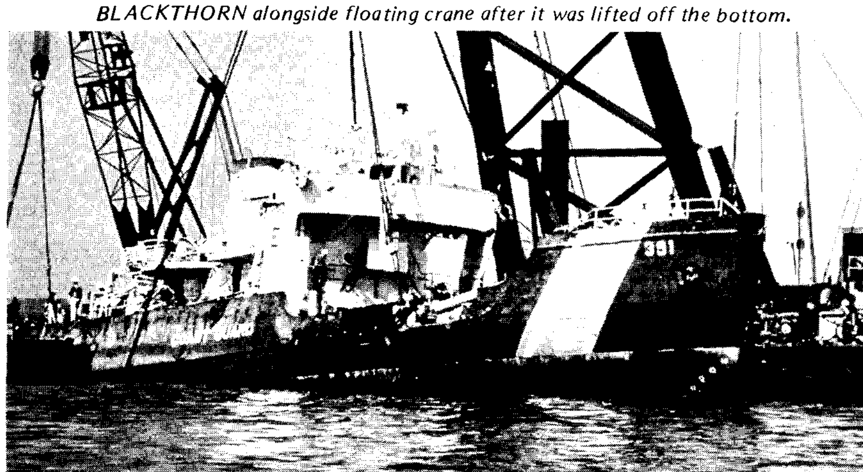
ANANGEL LIBERTY, a Greek freighter, went 75 percent hard aground on French Frigate Shoals while carrying more than 19,000 tons of clay and 500 tons of the ship's own fuel. An initial concern was the possibility that the ship might break up and contaminate the surrounding waters, which included a wildlife refuge. This was a situation in which crucial decisions had to be made quickly to prevent losing the ship and its cargo. RECLAIMER (ARS-42), with a detachment from Harbor Clearance Unit One aboard, was joined by BEAUFORT (ATS-2) in the successful completion of this operation. (See page 22.)

The BLACKTHORN operation involved extreme legal and public interest--spurred by potential legal suits, the tragic loss of life, and the commercial impact of closing one of the Gulf coast's largest ports (see *Faceplate*, Spring 1980). Included in the salvage force that completed this task successfully were PRESERVER (ARS-8), personnel from Harbor Clearance Unit Two, and divers from Explosive Ordnance Disposal Group Two (Det. Ft. Lauderdale).

In the EOD arena, where a motto warns that "there are but two degrees of effectiveness--success and failure," the 114X officer also gets plenty of action. For example, an EOD detachment consisting of one 114X Special Operations Officer and three EOD-qualified enlisted personnel participated in a joint service effort at Eniwetok Atoll, a circular cluster of 40 islands where the United States conducted 43 nuclear tests over a 10-year period (see *Faceplate*, Spring 1980). The detachment, assigned to the project on a 4-month rotation basis, was highly trained in rendering safe all explosives (foreign and domestic) and in underwater demolition procedures. This operation was completed after 28 months of challenging and demanding work.

An officer seeking a challenge will find a rewarding experience in the Special Operations Officer Community. An old calling with a new and improved visibility, this warfare specialty offers a definitive career pattern, improved utilization of expertise and experience, career growth to senior positions of management, and satisfaction in the performance of a necessary and often hazardous business.

BLACKTHORN alongside floating crane after it was lifted off the bottom.



UPDATE: WARMER SUITS FOR COLD WATER DIVING

Maxwell W. Lippitt, Jr.
Naval Coastal Systems Center

HT2(DV) (PJ) Stephen Morris prepares for open water test of PDTP.

Inadequate cold water protection can severely limit the abilities of the U.S. Navy diver. This is a problem that becomes more critical as new life support systems become available that allow dive duration times of more than 6 hours. The Diver Thermal Protection Project (DTP), currently underway at the Naval Coastal Systems Center in Panama City, Florida, addresses this concern.

The DTP Project focuses on developing equipment to permit divers to operate effectively in the coldest water for as long as necessary. The project started with an analysis of U.S. Navy diving modes and an evaluation of commercial state-of-the-art equipment. This included garment insulation resistance measurements, range-of-motion, and extensive dive evaluations to identify factors most important to the diver.

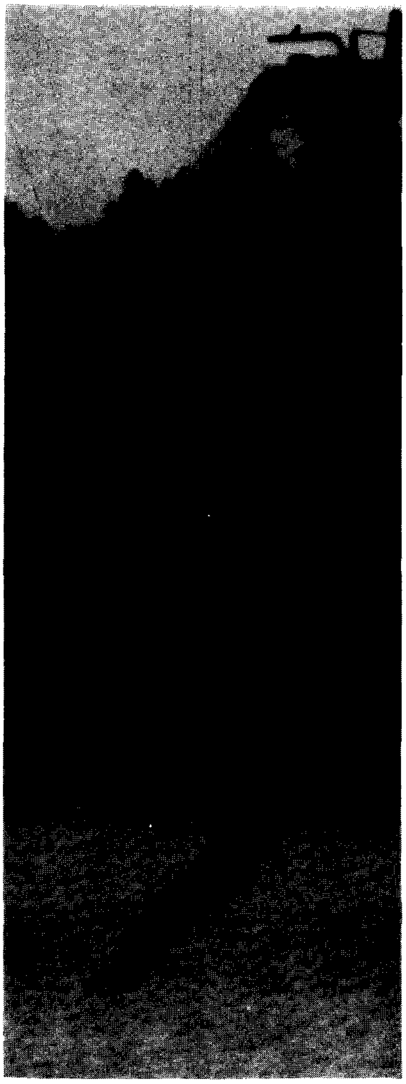
Concurrently, a BUMED panel set criteria defining the heat-loss a diver could have and still function effectively. Values were also determined for minimum skin temperatures, allowable degrees of shivering, and criteria for breathing gas temperatures in helium operations.

This information, with test data and information from other investigators, resulted in the formulation of a simple, predictive, mathematical model for the diver in cold water. This model, refined as additional data is derived, is the design basis for the systems now being developed. Two systems are involved—the Passive DTP (PDTP) and the Active DTP (ADTP). The PDTP is in the final development stage. The ADTP components and subsystems are being designed (and will be discussed in a future article).

The two systems differ in that the PDTP has no additional heat source. The ADTP will supply warm water from a heater to a heat transfer garment worn under the PDTP to allow the diver to operate during long, cold dives while breathing a helium gas mixture. The PDTP will be usable for almost all air mode diving except for long, low activity missions in water colder than 4.5°C (40°F).

The PDTP – What It Is and How It Works:

The PDTP is an insulating garment system based on the variable volume dry suit. It allows comfort, mobility, ease of swimming, and reasonable buoyancy. The outer garment contains inlet and exhaust valves for suit inflation level control. Thermal insulation is provided by the diver donning insulating underwear that is worn over a cotton "long john" comfort layer and wool socks. A moderate stretch capability of materials used in the PDTP was needed to permit better fit and comfort over the wide range of diver sizes. The suits will be furnished in four standard sizes.



BM1(DV) (PJ) Bruce McCormack tests PDTP during helicopter drop evaluations.

The outer garment has been fabricated from material composed of neoprene foam that has been irreversibly crushed. This eliminates closed cells, avoiding the loss of more than half of the thermal resistance that occurs at 100 fsw when closed cell neoprene foam is used. The crushed foam is laminated between layers of nylon knit fabric; testing indicates that the material is superior in stretch modules, abrasion resistance, and tear resistance when compared to other materials tested.

Diver evaluators report that crushed foam suits are more comfortable than other types and permit greater range of motion than suits constructed from coated fabrics.

An important factor in developing the PDTP underwear involved the compressibility of the insulation. An immersed diver in a dry diving suit maintains internal suit pressure at a value approximately equal to that of the ambient water at the shoulder. If the diver is in a vertical attitude, then a hydrostatic pressure of approximately 4 fsw exists at foot level and acts to compress the insulation in that area with a force of 2 psi. The commercial diving underwear materials compress to approximately one-fourth of their original thickness at this pressure, experiencing a corresponding major degradation in insulating value.

Tests of various materials showed that the best substance to use to maintain insulation features was a polypropylene fibrous batt material. This substance does not absorb water as other materials do because of the hydrophobic nature of the polypropylene and retains its insulation value even after long immersion periods. Because a diver often is overheated and perspiring before entering the water, the underwear is lined with a neoprene-coated nylon cloth that is impermeable to liquids and vapors to avoid transferring a significant amount of body heat to the environment.

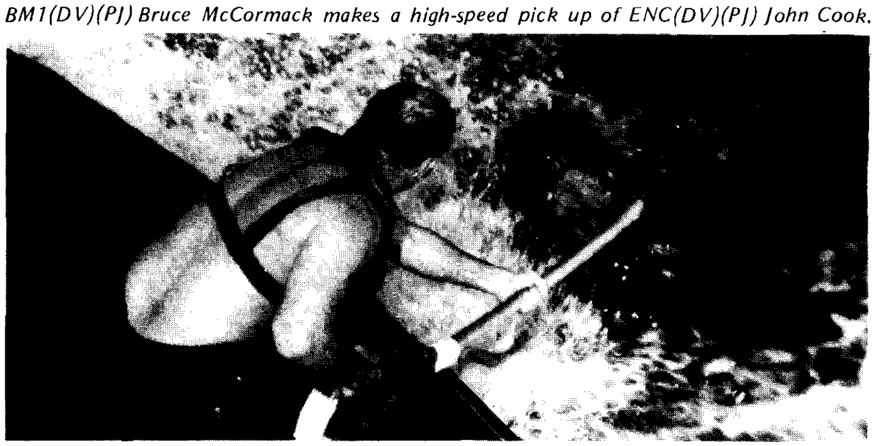
The PDTP design required the creation of a weight distribution system because a significant amount of buoyancy is unavoidable if the necessary amount of thermal resistance is provided. The weight distribution design requires a 16- to 20-pound standard weight belt along with a special 3-pound weight on each ankle.

The PDTP glove is a dry glove worn over an insulating liner. It is an underwater version of a glove fabricated by the Navy Clothing and Textile Research Facility for extreme cold weather use in an air environment. This glove provides good thermal protection while allowing surprisingly good dexterity.

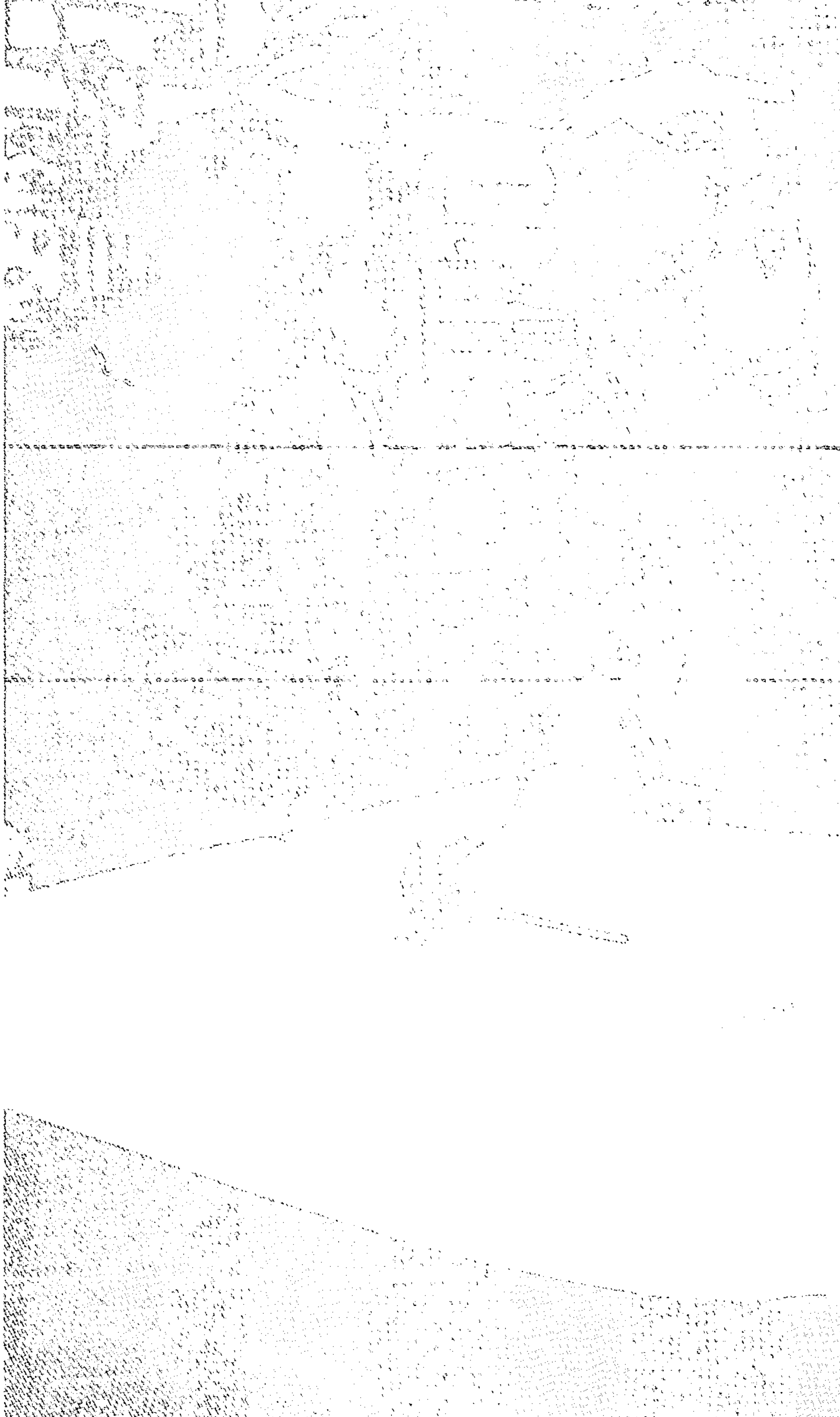
Completion of testing and evaluation of the PDTP is expected by October 1980. Tests are being performed to assess technical performance—including measurements of thermal performance, range-of-motion, time required to don and doff the system, magnetic influence, and compatibility with the various types of breathing apparatus in current use. Other diver evaluations are also being performed in activities similar to combat situations. These include long distance swims on the surface and submerged, parachute jumping while wearing the PDTP, climbing ladders, entering hatches, pick up from the water by a high speed boat, and extended duration missions in small submersibles. These tests, currently in progress, must be completed successfully before the PDTP can be designated as Approved for Service Use.

(An article on the Active DPT system will appear in a future *Faceplate*.)

BM1(DV)(PJ) Bruce McCormack makes a high-speed pick up of ENC(DV)(PJ) John Cook.



U/W ERT 107 PROVIDES "ON-CALL" EXPERTISE



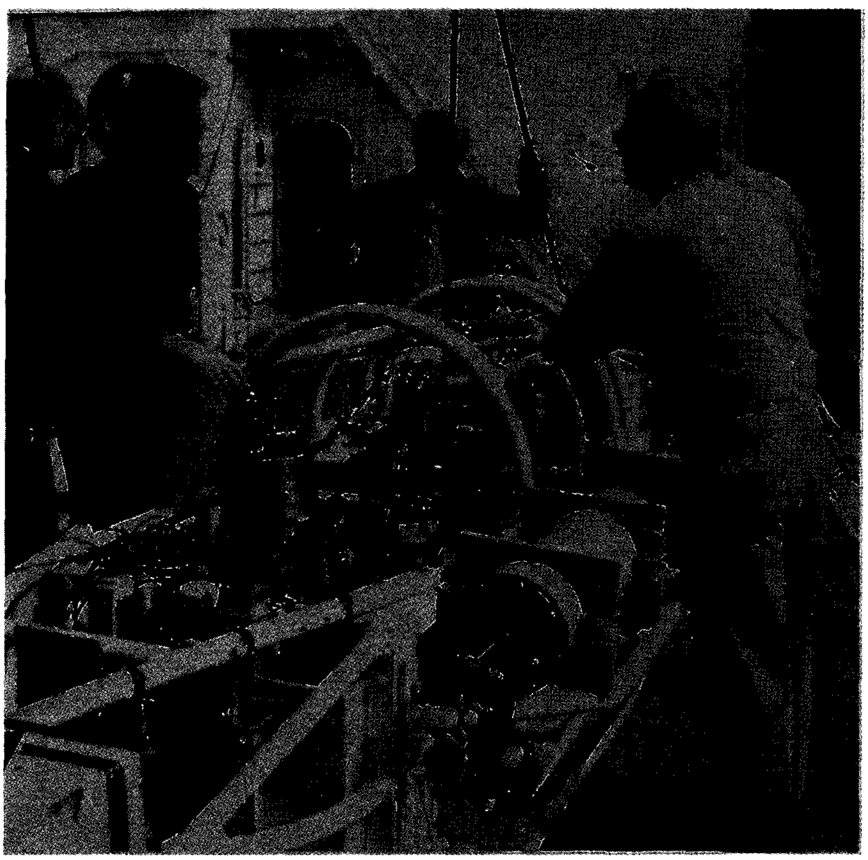
Underwater Emergency Response Team (U/W ERT) 107 has a unique role in the Research Reserve Program in deep ocean search and inspection. The mission of this reserve unit, formed in March 1977, is to provide a wartime/contingency team to assist local commanders and salvage (or other) forces in underwater search, inspection, and recovery operations by preparation to identify and recommend immediately Office of Naval Research (ONR) assets—contractor and laboratory—for that purpose. This includes arranging the transport of these assets and providing technical consultation and coordination of ONR assets on scene.

U/W ERT 107 is based in Raleigh, North Carolina. Under Commanding Officer CDR Tony Clark, the unit provides a wide-ranging, on-call expertise. Two are trained oceanographers. One is an experienced diver (Naval School, Diving and Salvage graduate) who has experience in diving medicine and in associated engineering systems. A corpsman is skilled in the problems and dangers of shipboard and underwater operations, and a storekeeper has training in diving and salvage logistics. Other members have extensive experience in ship handling, navigation, positioning, computer operations, and the various sciences in underwater operations.

To establish an on-call readiness posture, U/W ERT 107 has carried out three general tasks in its first 3 years. It acquainted itself with all actual underwater search and inspection events that have occurred in recent years. It established liaison with all U.S. Navy and civilian contractors who have an active interest in deep ocean search, inspection, and recovery. And, it developed technical expertise in the associated deep ocean search and inspection platforms (such as the Deep Ocean Search System—DOSS), navigation systems, and operational deployment procedures.

Members of the unit have taken part in underway exercises with the search and inspection group of the Ocean Technology Division at the Naval Research Laboratory in Washington, DC, which designed and operates the DOSS used to locate the Navy submarines USS THRESHER and SCORPION. Four team members spent their active duty training in the fall of 1978 aboard USNS HAYES (T-AGOR 16) on a search operation in the north Atlantic. This exercise involved a substantial amount of testing and evaluation of the DOSS-PLUS and DOSS-II vehicles in various experimental configurations. U/W ERT 107 personnel worked alongside NRL scientists in photography, navigation, sled handling, re-socketing, positioning, and statistical analysis.

Individual or unit active duty training is normally 2 weeks per year, though members are usually willing to supplement this with additional service time.

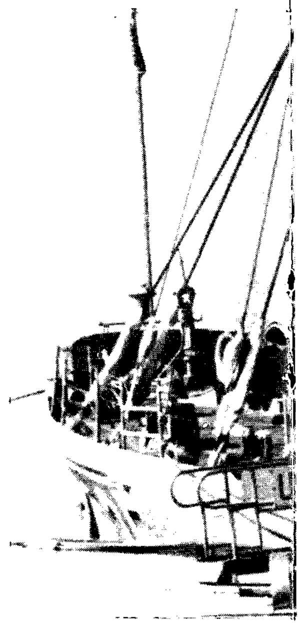


LCDR Bill Harmon (seated), CDR Tony Clark (center), and CDR Dave Godschalk try out the hyperbaric chamber control console at the Duke University Medical Center.

Left: LCDR Bill Harmon (right) and HM2 John Prevette plot a search course aboard USNS HAYES (see also inside front cover). Above: Two members of the NRL DOSS Team (left), Petty Officer Prevette (center), and CAPT Ed Hammond make final inspection of DOSS before lowering it over the side of USNS HAYES.

The Research Program of the Naval Reserve was established to provide a manpower resource that is trained and ready to augment Office of Naval Research activities and to carry out certain designated ONR functions in the event of war, national emergency, or when required otherwise. Included as categories of ONR emergency response teams are undersea search and recovery, radiological, chemical warfare defense, and biomedical units.

U/W ERT 107, out of a total of seven teams, is the only unit concerned with undersea search and recovery. There are two radiological emergency teams, two chemical warfare defense teams, and two biomedical defense emergency teams. NRL supports all but the biomedical units, which are under control of the Naval Biosciences Laboratory.



SRF Divers-

CDR Kurt A. Gustafson, USN
SRF Yokosuka

Japan has always, through necessity, been heavily dependent on its water resources. One familiar scene associated with these water resources is the female divers of Shima Peninsula who dive, without the assistance of diving equipment, to recover the famous Mikimoto pearls. The practice of the women going down to near unbelievable depths repeatedly to collect the shells in their cane baskets is, however, declining.

Another form of diving in Japan is not in danger of declining. In fact, the diving team at SRF Yokosuka is an integral part of the Ship Repair Facility and is becoming more active, exemplifying the SRF motto: "Nan Demo Dekimasu" ("we can do anything").

The diving locker at Yokosuka is unique in its personnel make up. When one hears over the diving circuits "II DESKA," it does not mean the circuits are garbled. It's only the term "are you okay?" passed down by one of the seven Japanese divers who, along with five U.S. Navy divers, make up a "can do" team. The following personnel have taken part in the busy activities at SRF Yokosuka:

USN

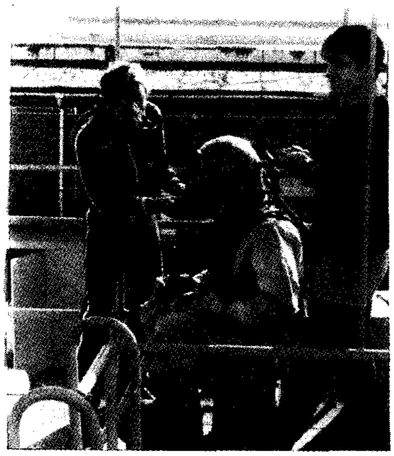
MMCS(DV) Charles Fulkerson
BM1(DV) Duane Wallace
BM1(DV) Don Tonkin
MR2(DV) Kracht
(now transferred)
ENFN(DV) Dan Bramblett

MLC

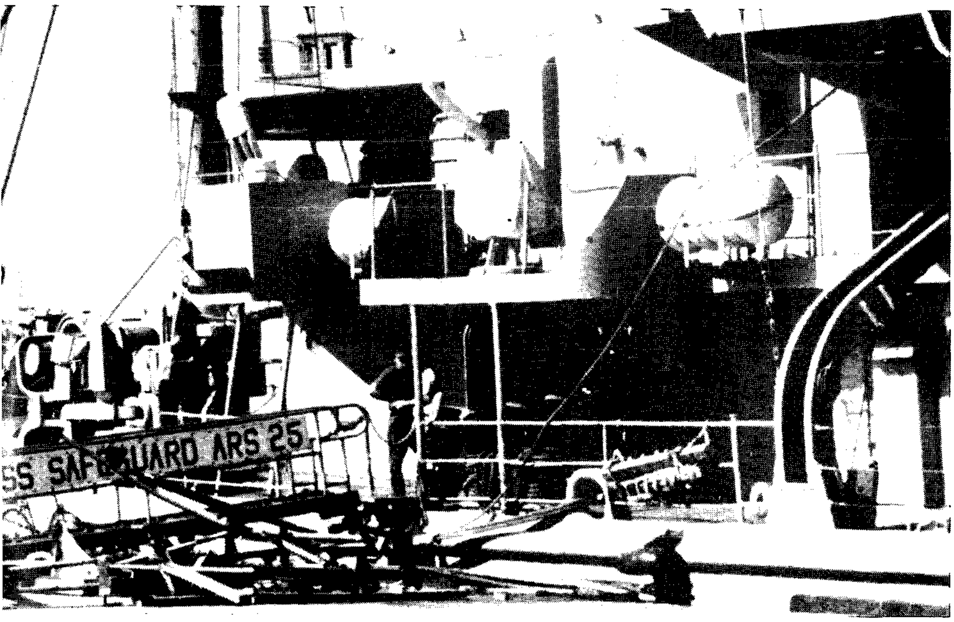
Katsuji, Shirai	L/Diver
Yoshio, Takahashi	Diver
Saburo, Takahashi	Diver
Koji, Hiramura	Diver
Toshiyuki, Ando	Diver
Seiichi, Hirabayashi	Eng
Teruo, Nagumo	Eng
Yukio, Higashitani	Deck Hand

Two recent arrivals who have been added to the team are MRCM(DV) Marvin Markham and EN2(DV) Ostrowski. Although assigned to the Yokosuka Naval Hospital, HM2(DV) Carr also frequently works with the SRF divers.

SRF Yokosuka's diving platforms include two diving boats. One is an LCM-6 (closed over), recently modified and with a fully certified diving system. The boat has six surface supplied diving stations for Mk 1 or Mk V diving; a 200-psi, 250 cfm air compressor for primary air; two 8-cu ft air flasks for secondary air; and a 12-kw, 110-v



Top photo shows ENFN1 (DV) Bramblett (left) and BM1 (DV) Tonkin at work. Middle: EOD divers DP2 (DV) Kane (left) and MN2 (DV) Thurman prepare EOD candidate SM3 Hightower for indoctrination dive. Bottom: Divers assist Korean Navy in salvage training.



yokosuka style

60-cy AC generator. The second boat is an LCM-8 (closed over), presently being modified for certification. It has six surface supplied diving stations, two LP air compressors; 25-kw, 440-cycle generator; and a 400-amp DC welder.

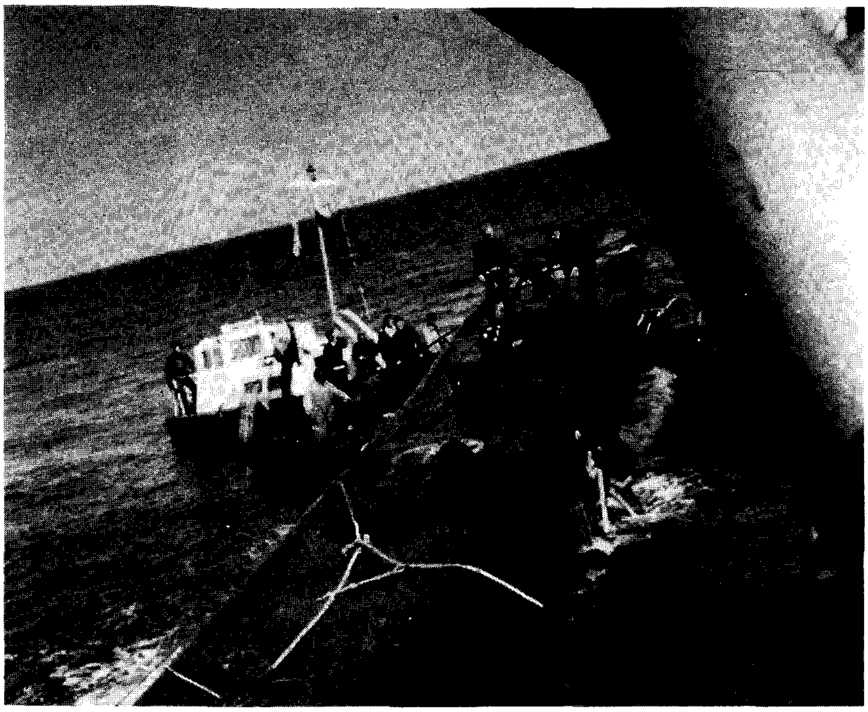
The diving locker features many recent modern additions, including a fully certified chamber. An open diving tank has been added to practice new techniques and to conduct indoctrination dives. One aspect that continually helps the divers is the support provided by the SRF shops, which supply whatever is needed by the diving locker to get jobs done with greater ease and success.

Top photo shows visiting USS SAFEGUARD (ARS–25). Middle: ENFN1 (DV) Bramblett works in machine shop. Bottom: MMCS (DV) Fulkerson (left) and MR2 (DV) Kracht (middle) assist submarine in Chinhae, Korea.

Missions of the SRF Yokosuka diving team in recent years have taken them many interesting places in the Orient, including Hong Kong. There are monthly trips by members of the diving team to Korea to complete security swims and to assist in salvage training with the Korean Navy. There are also, of course, the many requirements at home in support of extensive repair work on ships in short availabilities. Tasks locally include maintenance of the IMODCO deep draft fuel buoy, support of a very active hull cleaning program, and underwater prop changes. Recently, during a low workload period, the diving team also gained some salvage experience by raising a sunken barge that had blocked a pier at Yokosuka Naval Base for several years. This provided some real challenges for the diving locker personnel.

When divers arrive at the locker, they are required to "learn the ropes" fast. It is the perfect locker for a young diver, who must quickly master running the recompression chamber, installing cofferdams, doing a variety of machine work, and operating the diving boats and all diving locker machinery. An SRF Yokosuka diver is required to take on responsibilities quickly. As the workload increases with hull and Prairie Masker cleaning work, the locker has few "slack" periods, and everyone must obtain proficiency in all aspects of the diving locker.

Despite the heavy workload, the locker is always willing to assist other activities in any underwater tasks. MMCS(DV) Fulkerson offers the services of SRF Yokosuka to all diving facilities in the Navy for any underwater projects. The diving team at SRF Yokosuka thrives on helping others—regardless of the request.



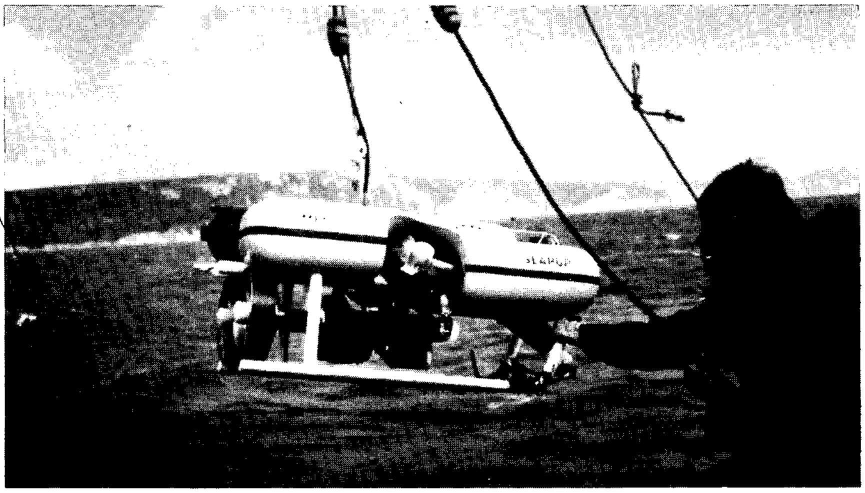
CASINO ROYALE

The Royal Navy conducted a submarine salvage exercise—called "Casino Royale"—in June 1980 off the southern coast of England. Representatives from NAVSEA OOC, led by CAPT Colin M. Jones, USN, Director of Ocean Engineering/Supervisor of Salvage, attended the final stages of the exercise to review various RN salvage assets and recovery methods.

Two submarine salvage training operations have been carried out by the Royal Navy since World War II, to update techniques, train personnel, and revise contingency plans. A number of significant developments that have occurred since the last exercise set the stage for the June 1980 operation. First, there has been an increase in the number of SSBN and SSN vessels in service and a corresponding reevaluation of existing salvage contingency plans. Also, there have been significant developments in the commercial field in connection with offshore activities, thus improving techniques and making more sophisticated equipment available.

Casino Royale had four primary objectives. The first was to prove that contingency plans adequately meet the requirements of submarine salvage today; a second objective was to prove the effectiveness of equipment constructed, purchased, or hired to meet those requirements. Another goal was to train Ministry of Defense (Navy) [MOD(N)] personnel in associated salvage techniques; and, in addition, to provide an opportunity for other MOD(N) authorities to use special facilities related to submarine rescue/salvage. Testing the viability of commercial resourses was also an objective of the exercise.

A Royal Navy Porpoise Class submarine—the NARWHAL, which was awaiting disposal—was used as the "casualty" vessel. Normally a 1,700-ton displacement submarine, NARWHAL—at the time of the exercise—displaced 1,350 tons after a significant amount of internal



Page 20, top: NARWHAL on the surface; bottom: HEBE III's lifting hooks. Above, left: SEA PUP goes over the side; right: diver gets a final checkout before dive.

machinery had been removed. Part of the exercise included partial dewatering of the bottomed submarine to ensure that it was within the lift capability of a single heavy lift gantry vessel (HLGV). To facilitate this dewatering effort, special high and low salvage fittings were installed. The final lifting weight was in the vicinity of 700 tons. Other modifications included painting a number of special markings on the hull to facilitate placement of lift wires.

NARWHAL was sunk in 22 meters (approximately 72 fsw) of water in Weymouth Bay, where shore support from the Portland Naval Base was readily available. After a number of salvage companies were contacted, the Neptun Salvage Company of Sweden was awarded a contract for the use of their heavy lift gantry vessel, HEBE III. HEBE III's purchase lift capability of up to 1,600 tons was more than sufficient for the planned lifting weight of NARWHAL after the various lightening procedures had been accomplished.

Overall, the salvage exercise was conducted successfully. The only significant difficulty experienced was in passing the lift wires underneath the submarine. After initial information that the wires could be placed 20 meters (approximately 66 feet) apart on NARWHAL, the spacing was changed to 15 meters (approximately 49.5 feet) because of spacing constraints on HEBE III. This created several problems concerning longitudinal stability. In addition, wire placement did not then match the areas of the hull that had been strengthened for lifting. However, these were not unusual or insurmountable problems, and just one day was added to the total operational schedule.

From a U.S. Navy standpoint, one of the most significant lessons learned from Casino Royale was the apparent unsuitability of a one-atmosphere diving suit (such as JIM) for effective work on a salvage operation of this type. Because of the limited movement of the arms and legs (especially detrimental when tasked to maneuver through any sizeable amount of mud and debris) and the awkwardness of the suit, it was not able to accomplish any of the salvage tasks that had been planned for it. (Some of the capabilities of JIM are discussed on pages 32–34.)

A one-atmosphere observation chamber—a new vehicle recently delivered to the Royal Navy—was very useful in this exercise. In fact, it proved to be of more value as an observation platform than the one-atmosphere suit because it was easier to handle. This is a one-man chamber that enables non-diving technical personnel to survey a bottomed submarine at depths to 1,500 feet at atmospheric pressure. It can also be equipped with one or two manipulators, if desired, increasing its capabilities.

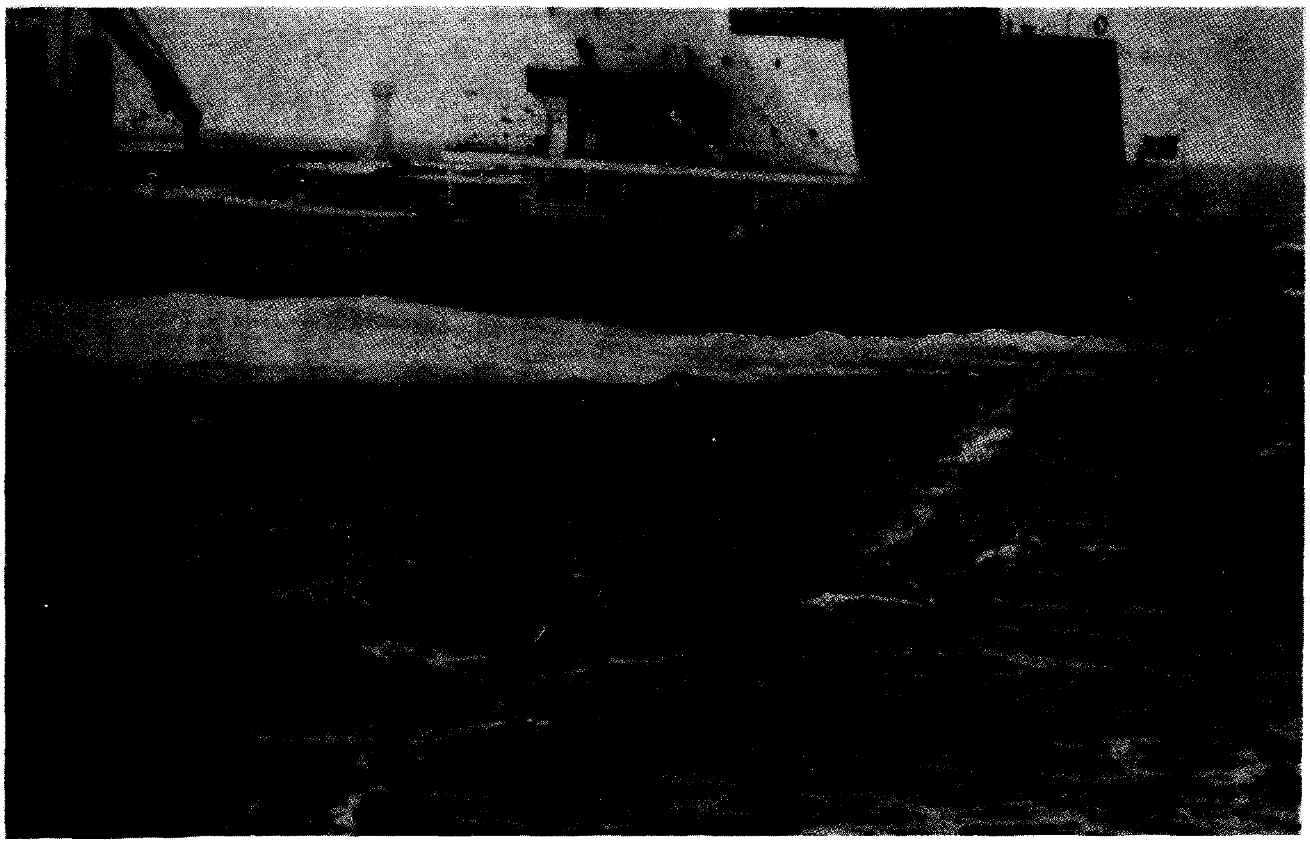
Another impressive asset used was a small remote-controlled tethered vehicle called Sea-Pup, which utilizes a closed circuit television camera for underwater observation. The one used in Casino Royale was not equipped with a navigation system and, as a consequence, its usefulness was somewhat reduced. However, Sea-Pup can be outfitted with a sea floor transponder navigation system that is not complex. This vehicle, which weighs approximately 150 pounds, allows a topside operator to drive it back to a given location or to conduct searches, etc., "knowing" where it has been. It is a very useful tool that complements more complicated search vehicles. Sea-Pup's depth capability is 1,500 feet; it can travel at speeds of up to 2.8 knots.

Casino Royale proved to be very beneficial as a learning and training exercise for the Royal Navy; it met its objectives. It was also an opportunity for U.S. Navy personnel to review RN salvage assets and techniques and to participate in a valuable exchange of information and theories.

SALVAGE OF THE M/V ANANGEL LIBERTY

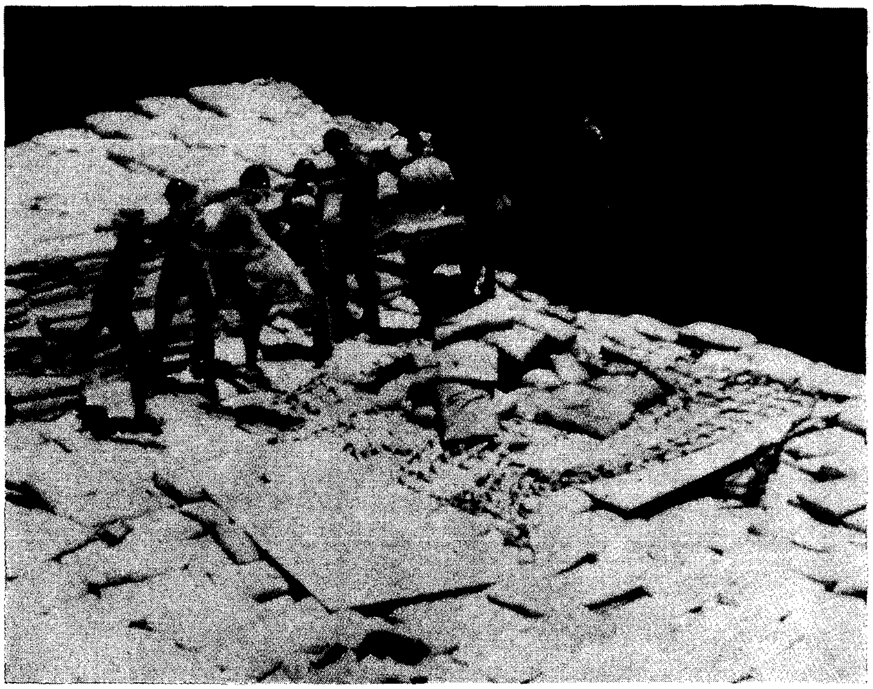
Early on the morning of April 27, 1980, the 23,000-long-ton M/V ANANGEL LIBERTY ran aground on French Frigate Shoals while enroute from Panama to Japan. The shoals are approximately 500 miles north of Honolulu, Hawaii, and are a designated U.S. Wild Life Sanctuary. The initial concern was a possibility of the merchant vessel breaking up and contaminating the surrounding waters with her cargo and fuel. The area's wildlife environment includes the breeding grounds of the Monk Seal, an endangered species. Thus, there was a high level of interest and concern regarding the stranded vessel.

The civilian tug MANA was dispatched immediately to the scene by the owner of ANANGEL LIBERTY. On April 30, LT Ken Harvey, Harbor Clearance Unit One (HCU-1) Salvage Officer, boarded a Coast Guard C-130 fo fly over the stranded vessel to obtain an estimate of the situation and to formulate an initial salvage plan. USCGC MALLOW (WLB 396)



was dispatched to the area to render assistance. The U.S. Coast Guard, acting under the authority of the Federal Water Pollution Control Act, Section 311D, assumed control of the stranded vessel and responsibility for its removal from French Frigate Shoals on May 1. Through the Commandant of the Coast Guard, they requested assistance from the Chief of Naval Operations. Later that day, U.S. Navy Salvage Forces in Pearl Harbor—under the command of CDR Archibald Campbell, Commander Service Squadron FIVE—were tasked to assist in the operation by Commander THIRD Fleet.

The successful refloating of the vessel would test the salvors' innovativeness in pitting their expertise and hard work against the laws of nature. On the evening of May 1, 1980, LCDR Bruce C. Banks, Commanding Officer of USS RECLAIMER (ARS-42), was designated On-Scene Commander for Salvage Operations. RECLAIMER, augmented by six Harbor Clearance Unit divers under the direction of LT Ken Harvey, got under way from Pearl Harbor for French Frigate Shoals. CDR Bob Bornholdt, at that time the COMNAVSURFPAC Diving/Salvage Officer, flew to the Loran Station at French Frigate Shoals and boarded the grounded vessel to serve as Salvage Officer. Upon arrival, a complete survey of the vessel by HCU-1 personnel indicated that M/V ANANGEL LIBERTY was approximately 2,100 long tons aground. (LT Harvey coordinated the HCU-1 detachment efforts on board the stranded ship.)



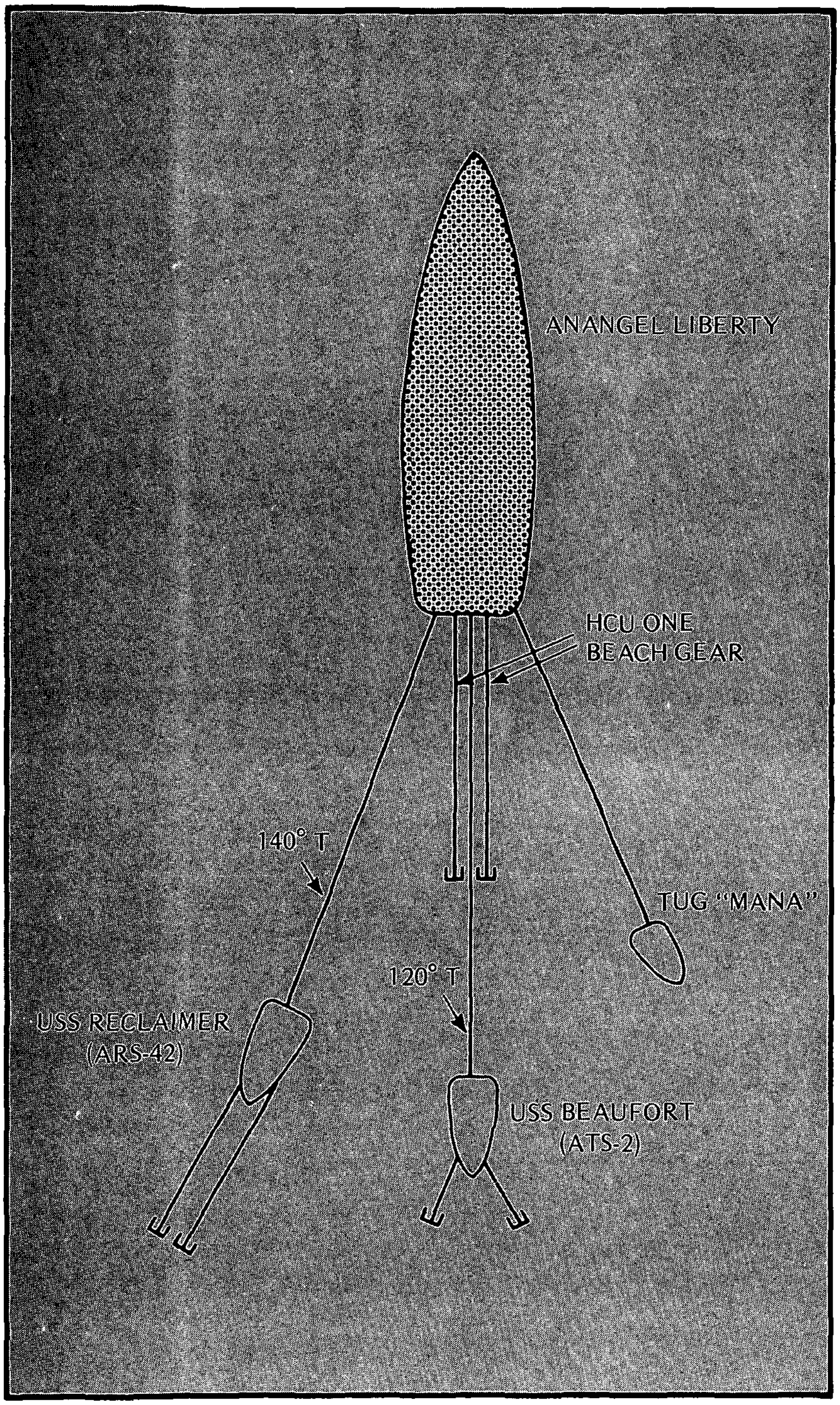
Page 22: top photo shows view of "LIBERTY" from C-130; bottom photo shows strain on the bull rope attached to the grounded vessel. Photo above shows the cargo offloading efforts, which proved to be vital to successfully refloating the ship.

ENC Connel (USS RECLAIMER) trips out a load of silica clay during offloading of cargo.

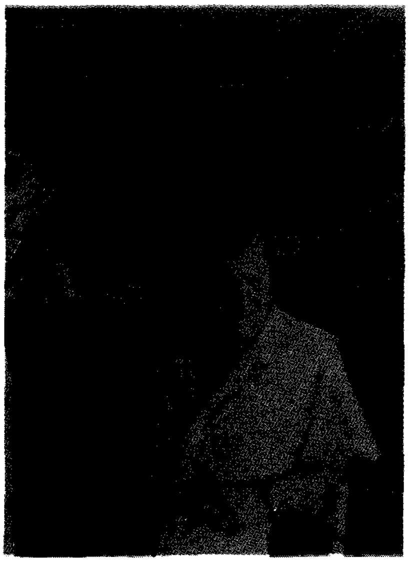
The vessel was resting on crushed coral throughout her entire length; but, luckily, the hull showed no signs of damage. The initial plan for salvage included laying two reverse legs of beach gear off the stern of ANANGEL LIBERTY, to assist in the pull effort and to keep the vessel from broaching; laying two standard legs and pulling from the port quarter of "LIBERTY"; and immediately jettisoning cargo. The calculated pull required to free "LIBERTY" indicated that another salvage vessel would be required, and COMSERVRON FIVE dispatched USS BEAUFORT (ATS-2).

Although the vessel's sea suctions were clear of the bottom, which allowed operation of all "LIBERTY's" winches and cranes, the task of offloading the clay (packed in 50-pound bags) became an arduous chore. Each bag had to be loaded by hand into cargo nets, which were then hauled over the side. On May 5, after offloading several hundred tons of cargo, several pulls were made using HCU-1's two reverse legs, RECLAIMER's standard legs and screws, and the tug MANA for a combined pull of approximately 200 tons—but the efforts were unsuccessful. Because the weather conditions could worsen overnight in the area, the On-Scene Commander assigned all available personnel to cargo offloading, working in two shifts, 24 hours per day, while continuing to make daily high tide pulls in an effort to free the vessel.

On the morning of May 6, USS BEAUFORT (ATS-2), under the command of LCDR Robert R.



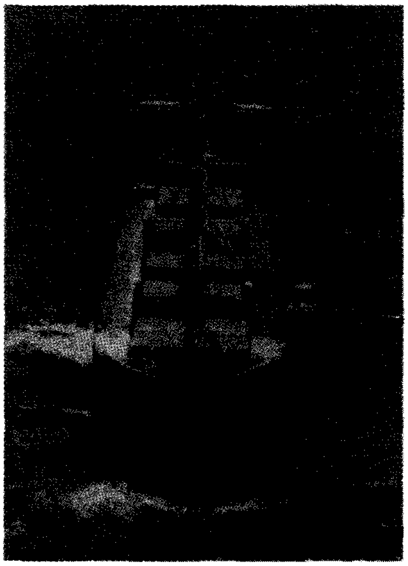
Final effective pulling arrangement for freeing the M/V ANANGEL LIBERTY from French Frigate Shoals.



RECLAIMER CO LCDR Bruce Banks' expression indicates the deep concern surrounding the salvage effort.

Wells, arrived on the scene with 10 additional HCU-1 salvors. BEAUFORT immediately deployed two standard sets of beach gear and got into harness, deploying available personnel to the cargo handling efforts.

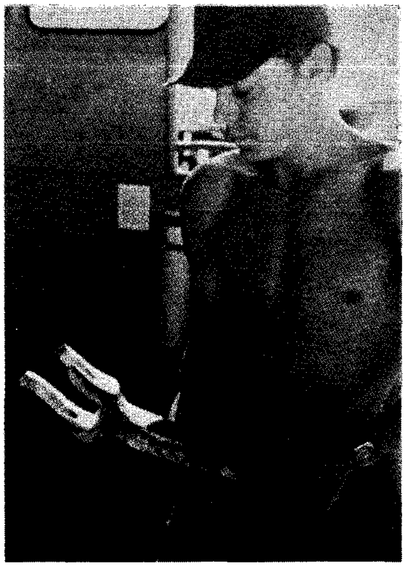
On May 7, after offloading approximately 1,900 long tons of cargo and after exerting a combined pull of approximately 350 tons (using the tug MANA and BEAUFORT's, RECLAIMER's, and HCU-1's beach gear), ANANGEL



ANANGEL LIBERTY hard aground on French Frigate Shoals.

The following data describes the M/V ANANGEL LIBERTY:

5-hold Greek Cargo Vessel
Length: 164 meters, Beam: 23 meters
DWT: 23,000 long tons
Draft: 33 Feet
Cargo: 19,200 long tons of Silica Alumina Clay
Fuel: 550 long tons
Vessel Launched: 1976
Crew: 23

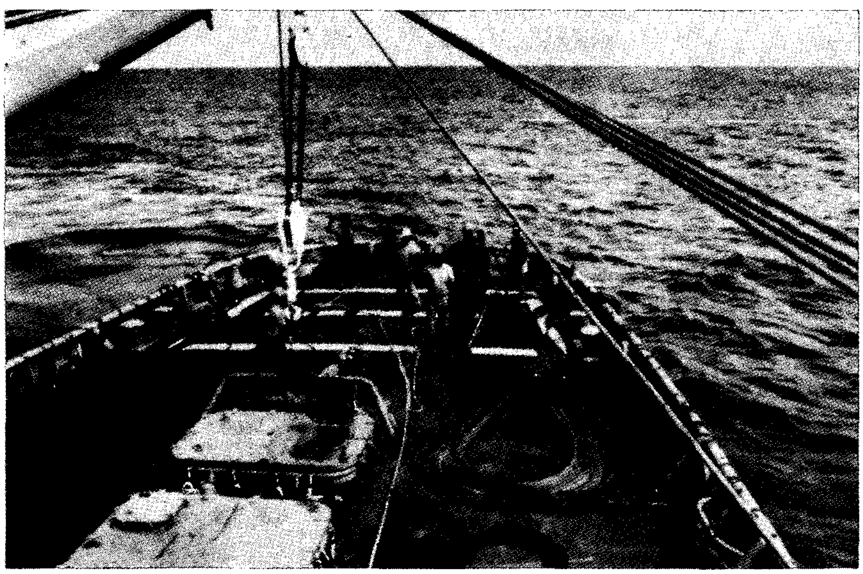


Left:Sailor holds the remains of a 1-5/8-inch pelican hook that literally "exploded" during one pulling evolution.Right:ANANGEL LIBERTY hard aground, with RECLAIMER in harness (in foreground).

LIBERTY was freed. All vessels were then tripped out of harness, along with HCU-1's beach gear, and ANANGEL LIBERTY proceeded to the lee of French Frigate Shoals on her own power. The following morning an underwater hull inspection of the refloated vessel showed no apparent signs of damage to the hull structure from grounding.

On May 8, ANANGEL LIBERTY got under way and proceeded to her original destination—Japan. Overall, long hours and hard work were involved in freeing the ship from grounding. Two 1-5/8-inch wires and a 5/8-inch beach gear purchase wire parted from the great strain placed on the beach gear; 76,000 50-pound bags of cargo were jettisoned, all without incurring personnel casualty or damage to the stranded vessel. The elapsed time from the arrival of RECLAIMER and the HCU-1 Detachment to the successful refloating was only 4 days, 10 hours. A post salvage survey of the grounding site confirmed that the retraction of ANANGEL LIBERTY had not significantly altered the environment, and the jettisoned cargo had quickly dispersed and was expected to produce no long term effects.

Once again, the Pacific Fleet Salvors displayed their professional expertise and "can do" spirit, adding credence to the salvor's poem: "When at last the toilsome deed is done and the fearful struggle with sea is won, the salvor sighs a great . . . amen; and takes his place . . . with the iron men."



Left: Sailors on the deck of RECLAIMER rigging the beach gear purchases. Right: ANANGEL LIBERTY at anchor in the lee of French Frigate Shoals after being successfully freed from the strand.

Salvor's Notebook

Entry: Tau Island Harbor Clearance Operation

Murphy's Law did not go to visit, it went to stay throughout the Tau Island clearance. Nonetheless, it was a valuable salvage experience for participants in learning to improvise and adjust to sometimes frustrating circumstances. (See Faceplate, Spring 1980.)

Item: The salvage plan for phase one was to refloat a sunken LCU, tow it to deeper water, and sink it. Only the first objective was accomplished. The primary cause of failure for the other two goals was a lack of sufficient pulling force to extract the craft from the harbor.

Lessons Learned:

*Phase one dramatically illustrated the importance of maintaining reliable communications; in this case, they were sketchy. Harbor Clearance Unit One (HCU-1) was not given the information necessary to keep the chain of command appraised and, therefore, to properly support the on-site team. This resulted in a cut-back of the original survey team into a four-man salvage team with little logistic support.

*This lack of adequate communication--and a corresponding insufficiency of realistic planning and proper preparation--caused a longer timeframe than might have been necessary otherwise.

Item: The salvage plan for phase two required a radically different approach because the LCU suffered severe bottom damage during the retractions, with a subsequent loss of watertight integrity, and could not be refloated. By selectively cutting the craft with explosives and by using a beach gear purchase system, the final goal of removing the LCU was achieved.

Special problems:

*Beach sand was a constant source of aggravation and had a very detrimental effect on equipment. The 5/8-inch four sheave blocks became fouled with sand during retraction, and attempts to clean them using HP air were fruitless. Marlinspikes were finally used to pry out caked sand.

*The screws holding the copper shim on the inside of the 1-5/8-inch carpenter stopper sheared off after approximately 30 pulls with the purchase system. The insides of the carpenter stoppers became excessively worn by the conclusion of the job from being secured on wire coated with sand. Various methods used to keep the stoppers clean were only moderately successful. When oil was used to lubricate the wedge (as per standard maintenance procedures), sand adhered to the oil and resulted in greater abrasiveness.

*Two divers received lacerations requiring stitches during dives in which they were not wearing chafing gear.

*Divers experienced problems working underwater while wearing the cotton/leather gloves currently in the Navy Supply System. The leather expanded when wet, losing the fit necessary for efficient underwater work.

Salvor's Notebook

*The difficulty of arranging flight transportation for class "A" explosives delayed the departure of the salvage team by several days.

Recommendations:

*Modifying the four fold blocks to increase the distance between the sheaves in the blocks and the inside plate in the block would probably result in greater ease in cleaning this equipment.

*Procuring a four fold block repair kit to reduce the cost of returning the blocks to operational status would be time and cost efficient. Presently, the blocks must be replaced "in toto" and cannot be repaired.

*Modifying maintenance requirements for oiling the carpenter stopper to allow the use of dry lubricants such as graphite would have reduced and possibly eliminated the shearing of the copper screws securing the copper shim to the stopper.

*When diving around jagged metal, it is only common sense that divers should wear chafing gear, especially in currents of 4 to 6 knots (as in this operation). However, the Kevlar chafing suits did not prevent puncture wounds. The best type of chafing suit pants was found to be dungarees.

*Developing an underwater work glove that has high flexibility, is tear and puncture resistant, and is durable would greatly aid divers and would facilitate underwater tasks.

*Determining the explosive limit of the receiving airport is a must, so that if the quantity needed exceeds the limit, a waiver can be requested. Storage capability of the airport should also be determined. MAC does not routinely have this information for commercial airports.

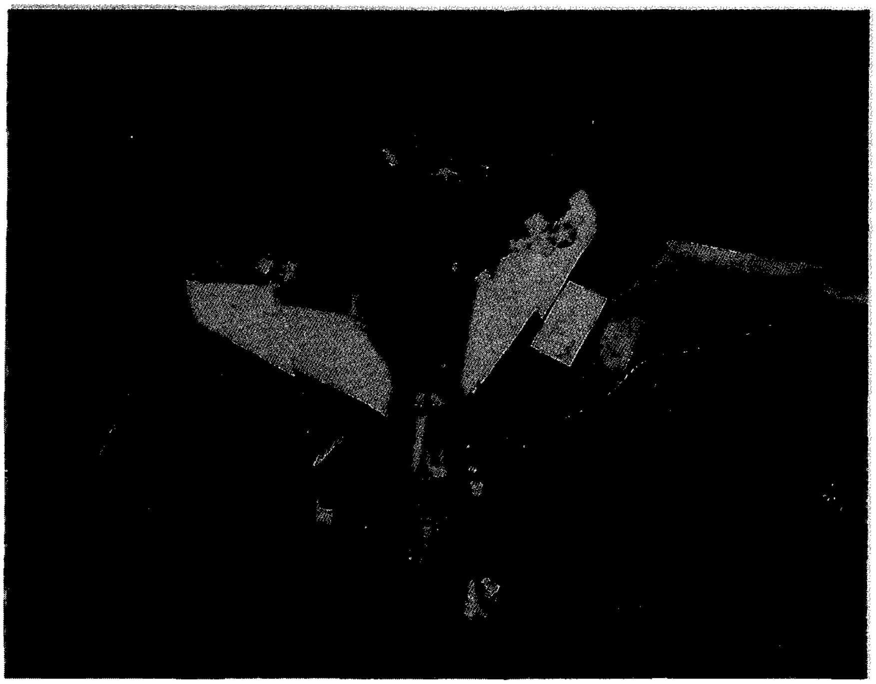
*Modifying demolition training curriculum for Navy divers to include actual in-water demolition is recommended. The salvage team at Tau Island had personnel with extensive experience in underwater demolition, but not all Navy commands are this fortunate.

Final Observation:

While the equipment used at the salvage site would have performed satisfactorily in a comparatively clean environment such as onboard a naval vessel, it was not capable of providing totally reliable service in a less than ideal situation.

Editor's Note: OOC is reviewing the above recommendations and will comment on their feasibility in the next issue of Faceplate.

Salvor's Notebook will be a recurring feature in Faceplate. *Its content will be a discussion of "lessons learned" from various U.S. Navy salvage operations. Its purpose will be to allow salvors throughout the Fleet to learn from those lessons.*



MUD-DIVING FOR AN A-7E CORSAIR

ENS L.C. Rutledge, USN
NAS Cecil Field

An A-7E Corsair (homeported at Naval Air Station, Cecil Field, Florida) experienced engine trouble and plummeted to earth on February 12, 1980. The pilot was rescued, unharmed, less than an hour after his aircraft crashed.

A routine investigation into the cause of the accident was initiated immediately. The problem of how to recover the wreckage, however, which had landed in an obscure swamp approximately 9 miles north of Moody AFB, Georgia, would prove to be anything but routine.

On paper, it sounded relatively easy—the problem involved recovering the aircraft fuselage and the engine, which had separated from the aircraft in the air. In reality, though, it took the Navy's "can do" spirit along with the cooperation of several small units that pulled together with a handful of personnel. LT "Mac" McDaniel, Cecil Field's Explosive Ordnance Disposal (EOD) Team's Officer-in-Charge, and his team of HTCS Max Owens, EMC Walt Kaiser, and AD1 Brian Spurger participated in the salvage, assisted by six members of Construction Battalion Unit (CBU) 410(led by LT R. George); the search and rescue crews who flew the CH-46 from NAS Jacksonville, Florida; and the Army National Guard sky crane crew.

Top photo shows A-7E after crash. Above photo shows foul weather that delayed the recovery several times.

The excavation of the aircraft began in a conference room, where ideas were exchanged and solutions were adopted on a "first-of-its-kind" type of salvage mission for NAS Cecil Field personnel. The CB Unit and the EOD team made the first trip to the site to survey the feasibility of the operation. EOD divers searched for engine components in a 20-foot by 20-foot muddy hole by hand as well as with metal probes.

At the fuselage site, the team searched for possible hook-up points on the plane's body and checked to see if the wings were intact. Meanwhile, CBU 410 decided that the best alternative for a quick recovery was to fabricate a modular, air transportable lifting apparatus that could be assembled at the swamp. This plan would eliminate the need to build a walkway to the site from the nearest road, over 800 yards away.

NAS Jacksonville Public Works Department used local materials to design a crane with a lift load capacity of 10,000 pounds. Other equipment included a shelter, fuel drop tanks on which to construct the crane, and plywood walkways to facilitate travel to and from both sites. The mire proved to have a personality of its own, for it was anywhere from 6 inches deep in some places to sudden chest-deep holes in other areas.

Newly assembled crane is raised into place by CBU 410 personnel.

Diving conditions were somewhat less than ideal.

Clothing for the operation included waders for everyone, wet suits for the divers, and foul weather jackets—for the operation would be delayed several times by rain.

The first real break came at the end of a particularly "long" day. An hour earlier, EOD member Spurger had succeeded in hooking a cable into a 2-inch-diameter hole on what he thought was the engine. During that next hour, everyone rather despondently watched the cable links literally "inch" upward at an estimated rate of one link every 10 minutes.

In a last ditch effort that day, another come-along was secured to the engine, adding another 4,000 pounds of strain to the newly constructed crane. At last, the engine slowly cleared the murky water line, finally free of its foreign environment.

The engine was then transported from the site by helicopter while the Seabees began the tedious operation of "breaking down" their crane to transfer it to the fuselage site 100 yards away.

Back at the engine site, EOD divers still searched for any small components that could prove to be a missing link in the investigation. With nature fast reclaiming her territory, the EOD team got to do what they do best – blow up the engine hole.

Using a 55-pound cast TNT bomb detonated in 12 feet of mud, they were able to push the debris up (the explosion reached a height of 50 feet) and out. The blast facilitated the recovery of the last remaining engine components—although no large remaining masses of metal were found.

The Seabees required a few more days at the fuselage site, partly because of inclement weather, before they were able to lift the aircraft out of the swamp. The right wing was removed first, followed by the left wing and the fuselage. Divers maneuvered in shoulder-deep water to attach slings underneath each section of the plane's body. The fuselage was lifted up on one of the crane's pontoons to prepare it for removal by the National Guard sky crane. As the final task of the operation, EOD divers scanned and probed the fuselage area for any last bits of metal.

The return of the aircraft parts and lifting apparatus to NAS Jacksonville marked the completion of the salvage operation and the beginning of a tedious job for the accident board.

DESIGN STANDARDIZATION IN DIVERS' LIFE SUPPORT SYSTEMS

Mr. Martin Chinn,
Mr. Harry Rueter
Naval Sea Systems Command

Diver wearing Mk1 Mod O diver's mask has completed dive using open diving bell, using YDT-14 as diving platform.

With the advent of standardizing and modernizing diving equipment through NAVSEA INST 9597.1 and distributing such equipment as the USN Mk 1 Underwater Breathing Apparatus (UBA) and the Mk 12 Mod 0 UBA to the Fleet, the need for dedicated diving system specifications for system design became evident.

Specific U.S. naval surface vessels were designed to support over-the-side diving operations, a characteristic generally confined to ships designed to perform salvage and rescue missions. Officially designated as ARS, ASR, and ATS, these ships carry a complement of divers qualified to conduct a variety of underwater operations. In addition, ATF's and other ships can rapidly be converted to back up underwater salvage/rescue work with the addition of mobile fly-on/fly-off self-contained diving units such as the Flyaway Air Diving System (FADS/II) (*Faceplate*, Winter 1978) and the Portable Surface-Supported Diving System (PSSDS) (*Faceplate*, Winter 1978). Whether built-in or portable, these systems represent state-of-the-art design concepts spanning some 40 years of operational changes, from the time most of these salvage/rescue vessels were built to the latest mobile equipment.

Over this period, many technological advances have been made in hardware/system design to meet the changing requirements and philosophy of underwater excursions. This dictates the requirements of system hardware on the surface necessary to provide and support safe underwater operations. Yet, in light of the ever-changing life-support equipment available to divers, there are, to date, essentially no changes made to built-in surface support systems on ships. There is little question that in systems installed over 10 years ago, some upgrading is desirable to meet current operational needs. In addition, the relatively recent requirement to certify all diving systems focused attention on the disturbing fact that throughout the developmental period, there exist no directives/specifications dedicated exclusively to shipboard diving life support system (DLSS) requirements.

This does not mean that no Navy or industry-wide specifications exist to satisfy the unique requirements of DLSS. In fact, the contrary is true. DLSS requirements do not necessitate specifications for DLSS use only, but are adaptable to directives/specifications created for other applications. In this respect, DLSS can be treated similar to a weapons system, an electronic system, a fuel system, a fire-fighting system, etc. Briefly, requirements call for specific guidelines for the design, repair, installation, operation, testing, and certification of diving systems as a part of a ship's (or other platform's) overall capability.

Specifications, the key to a system's adequacy to perform intended tasks, must be flexible to suit state-of-the-art technological changes. The degree to which any specific system is upgraded will determine the extent to which that system can be certified to perform. As a life supporting system, it is obvious that certain basic minimum requirements must be attained, even for the most elemental diving operations.

The need for overall system specifications established and promulgated by NAVSEA eventually led to a NAVSEA OOC-sponsored conference in November 1977. Discussions centered on the contents, coverage, and format(s) of these guidelines as well as the boundaries and conditions they are intended to control. Understandably, there was concern about potential difficulties in certifying older systems to present-day standards. One must remember, however, that what is now considered necessary to sustain a safe, life-supporting network is non-negotiable. Therefore, requirements for such systems cannot be dictated by what exists — what exists must satisfy present requirements. In some cases, shipboard systems can be conditionally certified "as is." Conditional certification means the systems have been inspected and can be operated within specified limits. Increased capabilities can be achieved through the normal ship alteration process. As in the case of most shipboard work, there are no plans to prohibit the resort-to-waiver actions when justified, even though such systems work may be considered "non-deviation" in general.

Considering these facts, a case is made for the development of certification specifications as follows:

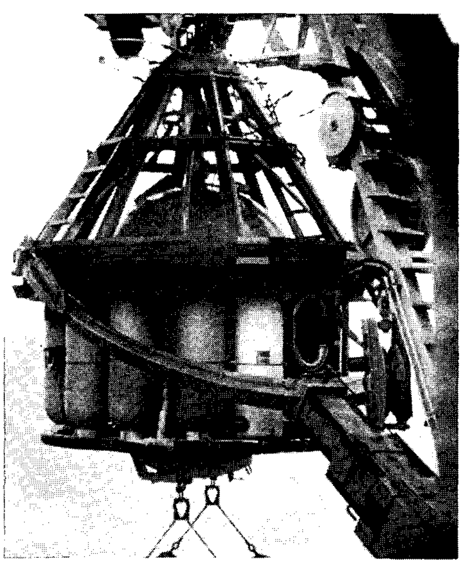
1. One set of requirements, applicable across the board, which will prescribe the acceptable design, material, installation, testing, operational, and maintenance characteristics of DLSS to suit the particular diving scenario.

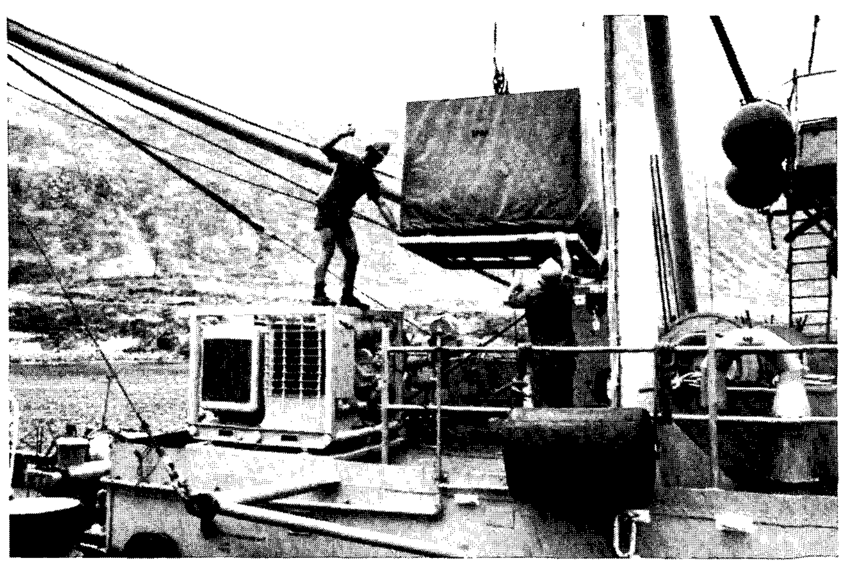
2. The use of existing specifications governing like performance requirements.

3. Establishing these requirements for DLSS within the present framework of other specifications governing shipwork.

Since the November 1977 NAVSEA conference, NAVSEA OOC tasked another naval activity to assemble and compile the necessary documents tailored to the specific needs of diving systems. That report is now under review. Planning and Engineering for Repairs and Alterations [PERA (CSS)], because of its involvement in diving-capable ships and as the principal motivating force behind this effort, is assisting NAVSEA OOC in this review.

The ultimate goal of this effort is to update the various NAVSEA governing documents with the latest diving information and to continue to do so in the future on a regular basis.





Above left: DDS Mk 2/Mod 1 personnel transfer capsule. Right: BM1 (DV) Davis and EM1 (DV) Korbe load FADS/II equipment aboard ABNAKI (ATF-96).

RESEARCH CONTINUES ON JIM

JIM and JIM operators posed during NMRI biomedical trials at NEDU. From left to right standing: STG1(DV) Carl Cross, JIM, and MR1(DV) C. Brooner (NMRI); kneeling: MR1(DV) C.M. Weaver and GM2(DV) D.L. Lyre (NMRI); Mr. Cliff Newell (NOAA).

Mary M. Matzen
Naval Medical Research Institute

What are the capabilities and advantages of 1-ATA diving systems? The use of such systems can 1) eliminate the need for decompression, 2) extend the bottom time at great depth, 3) eliminate some biomedical problems associated with other diving techniques and systems, 4) increase the capability for repetitive dives, and 5) provide protection from cold.

The Naval Medical Research Institute (NMRI), Bethesda, Maryland, recently completed a biomedical assessment[1] of a 1-ATA diving system called "JIM." During this study, JIM's diver-operators were convinced that they could do useful work at depth without paying the decompression debt.

The JIM system leased by NMRI, one of a number of such systems, was developed by DHB Construction, Ltd., of Alton, England. Before coming to NMRI, it was used commercially in deep sea work in the North Sea and other areas by the parent company, Oceaneering International. The JIM system consists of a cast body made of a magnesium alloy, with a hinged dome and articulated limbs. The arms are equipped with mechanical steel manipulators. The system is 6 feet 6 inches high and weighs almost 1,100 pounds on the surface with the operator inside. There are two independent life-support systems complete with externally mounted oxygen flasks. Either flask may serve either system. The life-support systems permit a working range of 4 to 6 hours with an emergency reserve of 20 to 22 hours. The inner temperature (where the operator works) is maintained at 19°C to 21°C, without an external heat source.

In 1977, NMRI leased JIM (through the Naval Sea Systems

Command) from Oceaneering International. Under the direction of NMRI's Dr. Arthur J. Bachrach, a cooperative research program was initiated between the U.S. Navy and the Admiralty Marine Technology Establishment Physiological Laboratory, U.K. . During JIM's testing and assessment, Mr. John Naquin and LT Michael Curley of NMRI collaborated with Dr. Bachrach in managing JIM's assessment(1).

In preparation for testing and assessment, JIM was sent to the Naval Ship Research and Development Command in Carderock, Maryland (the David Taylor Model Basin). The Circulating Water Channel at the Model Basin offered JIM both still water and in-current operational conditions. (Carderock can simulate currents up to 10 knots in gradients of 0.1 knots.)

Familiarization and training in the system was the first phase of the program. Operators were trained for in-water operation and maintenance of the system. Orientation dives were accompanied by classroom reviews and emergency procedure training. Ten operators were trained at NMRI. Most of them became proficient in a little over 10 hours--a time considerably less than anticipated.

Phase two was the *flexibility and mobility of the operator in the system.* So that a diver's range of motion in the system could be analyzed, baseline measurements of 14 basic motions were made by divers wearing swimsuits. About half of the movements were impossible in JIM, but flexibility and mobility were possible in a number of them. Basic anthropometric measurements—quantitative measurements of joint angle changes and range of motion while performing selected movements--were made of operators in the system under the direction of Dr. Glen Egstrom of the University of California at Los Angeles. The anthropometric tests indicated that range of motion in JIM was good. Advice on functional-strength muscle studies was provided by LT Dotto from the Sports Medicine Department of the U.S. Naval Academy.

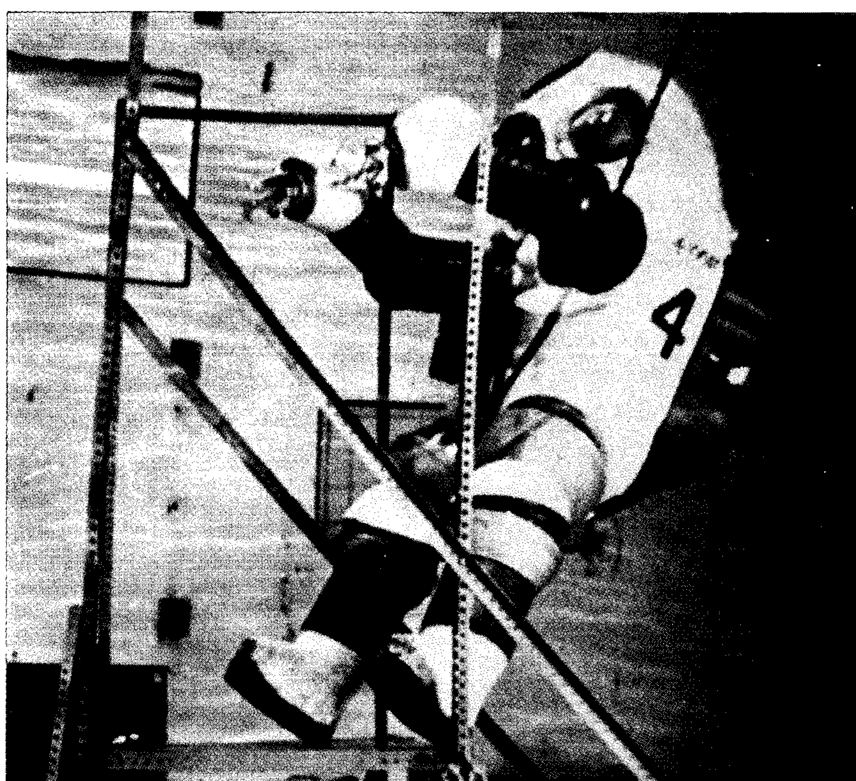
In the *training and emergency procedures* phase of the program, the testing was moved to the Naval Surface Weapons Center in White Oak, Maryland, where buoyant ascents were made from 100 feet. JIM operators demonstrated they could surface in a straight ascent at rates up to 100 feet per minute by jettisoning front weights. When they dropped both front and back weights, their ascent times approached 200 feet per minute. MM2(DV) Dan Fischer, who weighed 135 pounds and was the lightest diver, ascended the 100 feet in 22 seconds.

JIM's maneuverability was put to the test repeatedly. JIM and his operators were measured during deliberate falls forward and backward, while doing righting movements and lateral motions, and during straight turn-around walks both in still water and in currents up to 1 knot. The ability to climb steps was studied during a timed step task.

Tasks to test performance and maneuverability: JIM has its own specially designed and constructed assembly—the JIM Gym—on which skills in performing various tasks are demonstrated. JIM's still water accomplishments include:

- Transfering 3/8-inch nuts from one spindle to another.
- Picking up a flat washer from the deck.
- Placing a 1-inch shackle on a plate.
- Aligning pipe flanges and bolting fixed bolts.
- Operating a gate valve.
- Tying a bowline.
- Reading an underwater voltmeter and reporting the reading.
- Plugging in and locking deep submergence rescue vehicle connector.
- Shackling and lifting straps.
- Moving objects.
- Activating lift bag (in test pond).

For comparison, JIM performed some of the same tasks in currents



JIM working on the Gym Assembly.

at Carderock. These included timed walks, maneuvering on a circling task, nut transfer, shackle assembly, and maneuvering on a circling line. JIM successfully executed all of these tasks in currents of 0.5 knots; maneuverability in a 1-knot current was possible but difficult.

Also included in the testing was a weight discrimination task, which measured the ability of an operator to discriminate differences in weights while using JIM's articulated arms and steel manipulators. In JIM there is no force feedback in the system; therefore, the operator must rely on his own sense of feeling in operating the manipulator through the T-Bar in the arm assembly. Results of the testing showed that the operators could determine weight differences of 1.5 pounds or more. When they compared weights of 1.0 and 0.5 pound, their performance was similar to the change expectations on such a task.

A related task to test tactile sensitivity required the JIM operators to use the manipulators to identify objects under conditions of lowered visibility. Plastic filters were fitted into JIM's viewports, effectively simulating the distortion and degradation of vision that occur when one dives in turbid water. The degree of visibility and brightness was controlled by increasing the number of filters in the viewport. Five tools familiar to a working diver were chosen for identification in the turbid conditions—a C-clamp, crescent wrench, screw-pin shackle, valve, and safety shackle. Through precisely controlled procedures, the operators were able to identify the objects in 13 of 17 trials. The C-clamp was the easiest tool to identify, the screw-pin shackle was the most difficult.

Perhaps the most important potential contribution to Navy diving is JIM's capability to function as an observation platform. The lack of compression and decompression means that JIM could be delivered to an operational site at 1,000 fsw in 5 minutes and brought back with a full report and photographic documentation.

Measurements of an operator's capacity for physical work in JIM was an important phase of the biomedical assessment of JIM. The physiological status of each operator was studied before, during, and after a task performance, so that the degree of improvement and efficiency resulting from learning and training could be evaluated. Ventilatory flow rates, heart rate, and other physiological measures were taken in each instance.

JIM systems have been operated successfully at depth in Arctic waters, demonstrating the capability to perform without operator discomfort in cold water. In one series of experiments conducted by NMRI using the Navy Experimental Diving Unit (NEDU) test pool in Panama City, Florida, some operators had physiological and performance problems at temperatures ranging to 25°C. Thus, JIM has operated successfully in cold waters, but biomedical problems might arise under conditions of hyperthermia.

The breathing system of JIM was evaluated to determine oxygen and carbon dioxide percentages in the oral-nasal mask and in the cabin atmosphere. Specific information about the "Closed-Loop Gas Analyzing System" developed for use in JIM can be found in a NMRI report by H.C. Langworthy and C.R. Flynn(2).

The results of NMRI's research indicate that the physiological costs of performing rudimentary tasks in JIM are high; however, JIM can be used effectively to perform many tasks at great depth (to 1,500 fsw) without concern for high pressure nervous syndrome or decompression. On the basis of the biomedical assessment, NMRI investigators are convinced that from a physiological standpoint, the use of 1-ATA systems would greatly enhance the U.S. Navy's capability to conduct operations at great depths.

FOOTNOTE

[1] *An overall report of the NMRI Project is in final preparation. Those interested in receiving a copy may send a request to the author.*

REFERENCES

(1) *M.D. Curley and A.J. Bachrach. Tactile Sensitivity in the One-Atmosphere Diving System JIM. (In press.)*

(2) *H.C. Langworthy and C.R. Flynn. A Closed-Loop Gas Analyzing System. Naval Medical Research Institute, 1979 (NMRI 78-79).*

STG1(DV) Carl Cross uses modified Naval aviator oral-nasal mask in JIM.

the old master

"That Master Diver can readily run the side—you don't see any tenders holding a coffee cup and you sure know who's in charge."

—Certainly, these words are a compliment to any Master Diver: running the side is a most critical factor in evaluating a Master Diver's performance. However, what about the valuable and vital contribution he can make even when not conducting diving operations?

The Master Diver possesses experience that provides an added wisdom younger divers don't have and he is a key figure in establishing an attitude of professionalism among the divers. He also is ever-alert to diving safety. For example, he can quickly correct a young diver who is charging scuba bottles with small compressors when exhaust from one is feeding into the intake of the other. He can show him the advantage of using the regular shipboard high pressure compressor instead of the small portable field units. The Master doesn't just ensure that the "bright work" is shined and the helmets stowed with dramatic lighting to impress the "brass"—the real Master ensures that PMS is done. He takes the time to walk the inexperienced diver through scuba regulator repair, sharing the techniques he has learned.

I remember one old Master who threw away all the crescent wrenches from the diving locker—considering them tools no good mechanic would use. His point was a bit stretched, but the attitude of using the right tool for each job is a concept a Master should always stress.

A Master Diver is always alert for those things that divers 1st class can't do because they have not been fully trained. And, by virtue of his experience, he can complete the job and make them 1st class divers.

My first Master Diver not only helped his divers but, with loyalty and by example, he helped our junior Diving Officer pick up years of diving knowledge by willingly sharing every bit of savvy he had acquired. He briefed and/or critiqued divers after every dive and, collectively, the diving group improved each time we went to diving stations. He also conducted timely casualty drill training and instilled confidence in every diver. It amazed and inspired us all that he walked with humility, yet also with great pride.

Within our diving community, it is great to know that we don't have to "pick the Master's brain" or learn the hard way. A good Master Diver freely gives and leads and, when he does, he receives the respect he richly deserves.

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