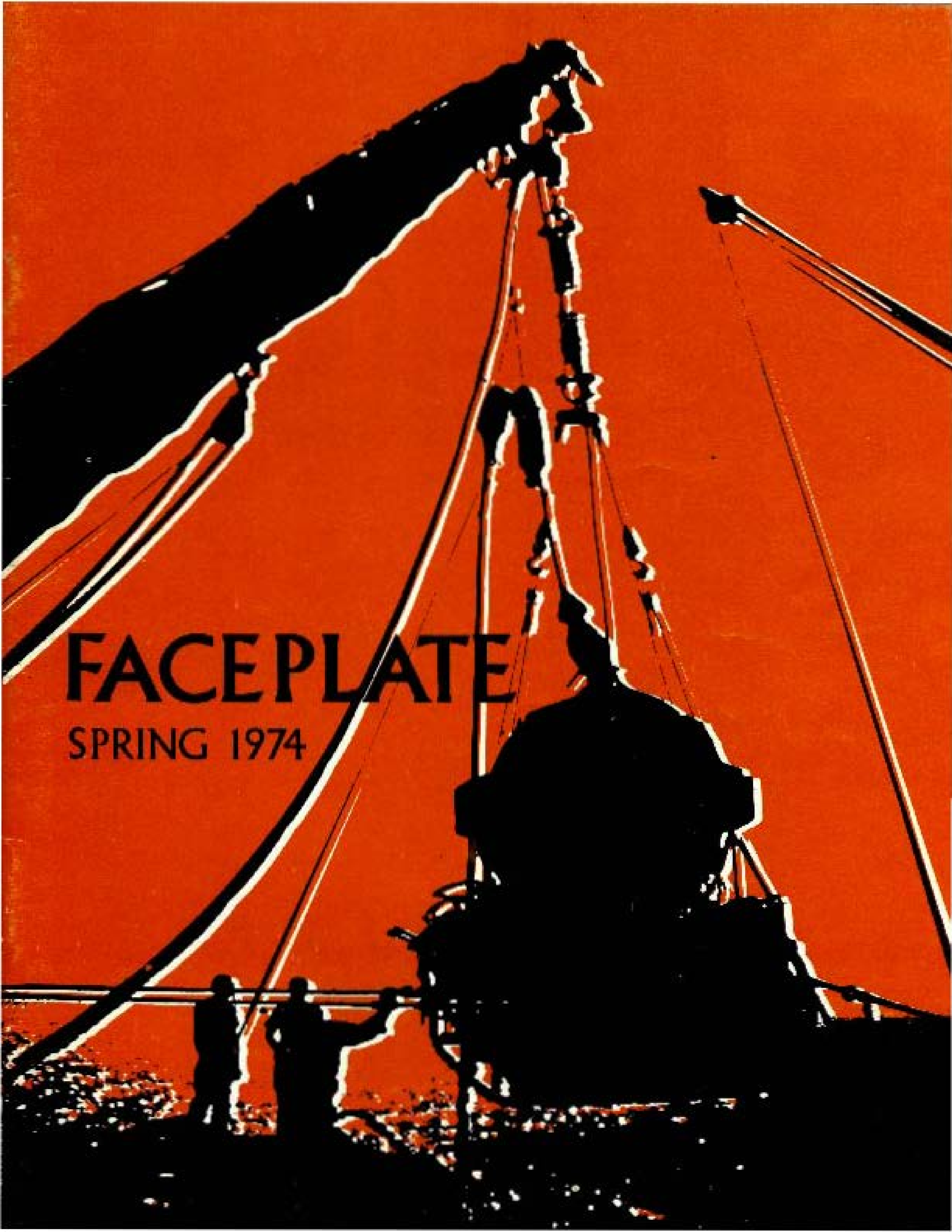
FACEPLATE
SPRING 1974

Shown here are various scenes from the Working Diver Symposium. (See p. 16.) Going clockwise from below, for the top four photos: ADM Kidd, Chief of NAVMAT, presents a fid from the USS CONSTITUTION to Dr. Batch, Director, Battelle-Columbus, at the banquet; Mr. Odum (left), NCSL, with LCDR Ringelberg, O-in-C, Panama City Detachment of NEDU; Dr. MacInnis (left), discusses his Arctic Diving paper with Mr. Koblick, Marine Resource Development Foundation, Puerto Rico; and, left, CAPT Boyd, Director of Ocean Engineering, symposium chairman, presents a symposium momento to CAPT Mitchell, USN(Ret.), Session IV chairman.

Clockwise, from left: Mr. Rynecki reports on salvops of T.V. IGARA; CDR Coleman, SUPDIV, formally gets the symposium started; and, above, Mr. Bergman, SUPDIV Office, discusses the conference with LCDR Barrett, RN Exchange Officer at NEDU.

FACEPLATE

VOLUME 5 NO. 1

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

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Front cover shows the Mk 1 DDS being lifted over the side of YDT-16. See p. 21.

Photo credit: Working Diver Symposium photos (inside front cover, pps. 16-17), Curtis L. Scott, Battelle-Columbus Labs.

Soundings

U. S. NAVY DIVING MANUAL REVISED

Naval Ship Systems Command has completed its revision of the March, 1970, U.S. Navy Diving Manual (NAVSHIPS 0994-001-9010). The January, 1974, edition of the manual represents one of the most comprehensive issues of this publication since its inception in 1916.

For the first time, the diving manual has been divided into two volumes, Volume 1: Air Diving, and Volume 2: Mixed Gas Diving. This separation not only improves clarity and simplifies references, but also reflects the qualification and training requirements of Navy divers.

The U.S. Navy Diving Manual of January, 1974, incorporates several major new areas of diving technology. The application of deep diving systems and associated diver breathing apparatus, saturation diving, and lightweight equipment for mixed-gas operations are several topics discussed extensively. This latest edition also addresses the many established diving procedures and techniques that have been revised, expanded, or clarified since the previous issue.

The U.S. Navy Diving Manual, January, 1974, will be available in print in June, 1974. DOD and Federal agencies may request copies from the Navy Publications and Printing Service Management Office, Building 157-3, Washington Navy Yard, Washington, D.C., 20374. Nonmilitary personnel may obtain the new edition from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C., 20402. Pricing information may be obtained from these facilities.

Editor's Note: Readers are requested to pay special attention to the following message from the Office of the Supervisor of Diving. Clarification of the number of required SCUBA support crew is of the utmost importance.

FOUR PERSONNEL REQUIRED IN SCUBA OPERATIONS

The actual required number of SCUBA support divers has come under some questioning in the diving community. Section 3.2, "Techniques," in the U.S. Navy Diving Manual lists both the optimum and minimum crew, which some interpret as directing that SCUBA operations may be conducted with three or four personnel. Note that this list comes under and is in addition to the Diving Supervisor, signifying that a minimum of *four* divers is required. The U.S. Navy Diving Operations Handbook also lists the optimum and minimum surface crew in a chart in Chapter 1, page 15. This reference has been misinterpreted when contrasted with the Diving Manual.

U.S. Navy policy is that any diving activity with three qualified divers can dive with a non-qualified diver as supervisor *only* when operational requirements dictate such action. Any diving activity with two qualified divers on board cannot conduct SCUBA diving operations without getting additional assistance from other qualified personnel.

CHANGES SOUGHT FOR NAVSHIPS DOCUMENT

The *Directory of Worldwide Shore-based Hyperbaric Chambers*, NAVSHIPS Document # 0994-010-4011, 1 and 2, is currently undergoing revision at Battelle Memorial Institute. Any additions and/or corrections should be received at Battelle by May 15, 1974. Send all information to: Mr. Cliff Marr, c/o Battelle, Columbus Laboratories, 505 King Avenue, Columbus, Ohio 43201.

FAULTY RESERVE VALVES IN OPEN-CIRCUIT SCUBA

NAVSHIPS has been informed of a high incidence of failure in the reserve valve of open-circuit, demand air SCUBA. Initial indications are that the disc and retainer, the spring, or both, are at fault. Activities using this equipment are advised to increase the frequency of testing this item. To check the valve: bleed down the air supply with the reserve valve on, wait 5 minutes, then actuate the reserve. If air does not resume flowing from the air supply, the reserve valve is faulty and should be repaired/replaced as necessary.

At best, the reserve valve is an unreliable device. No dive should be planned in which this item is an essential element. NAVSHIPS is investigating long term corrective measures to rectify this situation.

HeO_2 DIVING CALCULATOR DISTRIBUTED

An HeO_2 diving calculator has been assembled and distributed by the Supervisor of Diving, USN, to all

HeO_2 diving activities. The calculator was designed strictly as an aid in checking decompression calculations, and is *not* a substitute for the requirements specified in the U.S. Navy Diving Manual.

A review of this calculator was conducted by the Master Divers and Diving Supervisors at Harbor Clearance Unit TWO, Norfolk, Virginia. Their comments were expressed as follows:

a. It provides a good, fast check of the calculations made by the Master Diver/Diving Officer.

b. It should make the presentation of decompression tables to nondiving commanding officers easier and less complex.

c. Recommend that it should not be used in diving schools, so that diving students learn to make the calculations.

d. The laminated surface of the calculator is good and will allow it to be used on deck in all weather conditions.

e. The overall conclusion of the review by HCU-2 is that the HeO_2 Diving Calculator would be a worthwhile *addition* to the tools available to Diving Supervisors.

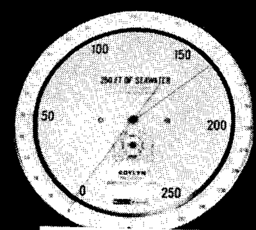
The Supervisor of Diving is interested in Fleet comments, and is requesting that those activities receiving the diving calculator submit their reviews on the use of this item.

The HeO_2 Diving Calculator was developed at the Navy Safety Center, Norfolk, by Master Diver Charles R. Flynn, who is currently aboard USS CANOPUS (AS-34).

NO RECALIBRATION NEEDED ON ROYLYN GAUGES

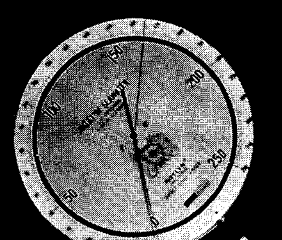
Questions have arisen regarding the recalibration of the Roylyn recompression chamber gauges, manufactured by 3D Instruments, Anaheim, California. Initial plant calibration, the accuracy of which is certified by National Bureau of Standards, is unaffected by wear and remains permanent. Since the gauge operates on a "direct drive" principle with no gears or wear points, no recalibration need be performed unless it undergoes extreme abuse. The sensing element, for example, may be damaged if the gauge is subject to a pressure overload beyond 150 percent of full-scale pressure. As a precautionary measure, a periodic accuracy check is recommended. Should a change in accuracy occur, the gauge should be returned to the manufacturer for repair.

There is a zero dial adjustment (see photos, right) on the front of both the caisson gauge (FSN # H6685-431-4895), normally mounted inside the chamber, and on the standard gauge (FSN # H6685-009-7470), usually mounted outside the chamber. A slight temperature change may cause the pointer to shift a few degrees. Once the temperature is stabilized, though, the pointer can be brought back to zero with no effect on its accuracy. The back of the caisson gauge has two connections (see photos, right). The bottom connection is left open to sense the chamber pressure. The top connection traps a reference pressure (usually ambient sea level). This allows the gauge to indicate true gauge pressure and/or a simulated depth inside the recompression chamber. This port can be sealed after exposure to ambient pressure or piped to the chamber exterior. A nonrepresentative trapped pressure will cause an erroneous gauge readout.



CAISSON GAUGE


CAISSON GAUGE,

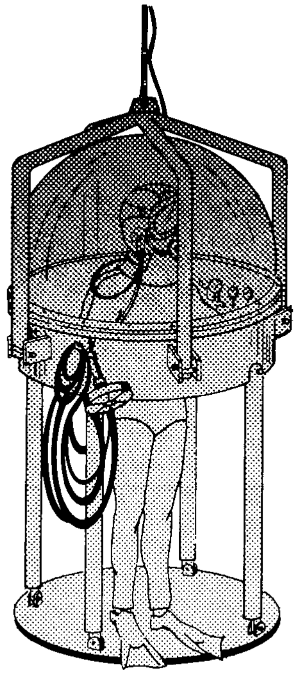

OUTSIDE GAUGE


OUTSIDE GAUGE

Open Diving Bells: a new underwater refuge

Mr. Allen Dietrich
Office of the Supervisor of Diving

During the operational evaluation of the Divers Mask USN Mk I (see *FP*, Winter, 1972), it was determined that diving operations below 130 feet require an open refuge bell for travel to the work site. With the anticipated wide distribution of the Mk I, the Supervisor of Diving (SUPDIV) is proceeding with a program to provide open bells to all fleet units with an assigned diving mission of greater than 130 feet.



The open diving bell is presently in the planning and conceptual design stage. In addition to the development of a complete drawing data package, current plans include the fabrication and testing of four prototype diving bells. Delivery of these units is expected in July, 1974, with evaluations being conducted by assigned fleet units. Additional open diving bell units will be fabricated by tenders or Navy shore facilities, in accordance with SUPDIV requirements.

Divers using the new bells will be surface-tended rather than tended by a standby diver in the bell. This decision was made by the Supervisor of Diving after consulting with various operational commands familiar with the use of these diving bells. An unusual element of the proposed design is the upper portion of the canopy, which is composed of a 1/2-inch-thick transparent hemisphere of acrylic plastic. This particular characteristic will allow unrestricted upward visibility. Other aspects of the bell will include quickly detachable lead ballast, two-way communication with the surface, and an emergency and treatment Built-In Breathing System (BIBS). Storage hooks, gas control panel, grab rail, and battery-powered light are also features of the new diving bell units.

Highest Civilian Service Award Given

In a recent special awards ceremony, RADM Kenneth E. Wilson, Deputy Commander of Naval Ship Systems Command, presented the Navy Distinguished Civilian Service Award to Mr. Earl F. Lawrence. Mr. Lawrence is the Ocean Operations Specialist at NEDU and Head of the Operations Division in the Office of the Supervisor of Salvage, NAVSHIPS. Mr. Lawrence received this award, the highest available to a civilian employee of the U. S. Navy, for his role in the SIDNEY E. SMITH salvage operation at Port Huron, Michigan, from June 5 to October 31, 1972. (See *FP*, Winter, 1972.)

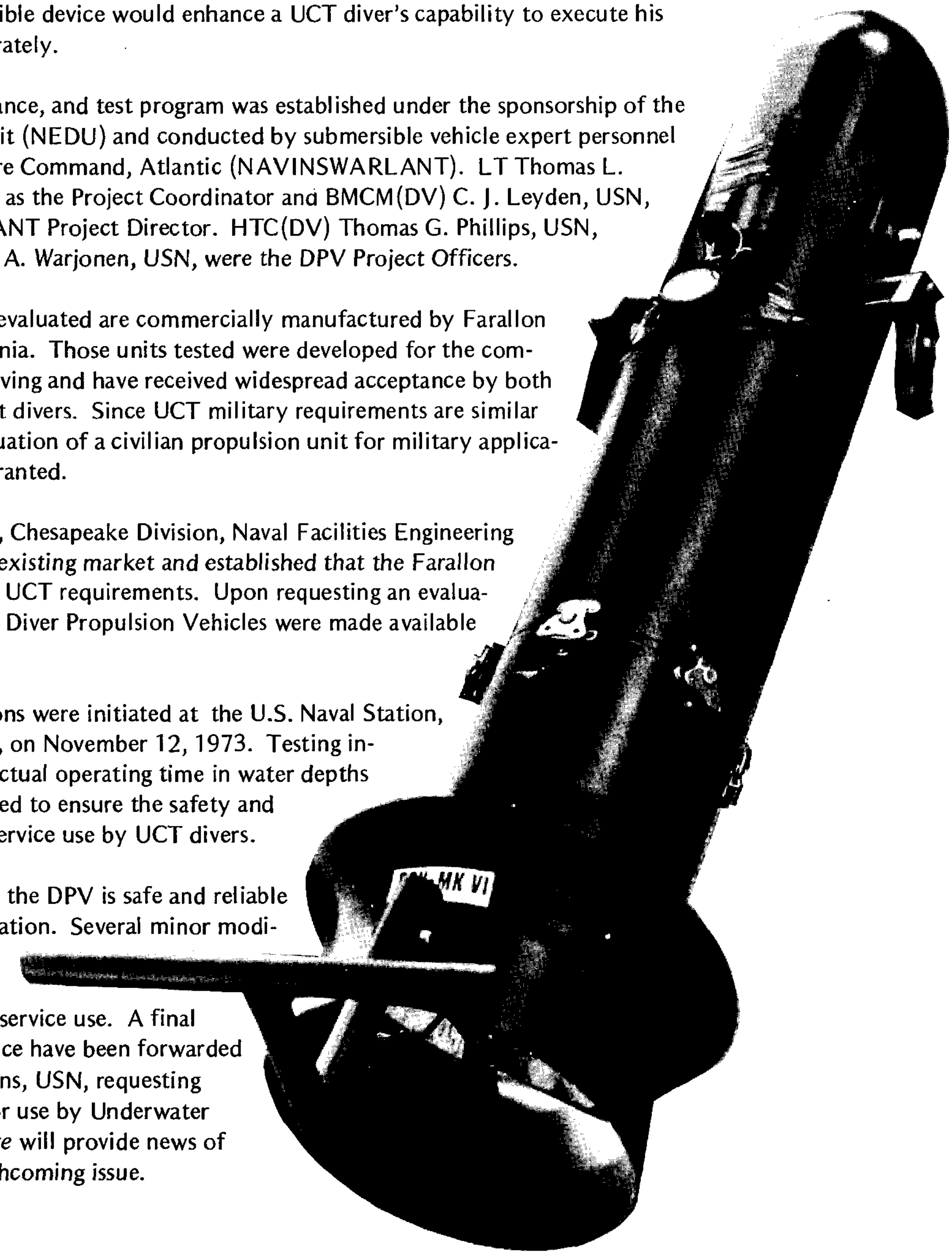
As Senior Salvage Master on the job, he developed the unique and innovative plan used to clear both the bow and stern sections of the broken ship from their critical position in the St. Clair River. Mr. Lawrence supervised all river-borne elements of the operation, and personally conducted essential survey dives in the extremely fast and hazardous river current. His inventive use and adaptation of new diving and salvage techniques significantly contributed to overcoming almost impossible operational obstacles. In addition, his ability to weld a combination of Navy, Army, contractor, laboratory, and local union personnel into a coordinated team of salvors was the key to the successful and timely completion of this monumental salvage operation.

RADM Wilson (right) congratulates Mr. Lawrence on his award.

DIVER PROPULSION VEHICLE TESTED

LT Thomas L. Hawkins, USN
Navy Experimental Diving Unit

Underwater Construction Team (UCT) divers are generally tasked with missions and responsibilities concerning the underwater construction and repair of various fixed facilities. An on-going primary duty is the extensive geophysical survey of selected underwater construction sites, a task that would adapt readily to the use of an underwater propulsion vehicle. Underwater Construction Team ONE, of the TWENTY-FIRST Naval Construction Regiment, Davisville, Rhode Island, recently assisted in the operational test and evaluation of a Diver Propulsion Vehicle (DPV) intended for their own utilization. The submersible device would enhance a UCT diver's capability to execute his assignments quickly and accurately.



A complete training, maintenance, and test program was established under the sponsorship of the Navy Experimental Diving Unit (NEDU) and conducted by submersible vehicle expert personnel from the Naval Inshore Warfare Command, Atlantic (NAVINSWARLANT). LT Thomas L. Hawkins, USN, NEDU, served as the Project Coordinator and BMCM(DV) C. J. Leyden, USN, served as the NAVINSWARLANT Project Director. HTC(DV) Thomas G. Phillips, USN, NEDU, and EOCS(DV) Harry A. Warjonen, USN, were the DPV Project Officers.

The diver propulsion vehicles evaluated are commercially manufactured by Farallon Industries of Belmont, California. Those units tested were developed for the commercial nonmilitary field of diving and have received widespread acceptance by both civilian commercial and sport divers. Since UCT military requirements are similar to commercial needs, the evaluation of a civilian propulsion unit for military application was considered to be warranted.

The Ocean Engineering Office, Chesapeake Division, Naval Facilities Engineering Command, had canvassed the existing market and established that the Farallon Mk VI DPV generally satisfied UCT requirements. Upon requesting an evaluation of this model, two Mk VI Diver Propulsion Vehicles were made available for testing.

DPV training and test operations were initiated at the U.S. Naval Station, Roosevelt Roads, Puerto Rico, on November 12, 1973. Testing involved a total of 40 hours of actual operating time in water depths to 60 feet. Testing was designed to ensure the safety and acceptability of the DPV for service use by UCT divers.

Test results demonstrated that the DPV is safe and reliable for underwater military application. Several minor modifications were incorporated during the test series, though, satisfying all requirements for service use. A final report and letter correspondence have been forwarded to the Chief of Naval Operations, USN, requesting service approval of the DPV for use by Underwater Construction Teams. *Faceplate* will provide news of further developments in a forthcoming issue.

SALVORS STUDY OIL SPILL CONTROL

Mr. James Hayes
Office of the Supervisor of Salvage

The Office of the Supervisor of Salvage is continuing in its efforts to expand and improve its capabilities in oil pollution abatement.During the week of February 11, 1974, salvors travelled from as far as Guam and Italy to attend the SUPSALV-sponsored Open Sea Oil Spill Control Course in Emeryville, California. The school was directed by the SUPSALV Pollution Control Operations Branch, with the assistance of Murphy Pacific Marine Salvage Company. A group of over 50 Navy personnel attended the conference, which was designed primarily for Navy Salvage Officers, District Area Coordinators, and their staffs. A wide variety of information was presented on various aspects of pollution control that proved equally beneficial to the various commands attending.

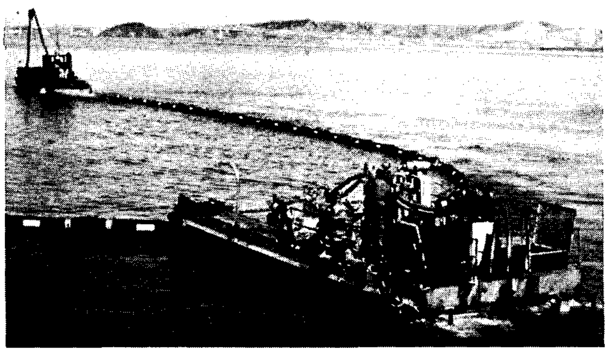
Representatives from numerous federal, state, and local agencies involved in pollution abatement were featured speakers. Topics discussed dealt with techniques for containment and collection of pollutants from the open sea, command and control of such operations, division of regulatory powers, and the SUPSALV worldwide Pollution Response Center System presently under development.

The recent salvage/pollution operation involving USNS PVT JOSEPH MERRELL (see page 19) provided a timely example for several speakers, as they related their involvement in the operation to their topic. This incident was especially pertinent to the salvage officers attending because it emphasized the fact that oil pollution abatement has become a vital consideration in present-day salvage operations.

Other highlights of the course included an inspection of the SUPSALV West Coast Pollution Response Center; a presentation from the U.S. Coast Guard; and a field demonstration of a prototype SUPSALV oil recovery system, using an inflatable oil containment boom and a sorbent belt skimmer.

The final day of the course included an informative lecture on SUPSALV's planned procurement of equipment necessary to provide the Navy with a worldwide open sea and salvage related pollution response capability. The lecture and following discussion period produced a great deal of student participation and brought out numerous problems encountered by the fleet in many of its remote areas of operation.

Future plans include a similar conference later this year on the east coast, in an attempt to enroll those persons unable to attend the course recently concluded. In addition, a portion of the material presented will be incorporated into the curriculum of the Salvage Officers Course conducted at the Naval School of Diving and Salvage.



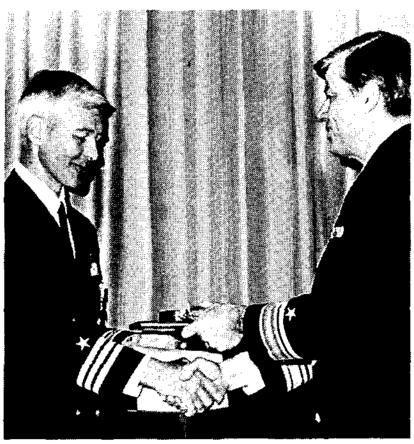
Navy absorbent belt skimmer and inflatable boom demonstrates "sweep" mode of operation off Tiberon, San Francisco Bay.

Mr. E. H. Simpson, Murphy Pacific, demonstrates various types of containment boom at SUPSALV Pacific Response Center.

honors and awards

RADM Kenneth E. Wilson, Deputy Commander of Naval Ship Systems Command, recently made a special award presentation of the U.S. Army Meritorious Service Medal to CDR Robert B. Moss, USN, Deputy Supervisor of Salvage, NAVSHIPS. The award was given in recognition of CDR Moss' service from June, 1972, to September, 1972, as the Navy Project Officer during the SIDNEY E. SMITH emergency salvage operation in Port Huron, Michigan.

CDR Moss' efforts provided timely assistance and leadership in the plans and actual operations of the joint Federal/civilian salvage team during a particularly critical period in which sound engineering judgment was essential. Specifically, the award notes that CDR Moss' "tact, conduct, and knowledge in assisting the Detroit District Engineer, Corps of Engineers, U. S. Army, were exemplary and led to the solution of several highly complex engineering problems." Throughout the operation, his "outstanding performance of unusually demanding duties reflects utmost credit upon himself and the United States Navy."



RADM Wilson (right) with CDR Moss.

As Assistant Supervisor of Diving, Naval Ship Systems Command, CDR William I. Milwee, USN, made important and lasting contributions in improving diving techniques, equipment, and tools. For this service to the U. S. Navy during the period of May, 1970, to June, 1973, CDR Milwee was awarded the Meritorious Service Medal.

CDR Milwee's involvement in diving technology was fundamental in the strides made during his tour, providing the necessary elements that enabled Navy divers to work safely, efficiently, and in comfort in the open sea to depths of 1000 feet. His citation states that, specifically, CDR Milwee "was the driving force in foreseeing the Navy's requirements in Surface-Supported and Deep diving. He was instrumental in developing the closed-circuit underwater breathing apparatus (Mk 10) and the Mk 1 Deep Dive System." In summary, CDR Milwee's overall service as Assistant Supervisor of Diving was "in keeping with the highest traditions of United States Naval Service." CDR Milwee is presently serving as Salvage Officer, on the staff of Commander Service Force Pacific, Hawaii.

LCDR James C. Bladh, USN(Ret.), was recently awarded the Meritorious Service Medal for his service as the Operations Officer in the Office of the Supervisor of Salvage, Naval Ship Systems Command. CAPT J. Huntly Boyd, USN, Director of Ocean Engineering/Supervisor of Salvage, NAVSHIPS, presented the award, specifying various accomplishments made during LCDR Bladh's December, 1971, through May, 1973, tour at NAVSHIPS.

LCDR Bladh's professional skills were demonstrated on numerous occasions, including the disposal of the X-REGULUS (AF-57) at Hong Kong, British Crown Colony, where he served as Officer-in-Charge, and in the salvage of M/V ORIENTAL WARRIOR at Jacksonville, Florida, May, 1972, through September, 1972. Also cited in the award was LCDR Bladh's "in-depth knowledge of saturation diving practices and procedures," which was instrumental in the successful completion of a 1000-foot, cold-water test of the Mk 10 Mod 4 closed-circuit underwater breathing apparatus at the Admiralty Experimental Diving Unit, Alverstoke, England. (See *FP*, Fall, 1972.) The able leadership and operational skill displayed by LCDR Bladh during this tour of duty "were in keeping with the highest traditions of United States Naval Service."

CAPT Boyd (right) with LCDR Bladh.

Do Not Fold, Spindle Or Mutilate

U.S. NAVY CERTIFICATION OF SYSTEM ADEQUACY

1. NAME OF SYSTEM	2. BUILDER	3. TYPE
4. SUPPORT SHIP	5. IDENTIFICATION NO.	6. AUTHORIZED DEPTH FT.

7. AUTHORITY AND BASIS FOR ISSUANCE:
This certificate is issued pursuant to the current OPNAVINST 99[illegible].1E and certifies that, as of date of issuance, the system to which issued, has been inspected and found to be materially adequate as described in the System Certification Procedures and Criteria Manual For Deep Submergence Systems, NAVMAT P-9290.

8. TERMS AND CONDITIONS:
Unless sooner surrendered, suspended, revoked or a termination date is otherwise established by the Naval Ship Systems Command, Washington D.C., this certification is effective until it expires (see date below), as long as the system operates within the authorized depths noted in Item 6 above, and preventive maintenance and alterations are performed in accordance with NAVMAT P-9290.

DATE CERTIFICATE ISSUED	DATE CERTIFICATE EXPIRES	NAVSHIPS LTR. FILE REF.
BY AUTHORITY OF NAVSHIPSYSCOM	(Signature & Title)	NAVSHIPS LTR. DATE

NOTE: VOID IF ALTERED, DEFACED OR EXPIRED

Mr. Charles Darley
Office of the Supervisor of Diving

U. S. Navy regulations stipulate that prior to utilization all Deep Submergence Systems in fleet service must have been submitted to the "System Certification Process." Deep Submergence Systems are all equipment and noncombatant vessels that take men under water, including support equipment and certain types of hyperbaric and ocean simulator systems.

The System Certification Process is a detailed review of a system's design and the relationship of the hardware to that design. General requirements of certification include: the compliance with Quality Assurance Programs, which cover fabrication of essential hardware; the successful completion of appropriate testing; and the development of sufficient operating instructions. When a Deep Submergence System has satisfied the System Certification Process, it is Certified by issuance of a document that states the operating range, the time period, and other determined limitations within which the system can be deployed.

The philosophy and procedures of this certification process are explained in NAVSHIPS 0994-013-3010, *System Certification for Safety of Deep Submergence System.* Another publication, NAVMAT P-9290, *System Certification Procedures and Criteria Manual for Deep Submergence System* is known as the "Certification Bible."

Two on-going deep submergence systems certification efforts of particular interest to the diving community are those of recompression chamber installations and surface-supported diving systems. The certification of nonportable shoreside recompression chamber installations is the responsibility of Naval Facilities Engineering Command, while shipboard and portable shoreside recompression chamber installations are assigned to the Naval Ship Systems Command. The certification of all surface-supported diving systems is also a NAVSHIPS responsibility.

Two NAVSHIPS documents, entitled Pre-Survey Outline Booklets (PSOB's) have eliminated almost all of the guesswork as to what the "Bureau" requires. Assembling the required technical package, however, is still difficult and will probably require a coordinated effort between the diving officer and the ship's engineer (or his equivalent in nonshipboard activities). Shipboard and portable recompression chamber installations are discussed in NAVSHIPS 0994-014-0010; while the surface-supported diving systems are covered in NAVSHIPS 0994-014-9010.

NAVSHIPS expects certification efforts to extend over a 5-year period. The required technical reviews will take a minimum of several months, depending on the individual ship or activity. The logical time for a ship to accomplish corrective actions indicated by the reviews is during scheduled overhaul; therefore, the corrective actions should be covered by the ship's 180-day planning letter. For the most efficient handling, the certification process should be initiated by an individual ship between 12 and 18 months before a scheduled overhaul.

This scheduling causes relatively long periods during which some systems will not have been covered by certification. The certification process, however, does include provisions for granting limited waivers to accommodate planned operations prior to a system's certification. Such waivers are granted by Naval Operations (OPNAV), Code OP-23, and are requested via Naval Material Command (NAVMAT), Code MAT-034. A copy of such waivers is sent to either NAVSHIPS (Code 00C-SC) or NAVFAC (Code FAC-04Ba), depending on the type of system in question.

Waivers will be granted on the basis of an acceptable risk, which is determined by the historical and technical background information forwarded with the request. Waivers for emergency treatments only in uncertified recompression chamber systems are not within the scope of the Certification Procedures as elaborated in NAVMATINST 9940.1A and are not required. The Commanding Officer or Officer in Charge must exercise authority for emergency treatments as defined by OPNAVINST 10560.1 and should be guided by the limitations of the U. S. Navy Diving Manual, NAVSHIPS 0994-001-9010.

The certification process exists as a result of the fleet's concern and it is for the fleet's benefit. Hang in there and we can make it work.

LEGION OF MERIT AWARDED TO CDR SPAUR

CDR William H. Spaur, MC, USN, Senior Medical Officer at the Navy Experimental Diving Unit (NEDU) since 1970, is considered one of the Navy's foremost experts in diving physiology and hyperbaric medicine. His expertise was specifically demonstrated while serving as the Project Director for the USN 1600-foot experimental chamber dive from April 17, 1973, through May 25, 1973. (See *FP*, Fall, 1973.) In recognition of this particular contribution to diving technology, CDR Spaur has been awarded the Navy's Legion of Merit. RADM Walter N. Dietzen, Deep Submergence Systems Program Coordinator, presented CDR Spaur with this award, given for "exceptionally meritorious conduct in the performance of outstanding service," in a ceremony at NEDU on November 14, 1973.

The 1600-foot saturation dive was the fruition of a lengthy program of testing and evaluation carried out jointly by NEDU, the Naval Medical Research Institute, and the Bureau of Medicine and Surgery. Throughout this research effort, landmark deep diving experiments were conducted. As a result, testing and evaluation techniques formerly considered too difficult have been successfully developed and implemented. In addition, the time spent below 1000 feet on this dive established a new world record.

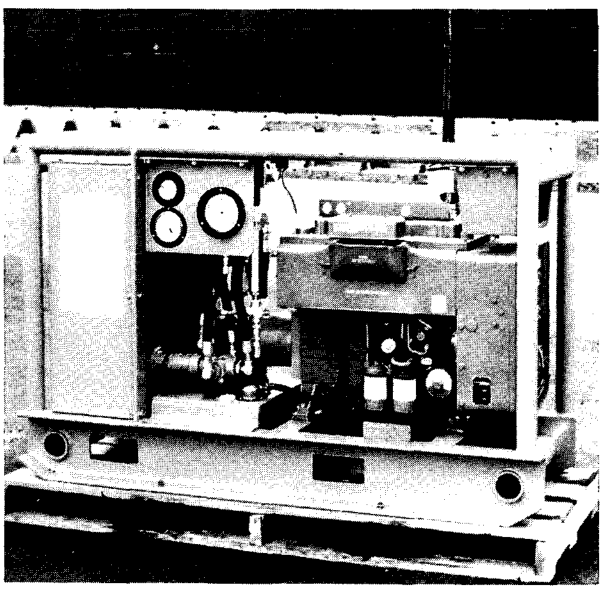
As stated in the citation: "The command, research, development, and administrative efforts of CDR Spaur represent a unique contribution which will be of permanent operational value in upgrading the safety of diving, evaluating new equipment and techniques, and meeting the requirements of a rapidly expanding diving program in the U.S. Navy."

RADM Dietzen (right) presents award to CDR Spaur.

HYDRAULIC TOOL PACKAGES ON THE WAY

Mr. John Mittleman
Naval Coastal Systems Laboratory

What kind of tools are divers equipped with today? Chances are you'll find a large number of hand tools and a few pneumatic tools at most activities, but times are changing. Comparisons between the underwater performance of pneumatic and hydraulic tools were started in 1967 at the Naval Civil Engineering Laboratory, Port Hueneme, California, and are now continuing at the Naval Coastal Systems Laboratory (NCSL), Panama City, Florida. In terms of power, versatility, and ease of maintenance, hydraulic tools were found to be superior. Air tools, though, continue to be more often used. They are easily acquired, and compressed air is readily available. Soon, however, divers will have greater access to hydraulic tools. The superior performance of these tools on such projects as the Makai dives and the Mk XII hardhat system technical evaluation dives brought recognition from the Supervisor of Salvage, Naval Ship Systems Command. NAVSHIPS has therefore initiated placement of hydraulic tools into the fleet, both at operational and at training activities.



NAVSHIPS Model 1 Diesel Hydraulic Power Source.

By summer, 1974, divers in the vicinity of each of the first eight receiving activities will have access to the following equipment:

NAVSHIPS Model 1 Diesel Hydraulic Power Source

For use with:

- Impact Wrench with 5/8-inch quick change chuck
- Impact Wrench with 3/4-inch square drive
- Grinder

Diver Operated Pump

For use with:

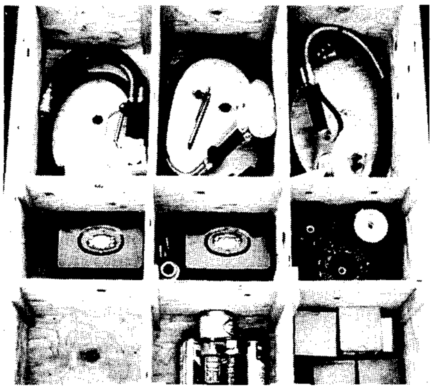
- Wire Rope Cutter, 1-1/8-inch capacity
- Barstock Cutter, 5/8-inch re-bar capacity
- Pull Cylinder
- Jack

The NAVSHIPS Model 1 Power Source combines a 24-horsepower diesel engine with hydraulic components, providing a convenient hydraulic power source of up to 15 gallons per minute (gpm) at 2000 psi. This power is communicated through a 3/4-inch I.D. hose to any one of the tools in the package. Although the tool package includes only two wrenches and a grinder, other tools, including chainsaws, sump and jetting pumps, abrasive cutoff wheels, and hydraulic intensifiers, can be used with the power source.

The impact wrenches perform such functions as drilling, tapping, and nut or bolt running. They also provide the diver with a measure of safety, since the impacting mechanism eliminates torque feedback to the diver's wrists if he jams a bit. The 5/8-inch quick change chuck will accept a screwdriver blade; an Allen wrench; a 1/2-inch square drive; or a hex power shank capable of carrying a drill chuck that can be used for tapping. The 3/4-inch square drive is used primarily with sockets of up to 1-1/2 inches across the flats.

The grinder can be used with a choice of grinding wheels or wire brushes and has also been used with hull cleaning brushes. The most versatile wheel used to date has been the fiber-reinforced disc wheel with hard grit and a soft bonding matrix. Harbor Clearance Unit

ONE reported the use of this tool in the removal of weld beads from the ropeguard and retaining nut of a YTB shaft, making it easier to change a screw. In August, 1973, during the Mk XII Techeval phase in Hawaii, USS BOLSTER (ARS-38) made use of the grinder to free her shaft of 1-1/4-inch wire rope that had jammed between the screw hub and shaft strut. Further investigation indicated that using the hydraulic grinder from the start would have reduced the bottom time for this job from 15 hours, using hand tools, to a maximum of 1-1/2 hours.



Power tools package.

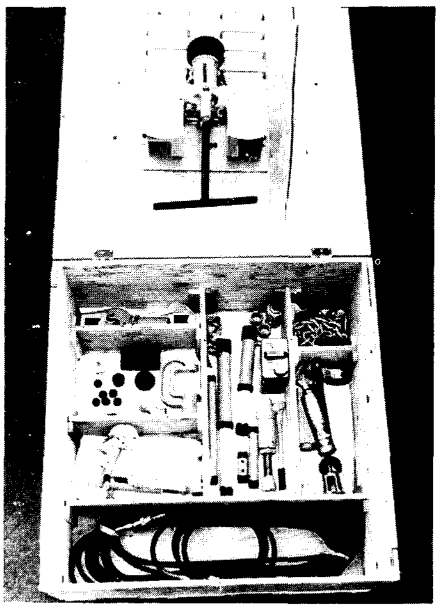
The diver operated pump generates small volumes of high pressure (3000-6000 psi) hydraulic oil for use with the hydraulic cylinders of the wire rope cutter, barstock cutter, pulling cylinder, and jack. The current capacity of the tool package's wire rope cutter is 1-1/8 inches in diameter. The grinder is used for larger sizes, such as 1-5/8 inches or 2 inches. Reinforcing rod up to a 5/8-inch-diameter, or 1/2-inch ACSR (high strength) wire rope can be handled with the barstock cutter.

The pulling cylinder and the jack are useful tools in salvage operations. Two pulling cylinders used alternately can drag loads of up to 5 tons across the seafloor. In addition to lifting up to 5 tons, the jack can be fitted with accessories for spreading, clamping, or bending.

Neither of the power sources described is limited to use with tools included in the NAVSHIPS Package. For example, submarine hull cleaning brushes will be used with the NAVSHIPS Model 1 Power Source at the New London Submarine Base. Future plans include adding to the package such new tools as a 400-gpm sump pump useful for jetting and washing, and a hydraulic intensifier for oil conversion. The intensifier will change the high flow rate/low pressure oil put out by the Diesel Hydraulic Source into low flow rate/high pressure oil, replacing the diver operated pump.

The current distribution of the NAVSHIPS Tool Package includes the Navy School of Diving and Salvage, Washington, D. C.; the Second Class School, San Diego, California; the Explosive Ordnance Disposal (EOD) School, Indian Head, Maryland; and the Saturation School at Submarine Development Group ONE, San Diego. There are also units at Harbor Clearance Unit ONE, Pearl Harbor, Hawaii; Harbor Clearance Unit TWO, Norfolk, Virginia; the repair facility at Subic, Philippines; and the Submarine Training Center, Pearl Harbor. A 2- to 3-day training course was conducted by one of the laboratory task leaders at each of the receiving activities, with divers from neighboring activities also participating in these sessions.

The role of the engineers associated with this hardware has changed since the first comparative studies were reported in 1967. The tools have been modified, retested, and put into the hands of the divers they would eventually serve. Those tools proven sufficiently useful and reliable were then designated by the Supervisor of Diving for inclusion in the current tool package. The distribution of the first shipment of tool packages begins field use. NCSL engineers will continue to cooperate with the receiving activities to allow a smooth transition from experimental to operational tools.



Diver pump and hand power tools package.

For further information, contact John Quirk or Bob Elliott, Department of Diving and Salvage, Code 710, Naval Coastal Systems Laboratory, Panama City, Florida 32401, Autovon, 436-4388, Commercial, (904) 234-4388.

CAPT BOYD DISCUSSES NEW POST

"This office has built a well-earned reputation of being a responsive, resourceful, and professional organization—one that can get the tough job done. I want to preserve, and if possible, improve that reputation."

The office referenced above is SHIPS OOC, Naval Ship Systems Command. The man intending to continue and improve the reputation is CAPT J. H. Boyd, Jr., new Director of Ocean Engineering and Supervisor of Salvage, NAVSHIPS, USN. Succeeding CAPT E.B. Mitchell, USN (Ret.), in September, 1973, CAPT Boyd now commands a complex organization that includes USN diving, salvage, and ocean engineering. In a recent interview with Faceplate, *he discussed some of the methods by which he plans to realize his overall objective, a few of the problems facing him in his new duty, and also an additional comment on his own interest in this field.*

Diving: While not discounting the importance of and the requirements for major continuing efforts in the area of deep diving, I very much want to improve the lot of the conventional diver. For instance, additional emphasis will be placed on the Mk I Divers Mask procurements and the Mk XII development as replacements for both the shallow water mask and Mk V deep sea outfit. I feel we can do much more than we are in the area of underwater ship husbandry; but we need better tools and techniques and certainly more practice. Perhaps a different philosophy is required so that underwater repair is considered a standard procedure instead of a 'last alternative' method. We're looking into it. Instead of making *emergency* underwater repairs, let's do *quality repairs* under water. And I put the emphasis on the words *quality repair*, not *under water*.

Our diving publications have been lagging a little recently. However, the Diving Gas Manual should be ready for distribution by April 1, 1974, with the new edition of the U.S. Navy Diving Manual following in June, 1974. (See Soundings, p. 4.) Additionally, a large printing of the highly popular Diving Operations Handbook will be ready for distribution in June, 1974.

Salvage: In the salvage area, I am delighted that there *is* something new to be taught to the old dog. The hydraulic pullers for beach gear [see *FP*, Winter, 1973] are particularly exciting. I'm also intrigued by the potential of using hydraulic machinery—especially for high power requirements such as pumps. We'll pursue the developments at a high priority.

But as in diving, experienced people are the most important element in salvage, and we must preserve and improve our expertise in this area. If the existing capabilities are not exercised they will quickly atrophy, especially in the fleet where there is such a quick turnover. If the fleet should lose this capability, we could have a duplicate of early WW II, when it took over 2 years to redevelop a viable salvage capability within the Navy. Therefore, I intend to continue and where possible expand the past cooperation and coordination between my office and the

Within the diving area of responsibility, SHIPS OOC provides technical direction for all Navy diving and underwater swimming programs; and develops, tests, and procures diving equipment, procedures, and systems. This also involves coordinating the Navy program for Safety Certification of diving systems and manned noncombatant submersibles. (See page 9.)

The management of all technical aspects of Navy Salvage Programs is a second major responsibility. The Supervisor of Salvage (SUPSALV) directs the development, testing, and procurement of salvage equipment and procedures; maintains emergency ship/submarine salvage (ESSM) pools and bases; maintains salvage, diving, and search and recovery contracts with commercial firms; and maintains and directs the Navy Salvage Service and Navy Rescue Tow Service. When requested or directed, SUPSALV takes operational control of salvage operations.

Also included among the numerous tasks within SHIPS OOC is directing the technical aspects of and providing equipment for the Navy's offshore oil pollution abatement program. Another assignment is the coordination and direction of NAVSHIPS efforts in nonmilitary-oriented ocean engineering systems and programs. (The complete SHIPS OOC Charter is contained in NAVSHIPSINST 5432.1B.)

Fleet Salvage Forces so the fleet will at least have the "first refusal" on bona fide salvage opportunities before contractors are brought in.

Until recently, Harbor Clearance Unit ONE, Pearl Harbor, Hawaii, was extremely active in Vietnam and was the vehicle for training a large number of young salvors. Many of these men have now returned to civilian life but have expressed interest in a Reserve Harbor Clearance Unit program. Consequently, we are sponsoring the organization of such a program within the Naval Reserve.

Problems: We have the age-old problems of people, funds, technology, and time shortages. We'll continue to do our best to manage these problems. One shortage we don't have, though, is in the area of interest. As we all know, there are many commands, activities, and agencies interested in the general subject of ocean engineering, both within the Navy and elsewhere in the Government. In addition, there are a large number of extremely active parties in the industrial, academic, and the press communities—all competing for their share of a relatively small pie. Overlapping authority, responsibility, and charters are frequent, and competing programs abound. One major goal that I have is to promote more efficient use of the limited national resources we do have in this area through cooperation and coordination. I'm not so naive to think all the competition and overlap can, or even should, be eliminated, but I feel much can be accomplished and we'll certainly try.

When asked how he first became interested in this field of duty, CAPT Boyd mentioned two incidents in particular. His first major operational contact was in 1962, while serving at the Naval Ship Repair Facility in Guam. In a period of 5 months, two typhoons sank or stranded 17 vessels. As Salvage Officer, CAPT Boyd became deeply involved with, and was instrumental in, the handling of this operation (for which he received the first of four Navy Commendation Medals). He was then selected as the 7th Fleet Salvage Officer (COMSERVRON THREE), though 9 years junior to his predecessor. His first day of duty there presented him with another major salvage operation: the sinking of USNS CARD in the Saigon River. According to CAPT Boyd, his salvage experiences "went on from there." What did follow "went on" exceptionally well; of the 28 salvage operations under his direction, all but one were successfully completed. The one exception, USS BACHE, had to be dismantled because of damages caused by several severe storms during the recovery operation.

Regarding the personal satisfaction he has derived from this work, CAPT Boyd commented, "I consider myself a U.S. Naval Officer first, an ED Officer second, and a Salvage Officer third. In each tour of duty, salvage was an additional task; but there is no question that being a Salvage Officer has been the frosting on the cake of a normal career." *If his career as Director of Ocean Engineering/Supervisor of Salvage is at all similar to his past record, it will be, no doubt, a successful one.*

CAPT Boyd graduated from the U.S. Naval Academy in 1953. After duty aboard USS GAINARD (DD-706) and USS JOHN S. McCAIN (DL-3), CAPT Boyd attended the Massachusetts Institute of Technology for advanced degrees in Naval Architecture and Marine Engineering. He is also a graduate of the Navy School of Diving and Salvage, Washington, D.C. He next performed duty at the Long Beach Naval Shipyard, Long Beach, California; the Naval Ship Repair Facility, Guam; and with the staffs of Commander Service Group THREE and Commander Service Force, U.S. Atlantic Fleet. His next post was as Officer in Charge, Navy Experimental Diving Unit, Washington, D.C., followed by a tour of duty with the Bureau of Naval Personnel.

CAPT Boyd has been awarded four Navy Commendation Medals for his performance in the following operations: Harbor clearance after Typhoon Karen, Guam, 1962; salvage of USNS CARD, Saigon River, 1964; salvage of USNS FRANK KNOX, Pratas Reef, South China Sea, 1965; and salvage of the commercial vessel OCEAN EAGLE, San Juan, Puerto Rico, 1968. He was also awarded the 1966 Gold Medal Award of the American Society of Naval Engineers. CAPT Boyd is a member of the Honorary Engineering and Scientific Societies SIGMA XI and TAU BETA PI.

"The contributions the diving industry has made both to the security of this nation and well being of mankind are too often taken for granted. The myriad of successful salvage operations, and the tremendous — and extremely vital — expansion of the oil industry into the floors of the world's oceans are but two outstanding examples. In the view of many, including myself, the primary factor enabling these accomplishments has been the close working relationships between all divers — regardless of nationality or means of financial support."—ADM Kidd

"While we are quick to acknowledge our accomplishments in diving, we fully realize that the working diver of tomorrow requires better tools, procedures, and techniques to effectively prosecute our missions. It is our job to see that he gets them."—RADM Dietzen

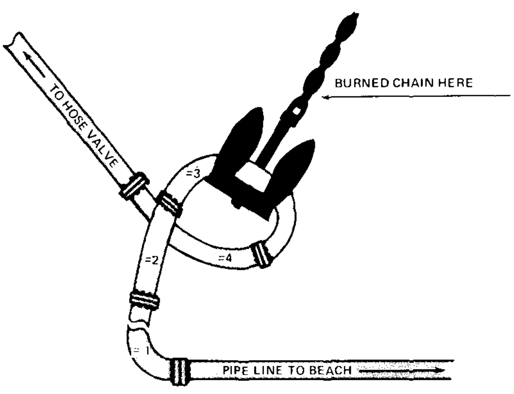
The free interchange of knowledge among the varied philosophies of United States and foreign navies and commercial firms was the reason over 450 divers, scientists, and engineers gathered for the fourth bi-annual Working Diver Symposium. Presented at Battelle Memorial Institute, Columbus, Ohio, on March 5 and 6, 1974, the symposium was sponsored by the U. S. Navy Supervisor of Diving, USN Office of Naval Research, the Marine Technology Society (MTS), the Ocean Technology Division of the American Society of Mechanical Engineers (ASME), and Battelle-Columbus.

Following the call to order by CAPT J. H. Boyd, Jr., USN, Director of Ocean Engineering/Supervisor of Salvage, NAVSHIPS, RADM Walter N. Dietzen, USN, Deep Submergence Systems Coordinator, welcomed the attendees on behalf of the Office of the Chief of Naval Operations. RADM Dietzen first noted the significant accomplishments in the realm of commercial diving, referring particularly to dry welding habitats, compressor-depressor breathing systems, and diver equipment improvements. He then discussed the advances made within the Navy diving program, including present or near-present procurements of the Mk I Diving Mask, portable recompression chamber, roving bells, and diver tool packages.

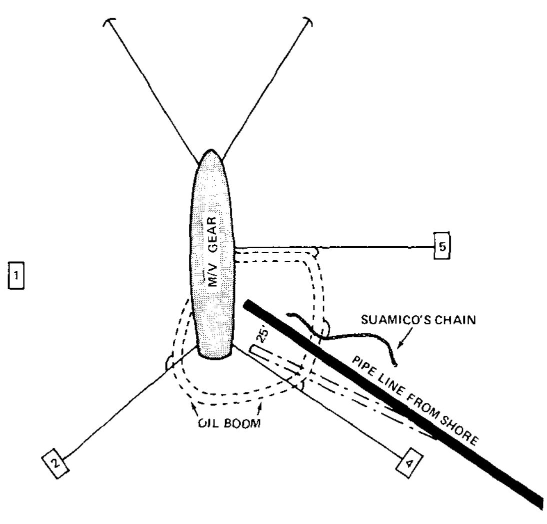
The attendees then heard experts in their respective diving fields from Canada, England, France, Japan, and the United States discuss a wide range of topics of current interest to all working divers. Subjects included arctic diving expeditions, offshore oil-exploration diving, underwater construction and salvaging, and specialized equipment. The speakers came from such diverse interests as the U. S. and British navies, diving equipment manufacturers, diving firms, and research organizations.

ADM Isaac C. Kidd, Jr., USN, Chief of Naval Material, was the keynote speaker at the symposium banquet. Speaking on the "Progress and Problems in Navy Diving," ADM Kidd discussed "where we are, where we may be going, and . . . a few factors about the overall naval environment — as we pause to take bearings on this longstanding, but still challenging, profession of diving in today's modern world." He emphasized not only the importance of military/industrial cooperation, but also the mutual benefits derived from international exchange agreements. ADM Kidd expressed the general opinion of all who attended the symposium with his comment: "conferences such as this certainly provide a highly essential opportunity to exchange opinions and develop new insights."

OIL POLLUTION SAL
MOVE INTO



Above: POL hose layout with anchor caught on hose section no. 3. Below: Boom is moored to no.'s 2, 4, and 5 nylons with running shackle and to SUAMICO's abandoned chain with 80-foot, 3/4-inch wire pennant.



USNS SUAMICO

The Supervisor of Salvage (SUPSALV) was called upon to prevent an oil pollution incident on November 6, 1973, when USNS SUAMICO damaged a POL line off Morro Bay, California. While preparing to transfer JP-5 fuel for Lemoore Naval Air Station, SUAMICO was mooring to a fixed buoy when her port anchor dragged and fouled in the 12-inch off-loading hose. Realizing what had happened, SUAMICO dropped her anchor and chain to prevent further damage and reported the accident before departing the area.

LCDR J. Mike Martinez, SUPSALV Representative, West Coast, immediately alerted pollution control experts from Murphy Pacific Marine Salvage Company. Assets were assembled to free and recover SUAMICO's anchor and chain, prevent possible oil pollution, and repair the broken POL hose. These assets included 2500 feet of heavy duty offshore oil boom from the Navy Pollution Response Center in San Francisco, California; the salvage vessel M/V GEAR; and personnel necessary to do the job.

Before the in-depth procedures were initiated, 1000 feet of containment boom was assembled at Morro Bay, towed 5 miles to the offshore site, and moored to serve as a preventive measure throughout the operation. Most of the 2500 feet of boom was eventually secured to GEAR's mooring lines and to SUAMICO's abandoned anchor chain with an 80-foot wire. After surveying the damages to the pipe, hose, and fouled anchor, divers removed a spar buoy (marking the end of the pipe) with its anchor and chain. SUAMICO's anchor was then burned loose from its chain, disentangled from the POL hose, and raised to the deck of M/V GEAR.

VOPS HIGH GEAR

Work could now begin to permit back flushing of the fuel line to shore tanks. After divers secured a wire to the valve head, GEAR began heaving the end of the POL hose onto the deck. When a tangled lift wire was cleared from the valve head and buoy, the blank on the valve head was modified to promote back flushing of the fuel line. Wire hoses were led out, and precautionary measures were taken to prevent and combat fire. The opening of the valve on the beach initiated back flushing to the shore, with divers continually checking the hose and pipe for leaks. Using 90 pounds of water pressure, the 400 barrels of JP-5 were flushed from the hose without loss or spillage.

Since the danger of oil pollution was now over, the oil boom was released and returned to the shore by the tug CAYUCOS. Installation of the new hose began after divers had freed the damaged hose from the pipe line and brought the last section onto GEAR's deck. While they were connecting the new hose, however, divers discovered a cut in one section. As a precautionary measure, all of the hose was then removed and transported by GEAR to Port Hueneme, California, for hydrostatic testing.

Testing was accomplished within 3 days, and divers were able to complete the installation of the hose sections without further mishap on November 14. The final inspection of the new POL hose and the subsequent recovery of SUAMICO's anchor chain brought the operation to a close. The expertise of all personnel involved had averted an oil pollution incident while successfully completing the necessary repairs.

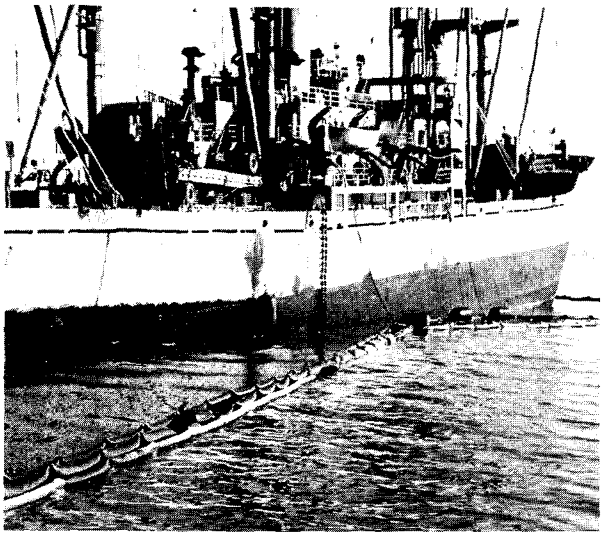
USNS PRIVATE JOSEPH MERRELL

Both the ship salvage and oil pollution control expertise of the Supervisor of Salvage were called upon when SS PEARL VENTURE and USNS PRIVATE JOSEPH MERRELL collided off Cape San Martin, California, on December 24, 1973. The accident between the 471-foot Liberian freighter and the 455-foot U.S. Navy cargo ship occurred in a dense predawn fog, leaving in its wake a severely damaged vessel and a rapidly spreading oil slick. MERRELL had been enroute to Oakland from Port Hueneme, California, in a restricted visibility of 500 yards when VENTURE's bow penetrated halfway through MERRELL's hull on the port side. No injuries were reported from either vessel.

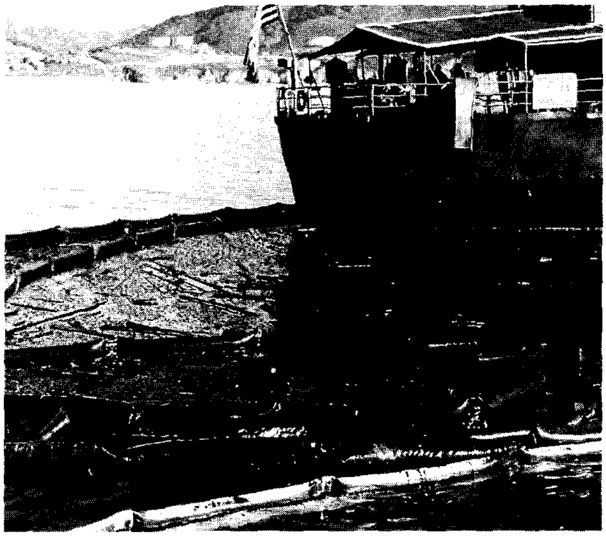
The U.S. Coast Guard notified LCDR J. Mike Martinez, the Supervisor of Salvage Representative (SUPSALVREP), West Coast, who in turn called upon Murphy Pacific Marine Salvage Company, SUPSALV's primary contractor. Preparations were made immediately for shipment of containment boom, skimmers, support vessels, and pumping systems to the scene. By midday, December 29, the logistics operation was in full swing. Detailed information on the incident had been received and correlated. Response forces were selected, briefed, and enroute to the accident site.

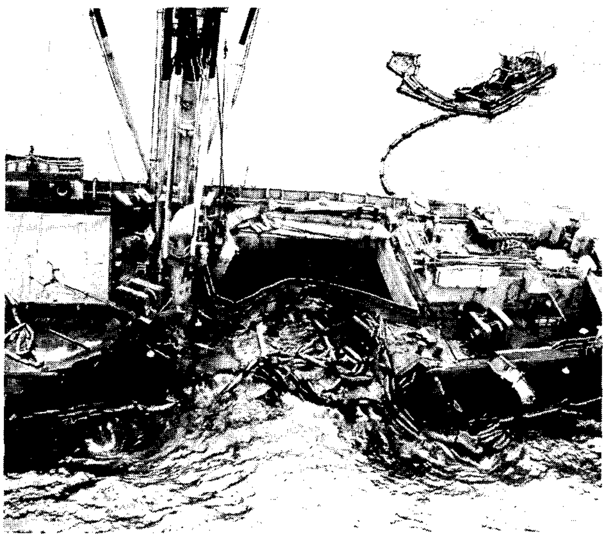
LCDR Martinez and the Senior Salvage Master of Murphy Pacific boarded MERRELL at sea to make an assessment of the salvage situation. Murphy Pacific's Pollution Project Manager proceeded to Monterey to assist the pollution control operations.

PEARL VENTURE had been able to pull away from the collision and continue under her own power to Long



Photos at left and below show various scenes during oil spill control phase of MERRELL salvops.





MERRELL . . .

Beach, California. MERRELL, however, lay "dead in the water" and, though in no apparent danger of sinking, required towing by the salvage vessel, M/V GEAR. The Coast Guard reported that an oil spill of approximately 16,000 gallons had streamed 100 yards wide and 2 miles long from MERRELL's shattered hull.

The 10-foot seas and 25-knot winds naturally dissipated whatever leakage was not picked up with oil containment equipment. By the following day, the focus of attention shifted from the spill to the towing of MERRELL. The location of Port San Luis had been selected previously as the most acceptable lee for the ship, should its stability and structural integrity be in question. On her arrival at Port San Luis, MERRELL was encircled with oil boom to contain the leaking oil and debris. Action then commenced toward the ultimate salvage and oil spill control. Open sea, high capacity skimmers were brought in to recover what was by then a sizeable concentration of oil and dunnage from the number 4 and 5 holds. During the first night of operations a severe storm ripped the oil barriers apart, resulting in beach pollution. Thereafter, efforts were spread over three areas: removing the unusable boom from number 4 hold, collecting oil and debris trapped in the hold, and general beach cleanup.

The Supervisor of Salvage brought in a scow barge containing 1000 tons of ballast, a derrick barge, and necessary auxiliary equipment. Operations then proceeded with the removal of MERRELL's cargo and placement of ballast in the number 2 hold, which would bring the ship to an even keel. Efforts of the salvors to accomplish these objectives were successful, allowing M/V GEAR to commence her tow of MERRELL on January 12 to Port Hueneme.

Final restoration of the polluted beach area was accomplished, successfully completing a combined response mission of salvors and pollution control forces.

MARK 1 : PART 2

*This is the second article in a series covering the events leading to 1000-foot certification for the Mk 1 DDS/ YDT-16 System, located at Harbor Clearance Unit TWO, Norfolk, Virginia. The initial article (*FP, *Winter, 1973) discussed the System's refurbishment, dealing particularly with the handling system for the personnel transfer capsule.*

LT Robert Lusty, RN
Harbor Clearance Unit TWO

For ease of management and to fit dockyard availability dates, the entire uprating process and the task of bringing the Mk 1 DDS/YDT-16 System to function has been divided into three phases:

1. Install and test a suitable handling system. Test dive the equipment.
2. Install a deep mooring system with adequate winches. Blank off the center well and install cool and cold rooms to house a 30-day food supply for 60 men.
3. Carry out work-up dives to 1000 feet in the open ocean.

The aims of the first phase have been achieved, but more open sea dives are planned before going into the yards.

On completion of the handling system installation in September, 1973, the Mk 1/YDT-16 proceeded to Chesapeake Bay to test, evaluate, and train personnel in the new handling system. Using the mock personnel transfer capsule (PTC), the split topping lift handling system proved to be an outstanding success. The seven-part steel wire topping purchases afford the operator excellent control, in addition to providing other very attractive characteristics. This design has made vangs, and the operators tending them, superfluous, since the entire system can be operated by one man at a three-lever control position. The steadying of the PTC as it is moved across the deck is achieved by the tugger boom principle, described in the Winter, 1973, Faceplate. The "marrying" of the split topping lift and tugger booms is believed to be a significant advancement in this type of operation, enabling two operators to handle the PTC. No particular skills are required to operate the system; intelligence, concentration, and practice are the keynotes.

The next step was to take the YDT-16 to sea and test the equipment. During this period, trouble was experienced with the emergency life support package. The nickel cadmium batteries had badly deteriorated and would not hold their charge. Diving was prematurely curtailed and the emergency life support system reported inoperable. After continued searching, Service Squadron EIGHT's Supply Force located a battery containing the cells required. Diving operations then commenced once again, during which time the handling system worked extremely well. The PTC was launched and recovered in state three seas without difficulty, with divers reporting that no alarming gyrations were experienced during the sea/air interface. Winds of up to 50 knots were recorded, but the YDT-16 remained a stable platform throughout the testing. How it operates in a long swell has yet to be seen.

To complete phase one of the program, the 500-foot and 1000-foot saturation dives remained to be completed. Before carrying out manned dives, the entire chamber system, i.e., deck decompression chambers (DDC), entry lock (EL), and PTC, was pressurized to 1000 feet. During this unmanned pressure test, dive leaks were detected at 650 feet. Pressurization continued to 1000 feet to get a better indication of the scope of the leakage, which came from 13 hull penetrators and three valves. Close inspection revealed that the "O" rings making the seals for the hull penetrators had lost their resilience and hardened. As a precautionary measure, therefore, all "O" rings in the System would have to be replaced. This posed a special threat because there was some question as to whether the engineering and stringent cleaning requirements were within the capabilities of the ship's force. In the past, all major work of this magnitude had been undertaken by the manufacturer.

After determining that the ship's force was capable of undertaking this task if certain materials were procured, a plan was formulated and presented to NAVSHIPS, Code OOC, for approval. A telephone arrangement between the NAVSHIPS certification team and Mk 1/YDT-16 personnel was then established to answer technical questions or solve problems as they arose. Working a 14-hour day, a team of five Chiefs and Petty Officers under the direction of HTCS Larry Pulliam completed the necessary repairs. The chambers were then repressurized to 1000 feet for a 24-hour test, during which no leaks occurred.

The leaking penetrator problem, coming when it did, could be considered beneficial because the System is now in a position to move ahead without the worry of leakage. In addition, the System is being "cranked" into SERVLANT's three yearly overhaul periods, beginning this spring. This will allow any future major System maintenance to be programmed during the overhaul period.

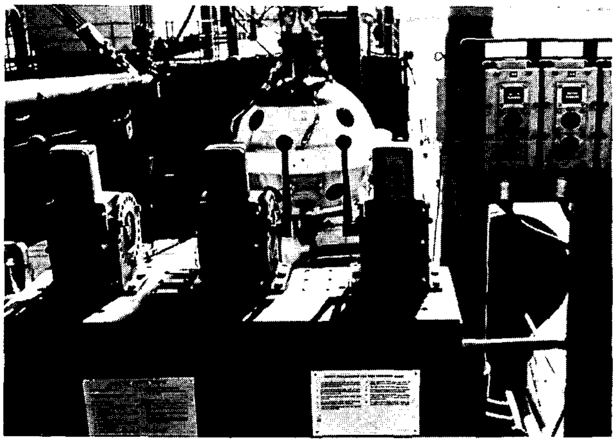
On January 7, 1974, four divers commenced a 500-foot saturation dive, surfacing 6 days later. This dive was successful and gave much-needed training to the many new faces in the team. It was also the first time the newly acquired fireproof clothing had been used. Comments on this material were favorable except for the towel, which lacked sufficient absorbing qualities. Minor static at very shallow depths was noted, but this has been measured and is of no consequence.

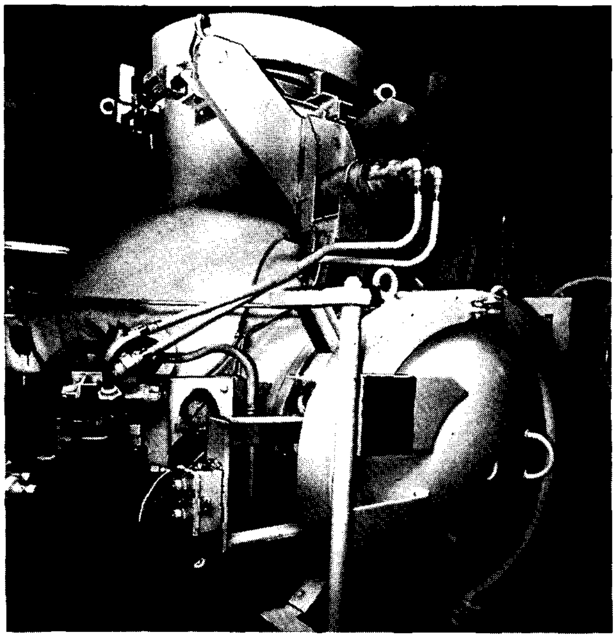
Four divers began the 1000-foot dive on January 28, surfacing on February 9. The System functioned smoothly except for a minor problem with the number two medical lock, which was difficult to seal at depths over 800 feet. This defect has now been corrected by adjusting the locking device.

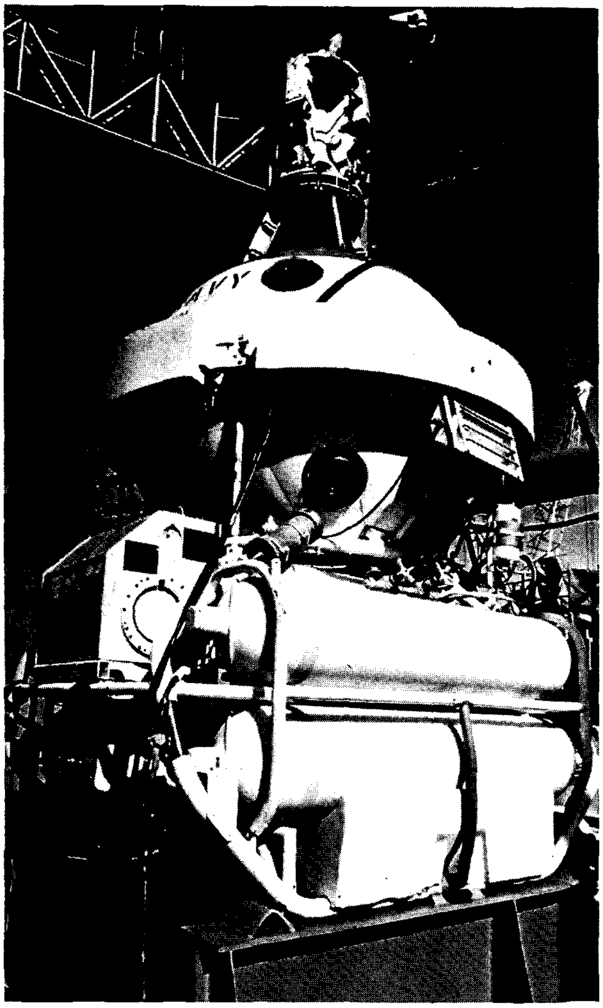
The entire Mk 1/YDT-16 crew is now looking forward to completing the overhaul period and achieving their aim of 1000-foot certification later this year.

Above: Mk 1 DDS divers and crew complete 1000-foot dive. Top row, left to right: BMC Petresak; LT Mewha, MC; GMG 1 Vanderford; LT Lusty, RN (O-in-C, Mk 1); LCDR Whitaker (CO, HCU-2); CPO Fraser, RN; BM 1 Lewis; and HT 1 Seeley. Bottom row, left to right: LCDR Gustafson; BMC Nelson; EN 2 Benoit; BMCS Aichele; EMC Bates (MDV); HTCS Pulliam; and CDR Coleman (Supervisor of Diving, NAVSHIPS).

Top left: three-lever control position for handling PTC. Below left: view of DDC, with entry lock at top. Below: Mk 1 PTC.







Mk 10 UBA with Mod 5 backpack. Backpack contains: UHF Radio (left); UDC (right); AN/PQC-4, with push-to-talk switch modification (bottom). Mk II Mask (in front of AN/PQC-4).

LT Thomas L. Hawkins, USN
Navy Experimental Diving Unit

The Naval Ship Systems Command (NAVSHIPS) sponsored an Operational Assist test project during October and November, 1973, to evaluate various auxiliary equipments being developed under Technical Development Plan (TDP) 38-02, *The Swimmer Support System*. Each of the developmental test items was intended for utilization primarily by Navy Underwater Demolition Teams (UDT) and Seal Teams. Included in the evaluation were: The AN/PQC-4 (XAN-1) Sonar Communications Set; a UHF Radio; two individual microphone assemblies; two separate divers' full face masks; an underwater decompression computer; and the Mod 5 backpack, which was designed for use with the Mk 10 Underwater Breathing Apparatus (UBA). Each of the equipments evaluated was designed to be diver transported as individually packaged optional selection items that mate to the swimmer's life-support system. Each of the following line items was in various stages of development during the testing:

AN/PQC-4 (XAN-1). The PQC-4 is an experimental radio system intended for underwater applications with open-, closed-, and semi-closed-circuit SCUBA. The radio incorporates several optional modes of operation that allow divers to communicate in both acoustic voice and tone. The unit also offers a hard wire "telephone" communication mode feature. Effective range and intelligibility characteristics of the experimental units were tested.

UHF Radio. The UHF Radio is a diver-carried unit designed to interface with the AN/PQC-4 electronics. The radio has both land use and in-water applications. Interface and operational characteristics of the radio were evaluated.

Microphones. Two separate microphone assemblies, both prototype units, were evaluated during the test series. One model was developed by the Ling-Tempco-Vaught (LTV) Corporation and the other by the Naval Coastal Systems Laboratory. Intelligibility characteristics were compared.

Full Face Masks. The first prototype mask, developed by the Naval Coastal Systems Laboratory, has been designated as the Mk II Mask. A second test mask, the "Scott Mask" or "3802 Mask," was developed under the TDP 38-02 contract by Scott Aviation Corporation. Both masks were comparatively evaluated to determine intelligibility characteristics as related to physical human factors considerations.

Underwater Decompression Computer. The underwater decompression computer (UDC) is a diver-carried instrument that electronically computes the total dive status by reference to a preprogrammed decompression table. Various dive profiles are made possible by the selection of optional partial pressures of oxygen and gas mixture settings. The diver is kept informed of the dive status by a multilighted information wrist display. The UDC was evaluated only for interface and physical human factors considerations. Further evaluation will be required by NEDU before conducting detailed at-sea operational testing.

Mod 5 UBA Backpack. The Mod 5 backpack, a "turtle-shell" cover structure for the TDP 38-02 equipment, was manufactured to mate with the Mk 10 Underwater Breathing Apparatus. The backpack was designed to house each of the auxiliary equipments for transport by an individual diver.

Testing of the TDP 38-02 equipment was coordinated and directed by NEDU in response to NAVSHIPS requirements. Operational tests were conducted by the Commander, Naval Inshore Warfare Command, Atlantic (NAVINSWARLANT), at the Naval Station, Roosevelt Roads, Puerto Rico. LT Thomas L. Hawkins, USN, NEDU, was Project Director. BMCM(DV) Corney Leyden, USN, was NAVINSWARLANT Project Officer. Formal approval had been granted by the Chief of Naval Operations to conduct the Operational Assist testing, which was designated as X/S 33.

swimmer support equipment evaluated

Additional diving support services for the Op-Assist were provided by the Commander, Naval Inshore Warfare Command, Pacific; the Explosive Ordnance Disposal Facility; Underwater Demolition Team TWENTY-ONE; Explosive Ordnance Disposal Group TWO; and the Naval Inshore Warfare Task Unit, CARIBBEAN. Technical support services for the AN/PQC-4 were provided by Mr. Bobby Stokes, Mr. Darwin Wiggers, and Mr. Dave Smith of Applied Research Laboratory, Austin, Texas. UHF Radio technical support was provided by Mr. Leo Feldicke of the Naval Avionics Facility, Indianapolis, Indiana. Operational coordination for X/S 33 was provided by the COMOPTEVFOR.

Testing was conducted primarily to determine whether the developmental progress of the equipments was in accordance with the actual specifics of the originally established requirements set forth in the development plan. The Op-Assist also provided an opportunity to assemble each of the auxiliary equipments at one location for joint evaluation as a complete diver transported system/package.

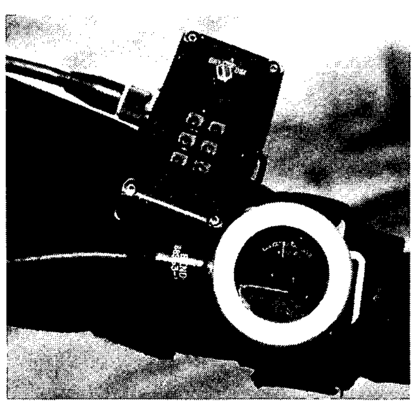
Radio intelligibility tests were conducted in each of the voice communication modes at various ranges and depths. The Modified Rhyme Test (MRT) was selected and utilized during all of the communications tests since it was very easy to administer and score. The MRT was developed specifically for use in determining the intelligibility performance level of speech communications systems.

Test and training operations were formally initiated on October 22, 1973. The Mk 10 Underwater Breathing Apparatus was utilized as the test life-support SCUBA but was not exposed to formalized Op-Assist testing. All tests were conducted in the open ocean at a pre-established test range and/or in conjunction with the Mk VII Mod 2 Swimmer Delivery Vehicle (SDV). The test range was composed of semipermanent marker buoys, which were emplanted at various distances between 0 and 2000 yards to ensure evaluation continuity. Average water depth throughout the test range was 40 feet.

Most of the items being evaluated were developed in response to the specific operating requirements of the UDT/Seal Teams; however, each of the individual equipments offers possible application by EOD and other Navy divers. Overall results of the testing conducted under X/S 33 are now being evaluated and will be released in a forthcoming project report.

CDR Colin Jones, USN, test dives the Mk 10 Mod 5 SLSS during Op-Assist.

MM1 Charles Wetzel, USN, with UHF Radio in land use configuration.



Underwater Decompression Computer wrist display (left) and Mk 10 UBA wrist display.

"SINK-PROOFING": a unique use of foam

The use of foam in salvage operations is a technique usually employed to dewater a flooded compartment in order to float a sunken or partially sunken vessel. A unique situation for installing foam arose in early 1973. The Supervisor of Salvage (SUPSALV) was tasked by the Naval Ship Systems Command Code 427 to provide the technical expertise and equipment necessary to implant approximately 161,000 cubic feet of polyurethane foam in an undamaged ex-U.S. Navy LST (Landing Ship, Tank). Designated MSS-2, the LST was used in Project End Sweep, a program created to demonstrate that the Haiphong Channel was free of mines. The unusual aspect of this operation was that SUPSALV is usually tasked with rectifying situations that have already happened, rather than preventing an incident from occurring.

As the primary ship maintenance division, NAVSHIPS Code 427 was assigned the job of "sink-proofing" a ship for this project. The general requirements for proper configuration of the LST called for the following: sufficient residual buoyancy by filling designated compartments with polyurethane foam; safety of personnel; and fire protection of unmanned main machinery spaces by installing CO_2 fixed fire extinguishing systems, remotely activated from the bridge. The ability to actuate the anchors from the bridge; control the main propulsion engines from the bridge, already a capability of the LST class ship; and provide a means of towing the test hull by helicopter in an emergency, were also specifications of the modification plan.

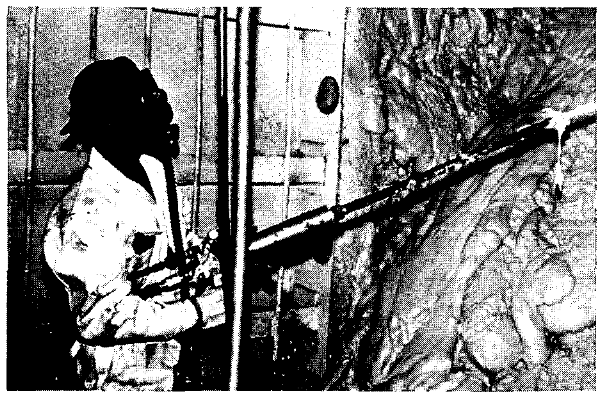
Several characteristics of the LST 1156 class ship determined it to be the most suitable for use as a test hull for Project End Sweep. This ship, as previously stated, has the capability for controlling engines from the bridge, precluding the necessity of further modifications in this area. It also has a sufficient displacement to provide the magnetic signature required for the project, and includes the capability for shallow draft at the required displacement. In addition, ships of this class were available in the Project area, and modifications could be made in the required time frame.

One of the more crucial aspects of this project was the proper installation of the foam, not only to achieve residual buoyancy but also to provide sufficient shock mitigation. Mr. Jerry Totten, from the Office of the Supervisor of Salvage, served as Project Engineer and on-scene representative during the foaming procedures. Murphy Pacific Marine Salvage Company was called upon to handle the operation, using foaming techniques similar to those in the SIDNEY E. SMITH salvops. (See *FP*, Winter, 1973.) The foaming was accomplished at the Ship Repair Facility, Yokosuka, Japan, using local labor.

All spaces below a waterline of 21-1/2 feet aft and 5 feet forward were considered for foam installation, with the exclusion of those compartments required for ship operation. The general procedure followed in each fore and aft section was to insert foam in the lower compartments first, then work upward to the second deck. Three independent foam dispensing heads, each with 275 feet of hose, provided a versatile application. All three units could be used in the same compartment or independently of each other. The ratios were controlled from the central control panel on deck, allowing constant quality control regardless of applicator location. Each unit was capable of applying 3000 pounds of foam per hour.

Eleven days had been allotted for this phase. Working around the clock, however, it was completed well ahead of schedule in 5 days. The MSS-2 was then maneuvered through the channel to successfully demonstrate that the area was clear of any underwater explosives.

The outstanding performance of NAVSHIPS support personnel in a "most important and time-critical operation" was praised in a recent commendation from ADM I. C. Kidd, Chief of Naval Material, USN. *Faceplate* joins with ADM Kidd in expressing "a highly deserved Well Done to the personnel involved."



Above: Both photos show different views of foam implantment.
Below: Central control panel for foam applicators.

DIVERS' GAS PURITY SYMPOSIUM – 1973

While the purity of the air we breathe was taken for granted by many people until the recent environmental crisis, it has never been taken for granted by divers. The 1973 Divers' Gas Purity Symposium provided a forum for over 100 representatives of Navy, industrial, and medical organizations to discuss advances made in solving the problems of divers' breathing gas contamination. Held at Battelle Memorial Institute, Columbus Laboratories, Columbus, Ohio, on November 27 and 28, 1973, this conference was as fruitful as the first symposium on breathing gas purity held in 1970.

The importance of successful exploration diving to the maintenance of a livable world environment was a basic theme in the introductory speeches. Mr. Carl Lyons of Battelle, Columbus Labs, opened the symposium by claiming that maintaining life as we know it may be dependent upon the exploration and development of the underwater frontier. CDR J. J. Coleman, Supervisor of Diving, USN, then emphasized that the free exchanging of ideas afforded by the symposium is an important means by which vital contributions can be made in the diving field. CAPT George F. Bond, MC, USN, of the Naval Coastal Systems Laboratory, Panama City, Florida, concluded the introductory speeches by explaining that it is through the combined efforts of physiologists, engineers, and equipment suppliers that advances in diving technology are achieved.

Experts in the fields of medicine, science, engineering, and diving technology discussed the results of their recent experimentation and analysis in the various areas of gas purity. The 19 papers presented were compiled into preprinted proceedings to acquaint participants with each author's subject before the symposium. The sessions went as follows:

SESSION 1

"Tolerance and Adaptation to Acute and Chronic Hypercapnia in Man"

"Low Temperature Performance of CO_2 Scrubber Systems"

"Sampling and Analysis Methods to Test Breathable Air"

"Reducing Errors in Gas Mixing and Sampling"

"OSHA Breathing Gas Purity Standards"

"Cleaning of Breathing Gas Systems"

SESSION 2

"Production of Diving Gases"

"Human Toxicologic Limits in Hyperbaric Environments"

"Freon Contamination at 400 Feet During a Saturation Dive"

"On-Site Testing of Divers' Compressed Air"

"Complete Analysis of Naval Hyperbaric Diving Gases"

SESSION 3

"Experimental Investigation of Recompression Chamber Ventilation Analysis"

"A Flueric Gas Concentration Sensor for Diver Breathing Gases"

"Recovery and Reuse of Diving Gas"

"Breathing Air Oil Mist Monitor"

"The Quality of Breathable Air Utilized by Canadian Forces Scuba Clubs"

"Divers Air Filter Testing"

"Air Sampling of Scuba Charging Lines"

Copies of the 1973 Divers' Gas Purity Symposium Proceedings may be obtained from the Defense Documentation Center, Cameron Station, Alexandria, Virginia 22314. The accession number is AD769118 and the price is $7.25 per copy.

"For having displayed exceptional competence and devotion to duty from June 5, 1972, to October 12, 1972," Mr. Jerry D. Totten was presented the civilian Superior Achievement Award. Assigned to the Operations Division of the Office of the Supervisor of Salvage, Mr. Totten demonstrated a high level of technical skill as the on-scene Salvage Engineer during the SIDNEY E. SMITH salvage operation in Port Huron, Michigan.

In addition to other duties, Mr. Totten was instrumental in designing and supervising the fabrication of non-structural hatch covers installed over the cargo hatches and various plugs and patches installed over other openings to the river. Mr. Totten's efforts in salvaging the SMITH warrant special recognition as having "significantly contributed to the success of this most difficult operation."

In a special award ceremony on February 28, 1974, CAPT J. H. Boyd, Director of Ocean Engineering/ Supervisor of Salvage, presented the Navy Commendation Medal to LCDR Joseph L. Bradshaw, USN. LCDR Bradshaw received this award for his "meritorious service" as the Supervisor of Salvage West Coast Representative from June, 1972, to February, 1974.

During this tour LCDR Bradshaw demonstrated an outstanding ability to manage an independent office, resolving a wide variety of administrative and operational problems involving contractor-operated ships and craft. His outstanding skill in working harmoniously with U. S. and foreign naval personnel, in addition to his extensive knowledge of all aspects of salvage and tow ships and craft, significantly contributed to the provision of expanded salvage and tow services to U. S. public and private vessels operating in the Western and Southern Pacific Ocean areas, the South China Sea, and the Indian Ocean. As stated in the citation, "The exceptional leadership displayed by LCDR Bradshaw and his untiring efforts to carry out his demanding duties with good judgment and total devotion to duty, were in keeping with the highest traditions of the United States Naval Service."

honors and awards

LT Craig T. Mullen, USNR, has been awarded the Navy Commendation Medal for services rendered as Assistant Officer-in-Charge during the SIDNEY E. SMITH salvage operations at Port Huron, Michigan, from June 5, 1972, to November 15, 1972.

LT Mullen's supervisory skills as well as his own personal diving efforts were primary factors in the success of the operation. In addition to these contributions, he directed the first underwater filming of urethane foam implantment in a sunken ship, significantly enhancing Foam-in-Salvage Training. "LT Mullen's exceptional leadership, professional knowledge, and management ability, combined with his good judgment and complete devotion to duty, were in keeping with the highest traditions of the United States Naval Service."

The Old Master ...

Y'all know that old axiom about learning from your mistakes. Well, I'm giving you a chance this issue to follow an even better one–learn from others' mistakes before you make them yourself! Diving is a dangerous business, and accidents are bound to happen. These are some of the diving mishaps that occurred during the first 6 months of 1973, each accompanied by my own two cents on the matter. Read and take heed of what should have been done in each case, and maybe *you* can prevent some of the future mistakes from happening.

Diver in open-circuit SCUBA was on a working dive and left the surface to swim out an underwater cable. The dive had been planned for 15 minutes' duration, to remain within no decompression limits, but lasted 8 minutes longer than that length. Depth was maintained at between 80 and 120 feet. Nineteen minutes into the dive, the diver's diving partner ran out of air and went on reserve. They then tied off a retrieving line to the cable and took approximately 1 minute to get to the surface, arriving there 23 minutes after starting the dive. The diver on reserve inflated his life jacket and remained with the bitter end of the retrieving line while the buddy swam to the boat 150 yards away. He swam alone at a depth of approximately 10 feet because the surface was rough. It took approximately 10 minutes to reach the boat.

The next day the diver who had remained with the retrieving line noticed a slight pain in the right shoulder, but attributed it to a pulled muscle. Later in the day the diver had difficulty putting on clothing. On the second day after the dive, he awoke with moderate pain from the right shoulder to the elbow, and reported to the recompression chamber for treatment. He was placed in the chamber and started down. He experienced complete relief of symptoms at 20 feet on descent and completed a Treatment Table 5 symptom free.

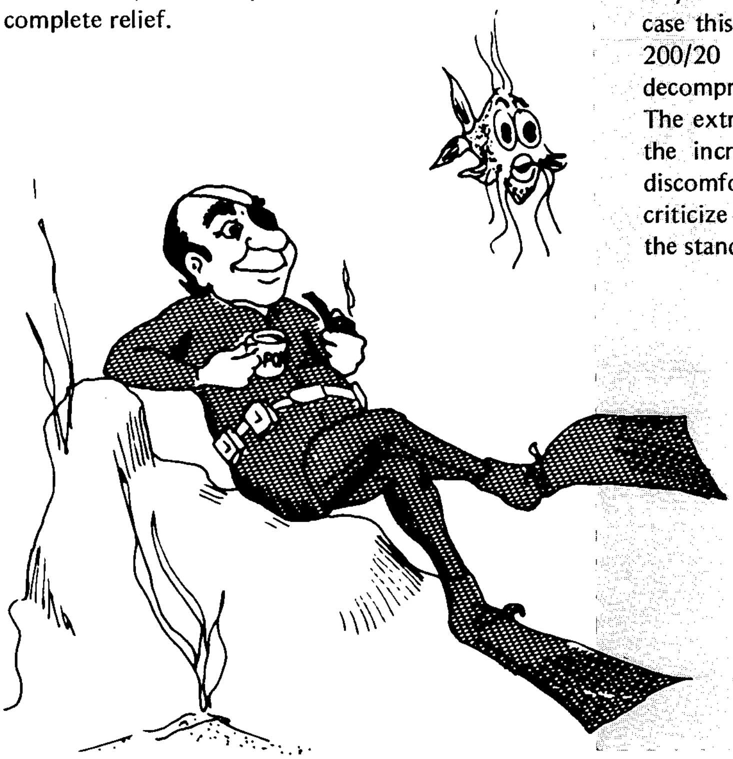
Here's a case of bends caused from insufficient decompression. The proper decompression schedule of 120 feet for 25 minutes requires 8 minutes total ascent time, including a 6-minute stop at 10 feet. Both divers took approximately 1 minute actual ascent time. The buddy was not effected because his swim to the boat provided him with 10 minutes decompression at 10 feet.

These fellows could have avoided this accident at two points during the dive. The first was by following the dive plan and limiting the dive to no-decompression limits. The second point was when the diver went on reserve. If he had followed the U.S. Navy Diving Manual directions and started for the surface as soon as he went on reserve rather than staying down an additional 4 minutes, he would have had sufficient air to complete his in-water decompression. An additional error committed in this case was that the diving partner swam alone at 10 feet back to the boat. The Diving Manual requires a tether or a diving buddy on a single SCUBA diver. The final error was the failure of the diver himself to report any symptoms until some 36 hours after they began. This case has quite a few diver errors. The effected diver came out OK this time, but you might not be so lucky if you make the same mistakes. Get the message?

Diver in surface-supplied deep sea air rig spent 17 minutes bottom time at a 92-foot depth. This was not a decompression dive and he was brought back to the surface at 60 feet per minute (fpm). He lost control of his air control valve and "blew up" to the surface from 50 feet in approximately 10 seconds. Since he had lost approximately 40 seconds of decompression by exceeding the maximum ascent rate of 60 fpm, he was placed in the recompression chamber and treated on Treatment Table 1A, in accordance with procedures established in the Diving Manual. At no time did he exhibit any symptoms of decompression sickness.

Now this is a case of doing it right! They followed the Navy Diving Manual to the letter and got successful results without needless injury. Let me caution you, though, because this was a no-decompression dive and little ascent time was missed. On deeper and/or longer dives this is a very serious accident. Be conscious of the possibility of blow up and be prepared to react properly.

Diver in a surface-supplied Kirby Morgan KMB-8 band mask made a moderate to heavy work dive. The depth of the dive was 191 feet, with a bottom time of 17 minutes. (Appropriate depth/time waivers were obtained from higher authority.) The water temperature was 51° and a 1/4-inch-thick wet suit was the diver's only thermal protection. He was decompressed on a 200/20 Exceptional Exposure Air Table, which provided 40 minutes' decompression time. Seven hours after surfacing, the diver noted a discomfort in the right shoulder. Thirty minutes later the pain was of a sharp nature and much more severe. He reported the symptoms, was recompressed for treatment, obtained relief at 45 feet, and completed a Treatment Table 5 with complete relief.



This case of the bends was probably caused by selecting the wrong decompression schedule. You have to consider here the special factors of a heavy work rate combined with cold water and minimal thermal protection for the diver. Reduction in body temperature causes a reduction in blood flow, which restricts the blood from carrying the inert gas to the lungs during decompression. Here is another situation where following the Good Book would have avoided needless injury. Table 1-9, page 111, in the Diving Manual states that if the dive is particularly cold or arduous, the next *deeper and longer* schedule should be used. In this case this would have meant a 210/25 instead of a 200/20 schedule, providing 57 minutes of decompression instead of the 40 minutes taken. The extra time required is a small price to pay for the increase in safety and decrease in personal discomfort. In addition, with hindsight one can criticize the decision to use a KMB mask instead of the standard deep sea rig in a dive of this type.

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