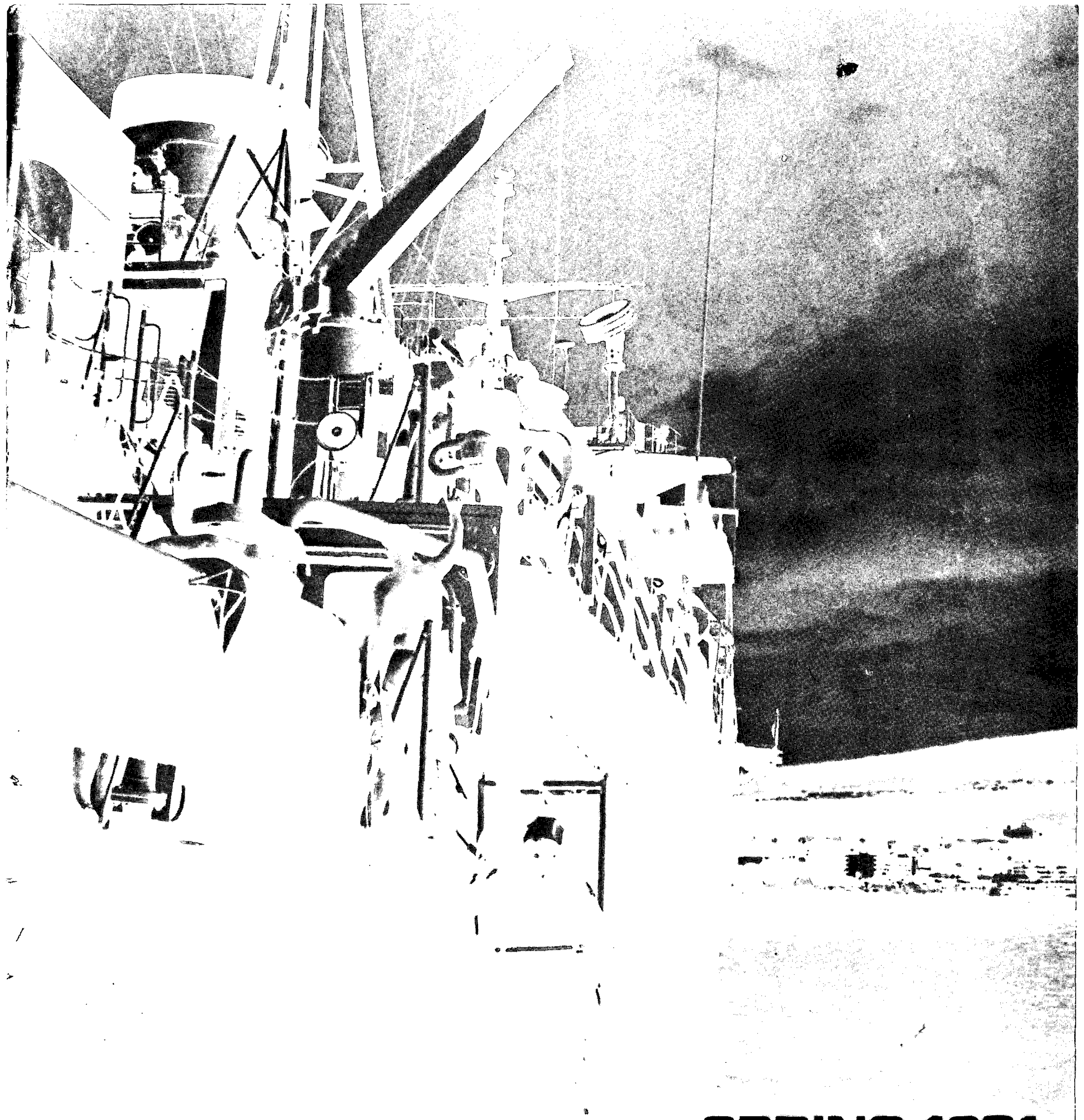

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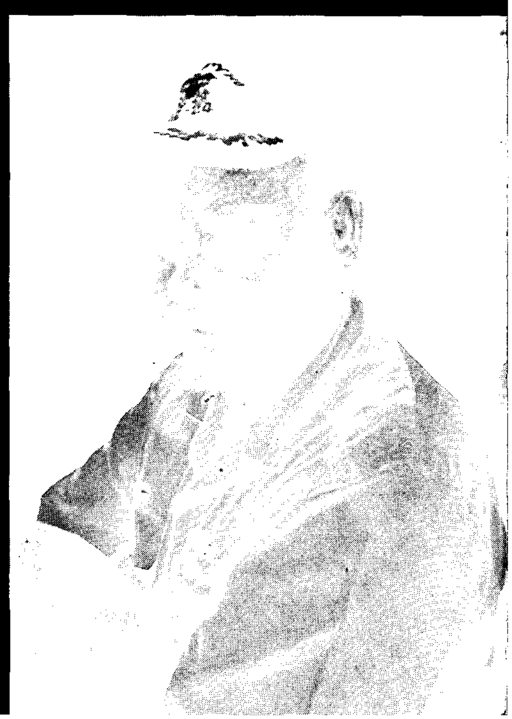

VOLUME 12, NO.1

FACEPLATE

. . . *the official magazine for the divers and salvors of the United States Navy*

Front cover shows two MK 12 divers going over the side.

Inside cover shows, clockwise from upper left: NAVOCEANO divers; a MK 12 diver surveys a U-352 torpedo; SDL-1 is loaded aboard HMCS CORMORANT; Sai Manning; and (l-r) CPO(D) Morrison and CPO(D) Kidman, RN.

Back cover shows the Canadian SDL-1 inside the NEDU Ocean Simulation Facility wet hyperbaric chamber in preparation for testing.

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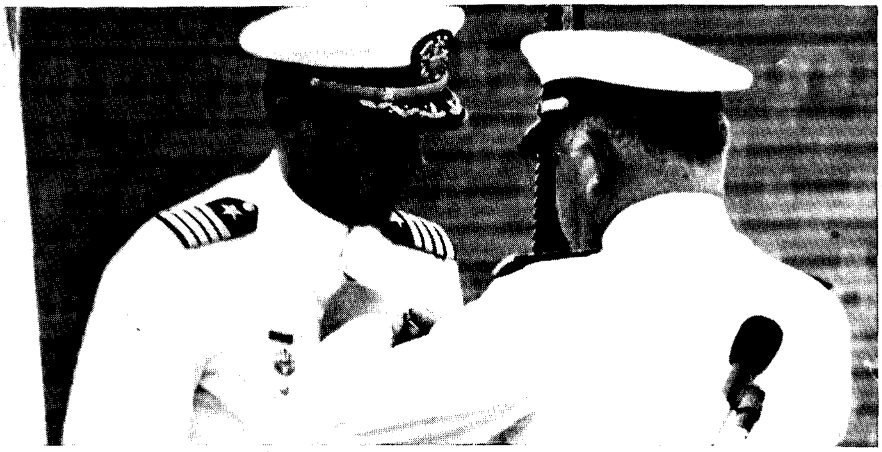
SOUNDINGS



MN1(DV) R.A. Von Gogh/Naval School, EOD

Left: CAPT Kennedy; right: RADM Jackson.

CAPT KENNEDY AWARDED LEGION OF MERIT

During a formal change of command ceremony held at the Naval School, Explosive Ordnance Disposal, Indian Head, Maryland, on 5 June 1981, RADM Dempster M. Jackson, USN, Executive Manager for the Department of Defense Explosive Ordnance Disposal Technology and Training, presented CAPT Joseph T. Kennedy the Legion of Merit on behalf of the President of the United States.

This high honor is in recognition of CAPT Kennedy's superior performance as Commanding Officer, Naval School, Explosive Ordnance Disposal during the period September 1977 to June 1981. The professional standards of excellence demonstrated by CAPT Kennedy served as a perfect example to motivate the personnel of his command in achieving unusually high goals.

During his tenure as Commanding Officer, Naval School, Explosive Ordnance Disposal, a Navy-managed all-services training command, his exceptional management abilities and appreciation of interservice relationships resulted in optimum cooperation and effectiveness between the services represented.

CAPT Kennedy served as a member of the Information Exchange Project—America, Britain, Canada, and Australia (IEP-ABCA-5)—working conference and as a member of the U.S. delegation to the NATO EOD Working Party at NATO Headquarters, Brussels, Belgium. His detailed knowledge and vast experience in EOD operations, timely perception of new requirements and methods, advice and recommendations have resulted in significant progress and improvements in the standardization of training operations and equipment.

During the period from November 1979 to March 1981, CAPT Kennedy concurrently assumed additional responsibilities as Commanding Officer, Naval Explosive Ordnance Disposal Technology Center, Indian Head. During this time, NAVEODTECHCEN successfully underwent a stringent NAVSEA inspection by the Inspector General. The outstanding results directly reflect CAPT Kennedy's effectiveness as a superb manager and leader. His personal involvement in retention and morale earned the Command a 100 percent retention rate. CAPT Kennedy provided the NAVEODTECHCEN with significant expertise and superior knowledge in producing a unique plan that has been used as a model for future endeavors for clearance of ordnance from bombing ranges.

As Commanding Officer of both Naval School, Explosive Ordnance Disposal and Naval Explosive Ordnance Disposal Technology Center, CAPT Kennedy's exceptional professional ability, initiative, and high personal and military standards leave behind an enviable legacy.

CDR Blanton.

CDR BLANTON RELIEVES CAPT KENNEDY AT NAV SCHOOL, EOD

CDR James C. Blanton, USN, relieved CAPT Joseph T. Kennedy, USN, as Commanding Officer, Naval School, Explosive Ordnance Disposal on 5 June 1981.

CDR Blanton is from Kings Mountain, North Carolina, and graduated from East Carolina University. He was commissioned on 2 July 1965 from Officer Candidate School, Newport, Rhode Island. CDR Blanton served aboard the USS TIDEWATER (AD-31) as Damage Control Assistant and later as Engineering Officer. In September 1968, CDR Blanton commenced Explosive Ordnance Disposal (EOD) training at Key West, Florida. He graduated from Naval School Explosive Ordnance Disposal, Indian Head, Maryland, in June 1969. His first EOD assignment was the EOD Shipboard Unit Pacific at Pearl Harbor, where he served from

July 1969 to August 1971 as Operations Officer and Assistant Officer-in-Charge. He deployed to the Republic of Vietnam during this time as Officer-in-Charge of an EOD Mobile Team in Saigon and again as the Senior EOD Advisor to the Vietnamese Navy. He was transferred to the Naval Ocean Systems Center, Kanoehe, Hawaii, as Officer-in-Charge, Military Detachment and Deputy Technical Officer. CDR Blanton assumed command of Explosive Ordnance Disposal Training and Evaluation Unit One on 21 February 1974. During the period of October 1977 to July 1979, he served at the Bureau of Naval Personnel and the Naval Military Personnel Command as the Assignment Officer for the recently established Special Operations Officer community. Prior to assuming duties at the Naval School, Explosive Ordnance Disposal, CDR Blanton completed a tour in the Office of the Chief of Naval Operations (Surface Warfare), where he served as the program sponsor for Navy Explosive Ordnance Disposal.

CAPT Kennedy is being assigned as Commanding Officer, Explosive Ordnance Disposal Group Two, Fort Story, Virginia.

CPO(D) MORRISON RELIEVES CPO(D) KIDMAN AS ROYAL NAVY EXCHANGE CPO AT NEDU

CPO(D) Ted Morrison, RN, has reported aboard the Navy Experimental Diving Unit (NEDU), relieving CPO(D) Kidman, RN. Morrison is the second Royal Navy enlisted diver to occupy an exchange billet at NEDU. His arrival marks the continuation of an excellent program designed to exchange diving information between the U.S. and Royal Navies.

Chief Morrison comes to NEDU after achieving impressive diving credentials. During his 14-year Naval career, he has completed diving courses in SCUBA, Explosive Ordnance Disposal (EOD), mixed gas and saturation diving techniques. He has served as either a diving instructor or supervisor. In addition, Chief Morrison was selected earlier in his diving career as a member of the Royal Navy Diving Display Team.

He has also participated in salvage–diving operations to 450 feet-of-seawater (FSW) to retrieve a helicopter downed in a Norwegian fjord. Additional experience was gained in several other aircraft SALVOPS.

In his last assignment (HMS VERNON, Portsmouth, England), Chief Morrison worked as a member of the RN Saturation and Experimental Diving Trials Team. In his capacity as Chief of the Team, he supervised dives to 1,000 FSW. He also supervised HeO_2 diving in the open sea from small craft such as Gemini and Zodiac rubber dinghies.

Chief Morrison reported to NEDU following participation in the U.S. Navy's Master Diver Evaluation program at the Naval Diving and Salvage Training Center. During that time, his knowledge of diving-related physics and medicine, recompression chamber operation, and conduct of actual diving operations in SCUBA, air, and HeO_2 diving was evaluated. CPO(D) Morrison proudly became just the second Royal Navy diver in history to be designated a U.S. Navy Master Diver and wears the coveted Master Diver Silver Breast Insignia. In fact, his predecessor, CPO(D) Colin A. Kidman, was the first Royal Navy diver to achieve this distinction.

CPO(D) Morrison (left) bids farewell to CPO(D) Kidman at NEDU.

CDR BORNHOLDT ELECTED PRESIDENT OF INSTITUTE OF DIVING

CDR Robert A. Bornholdt, USN, Commanding Officer of the Navy Experimental Diving Unit, is the newly elected President of the Institute of Diving. He relieved CDR Jack Ringelberg, USNR, at the Institute's fourth annual meeting in Panama City, Florida, 6-7 March 1981.

The Institute of Diving is a voluntary, private, non-profit organization formed in 1977 for the advancement of professional and scientific knowledge related to human-oriented activity under water. Membership consists of military, commercial, and sport divers, as well as other individuals, organizations, corporations and/or groups interested in diving or diving-related activities.

The Institute's long-range goals include providing a forum for professional and scientific communication among individuals and groups involved in the basic research and applied technology concerned with life sciences and supporting hardware and application techniques for the quest of the undersea environment. Another goal is to provide a public museum of diving history to display and store artifacts and documents of permanent historical record and value.

For additional information, contact: Institute of Diving, P.O. Box 876, Panama City, Florida 32401.

BRIEFING FOR RESERVE READINESS COMMANDER

During a recent visit to the Reserve Training Center in Raleigh, North Carolina, CAPT R.P. Lester (center), Commander, U.S. Naval Reserve Readiness Command, Region Seven (Charleston); was briefed by CDR Charles E. Johnson (left), a Naval Reservist and Duke University (School of Engineering) heat transfer engineer. Discussed was CDR Johnson's analysis of an overheating problem in the conductor cable used to tow deep ocean search equipment for the Office of Naval Research. Looking on is CDR Tony F. Clark, Commanding Officer of Underwater Emergency Response Team 107, which drills in Raleigh.

CDR Johnson is the Engineering and Diving Officer of the Unit and, as a civilian, is an Assistant Professor of Mechanical Engineering and Materials Science, Assistant Medical Research Professor in Anesthesiology, and the Engineering Safety Officer for the F.G. Hall (Hyperbaric) Laboratory at the Duke University Medical Center. CDR Johnson has just been reelected as the Chairman of the Ocean Engineering Division of the American Society of Mechanical Engineers.

L-r: CDR Johnson, CAPT Lester, CDR Clark.

Official U.S. Navy Photo by PH1 G.L. Wendham

New Developments at CEL

Technology for powering diver-operated underwater construction work systems with high-voltage electricity has received a tremendous boost by recent developments in underwater electrical safety by the U.S. Navy.

In the past, diver electrical safety in the severe operating environments of the ocean has restricted Navy underwater operations to large, heavy, low-voltage battery powered systems or hydraulic systems, both of which are often unwieldy and inefficient.

Now the Civil Engineering Laboratory (CEL) at Port Hueneme, California, has built and tested a unique ground fault detection and power shutdown (GFD) system capable of removing power from a 440-volt, 3-phase load within 10 milliseconds. Systems rated up to 100 kw have been built and tested. The system's circuit design philosophy and operational sequence make the use of electrical power by divers much safer.

According to Lee Tucker, CEL project engineer, in normal operation the ground fault monitor (GFM) applies a positive DC voltage to the delta-connected secondary of the power transformer. The negative side of the DC supply is connected to ground (cable armor, seawater). If a breakdown in the insulation resistance of the cable or load occurs, a small DC current will flow from the supply. The DC current level is monitored and if it exceeds a predetermined level, a signal is sent to open the circuit breaker. This signal is delayed 5 ms and used to turn on a set of triacs which short the secondary of the isolation transformer. The triacs also provide a low impedance path to dissipate the stored energy in the load circuit.

The shutdown from the time the DC current exceeds the setpoint until all power has been removed is 10 ms. If for some reason the circuit breaker does not open, the short circuit currents from the triacs will cause the line fuses to blow and shut down the power.

The integrity of the DC circuit is monitored by a 10-kHz signal. The system automatically shuts down if that signal fails, when an open circuit develops, or when an internal component of the equipment malfunctions.

To make the technology readily available for divers, CEL has developed a portable GFD package, weighing 50 pounds and measuring 7x8x11 inches. This system can safely transfer up to 2.5 kw at 120 VAC for powering lights or inspection equipment.

In addition to the GFD system, a laboratory model of an underwater electric field detector was built and tested. It can be used by a diver to detect stray fields originating from power systems not equipped with GFD, powered cathodic protection systems or other underwater electrical equipment.

The field detector senses a voltage gradient across three pairs of electrodes exposed to the water on the end of a handcarried probe. A signal proportional to the voltage gradient is compared against a preset level. If the level is exceeded, a warning is sounded. The device is capable of detecting electric fields as weak as 0.12 volts per foot.

The alarm circuit output of the detector can be used as an input signal to the GFD system to induce an immediate shutdown of the power load.

These new CEL developments open the door to a multitude of underwater applications—electrically-powered submersibles and rescue chambers, seafloor vehicles powered to greater depths, diver tools using seawater as a medium and driven by submerged electrically powered seawater pumps, and multi-kilowatt lighting systems to enhance diver capabilities.

With final approval for Navy diving applications of the GFD system and the electric field detector, the Navy can look forward to a new era of expanded work capability with safer, more efficient, and more powerful tools and work systems.

VIEW FROM THE TOP

In this edition, I would like to discuss with you my views of where we are going over the next few years in the Diving and Salvage Community. It's quite clear to those of us who are "old timers" that the total size of our Navy diving and salvage force has diminished markedly over the last 10 or 15 years. We have only a fraction of the number of salvage ships that we had 10 years ago. The few that we do have are capable and well-manned; we can all take a great deal of pride in their performance.

It is clear that the current administration is placing a great deal of emphasis on rebuilding the Navy. It is their goal to rebuild our Navy to a size that will enable us to do our job and to enable us to go in Harm's Way if necessary. To me, that has to mean they intend to support a salvage force as well.

It is apparent from any reading of history that the salvage forces played a very vital role in World War II. It is equally clear that the complexity of modern warfare has brought about such a marked increase in the cost of all types of war material—by cost I don't mean in inflated dollars but in man-days to produce—that we can ill afford the loss of any war material, should we find ourselves in any type of all-out war. In other words, a shipload of tanks or other war material today is so much more valuable in terms of the man-days required to produce it that its loss would have a much greater impact on our overall defense posture than such a loss during WW II. This means that we must be prepared to prevent such losses in every way possible. Therefore, I expect to see, as we build additional *battle* forces, the construction along a parallel path of replacement *salvage* assets.

I hope to see the establishment and equipage of additional Emergency Ship Salvage Material (ESSM) bases in strategic overseas locations. We will be developing new types of ESSM equipment with the goal of obtaining more efficient, lightweight, portable equipment—particularly pumps and compressors—that can be used initially in a salvage operation without requiring a heavy lift capability to get them onboard. We will continue to press on in the area of training, to provide our divers and salvors with the very best possible training, to equip them with the required knowledge and to give them the necessary experience. This is an absolute requisite if we are to stay on the leading edge of the salvage business worldwide.

As a parallel effort to developing an improved Navy salvage capability, it is incumbent upon the Supervisor of Salvage to do everything possible to enhance the commercial salvage posture in our country. That posture is the source from which we must be able to mobilize additional assets in time of war. For this reason, the Supervisor of Salvage is charged with the responsibility of fostering the commercial salvage posture. As a part of this effort, we have initiated a study by the Marine Board of the National Academy of Engineering to review the nation's commercial salvage posture and to determine its adequacy. If it is determined to be inadequate, the Board is to make specific recommendations for its improvement. This Marine Board Study is under way and, when the project is completed, I will report to you the results of this effort.

Commencing with the FY83 budget, there will be some realignment of responsibilities to fund

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

various aspects of salvage operations. I anticipate that this realignment of responsibilities will ease the problem of finding funds for aircraft salvage. This realignment of responsibilities will more clearly define who has responsibility for determining which salvage operation should be conducted and who has responsibility for paying for those operations.

In addition, commencing in FY83 there will be an increase in funds available to purchase new ESSM equipment. We should see not only the purchase of a significant amount of additional new ESSM equipment, but an opportunity to catch up on the backlog of refurbishment of some of the currently non-RFI ESSM equipment. In my view, we have at our ESSM bases a significant shortfall of equipment. Some of this shortfall was brought about by our past policies, which made it too easy for people to borrow equipment from the ESSM bases and, in many instances, fail to return it in as-issued condition (if returned at all). There is a significant shortfall of anchors, chain, wire, and some of the other basic building blocks for salvage equipment. As these are replaced, the current policies will continue in effect, making it difficult for this equipment to be removed for anything other than a bona fide salvage operation. Very careful inventory control procedures will be used to ensure that ESSM equipment is returned to the ESSM base and that, if necessary, it is refurbished before being returned.

At the same time, there will be increased demands placed upon the Fleet to fund and take responsibility for their own salvage material and equipment. It is no longer either the funding or managerial responsibility of the Naval Sea Systems Command to overhaul or refurbish salvage machinery and equipment on salvage ships. This is a Fleet responsibility, just like the maintenance of everything else on the ship. It is clear to me that better maintenance and care of machinery is provided by someone who is responsible for budgeting and accomplishing the maintenance and repair than someone who has no such responsibility. It is for this reason that a number of years ago we undertook a shift in responsibility for the maintenance of ships and their components.

SUPSALV will continue to fund actual expenses on salvage operations when directed and will continue to provide technical support for any salvage or diving operation whenever and wherever necessary. I would like to emphasize that there is significant expertise in our office in a number of areas and I will provide assistance to the Fleet with any operation, anytime, with only a telephone or message request.

As a final comment, I would like to pass on the fact that we are working on establishing a Master Diver billet for the Office of the Supervisor of Salvage. As soon as this billet can be established and filled, we will have a Master Diver to assist both in answering questions that come in from the Fleet and in providing follow-up to those items.

The Old Man of the Navy: A Special Breed

Ken Hively/Los Angeles Times Photo

CDR Manning, "the Old Man," beside his ship in San Francisco Bay.

Article written by Charles Hillinger.

ABOARD THE USS PYRO. When the 205 sailors aboard this ammunition ship call their skipper "the Old Man" they say it with affection and admiration.

"Hell, they mean it," snorted CDR Sai Manning, 59, captain of the PYRO (AE-24), who chews tobacco and smokes cigars at the same time and never spits.

He joined the Navy in 1940 and figures he has spent 34 years at sea.

When the Navy created the new master chief rating in the late 1950s, Manning was the first to get it. When he was 39, he became the oldest ensign in the fleet. That was 20 years ago.

"The Old Man is the last of a special breed, or maybe the first," said Chief Bos'n Mike Byrd, 35, of Cincinnati, adding, "He has seen everything and done it all."

"Most senior officers put on airs and alienate themselves from the troops. Not Sai Manning."

When Byrd, who has been on a dozen ships in 15 years, learned Manning was to become skipper of the PYRO, he requested a transfer to the ship.

"I had heard so much about the Old Man, I knew my Navy career wouldn't be complete unless I served with him," Byrd said.

Brian Dietz, 24, boiler tender, said his captain knows every sailor on the PYRO on a first- and last-name basis.

"He really cares about his crew," Dietz said.

"For the captain of a ship to be a decent man is important to the younger men. I've been through all the pitfalls," Manning said.

"It's difficult to understand what makes a young sailor tick if you haven't been one yourself," he continued.

"For me to be captain of a ship is the ultimate. You cannot imagine the exhilaration, the feeling of having your own ship."

"Of course, when things go sour, you wish you were somewhere else. When you get a knock on the door at 3 in the morning and someone says: 'Captain, the wheel just fell off. . .' "

"I'm not hanging around for the money. Hell, I'm working for zilch. I'd get 75% of my base pay if I retired. But as long as I'm able to have something to teach young officers and men, I want to keep going."

"I worry about my young men," the skipper said. "I hate to see them get into trouble. I hate to see a young man with potential not develop that potential. I'm constantly on their tails reminding them there is a helluva lot more they can do for themselves. . ."

"The captain is forever pressuring his men to move up in their rates or ranks. He's always after us, pushing, going out of his way to help us advance," said Ens. Mell Caicazola, 30, of Riverside, California.

"Hell, I've been around so long, I've heard the same yarns for 41 years," Manning said.

"A captain holds masts—that's court aboard ship—when a sailor gets into trouble. Their stories are fantastic."

"Every now and then, one will think he's got me. He thinks I am buying his story. At that point, I give him the old steely eye and bark, 'Bull!' You should see the expression on his face," the skipper howled. "Hell, I did some of the same things when I was in their shoes."

He tells how he came to be called Sai, not his given name, but now his legal name.

Going ashore from the PYRO, one of 14 ships he has served on, CDR Manning draws a salute. Ken Hively/Los Angeles Times Photo

"It happened during World War II when I was a young sailor on the sub ICE FISH. It was right after the invasion of Saipan. I had a thirst for beer."

"I told the deck officer I was born on Saipan, that my father was a missionary there and I knew people on the island. He bought it."

"He let me go ashore. I quenched my thirst. My shipmates started calling me Sai for Saipan. I've been Sai ever since."

Said Manning, "I'm the mayor, judge, police chief. I even get to marry them. We have burials at sea. We get urns shipped from all over the country, the remains of old Navy men that requested burial at sea. We give them a proper send-off. . ."

Much remains the same in the Navy since Manning enlisted when he graduated from high school in Russell, New York, 41 years ago.

"Today, as always, sailors are the traveling romantics of the world. It's a tremendous life. Visiting ports in this country and overseas. Soaking up foreign cultures."

In his 34 years at sea Manning has served on 14 ships and as skipper of the last three. During his 21 years as an enlisted man, he was a radioman.

During the Vietnam War, he served 13 months on the South Vietnamese destroyer CHILIN with 70 Vietnamese sailors. His duty was adviser to the captain.

"I was the lonesome American on the CHILIN. That's when I learned to speak Vietnamese," he said.

He is saddened to see the decline of the U.S. Navy in recent years, "the phasing out of so many of our ships and no replacement with new ones at a time when our adversaries are working around the clock to upgrade their fleets."

"But America still has the best offensive weapon in the world," Manning insisted, "our well-trained, intelligent, motivated American sailors."

THE CHALLENGE OF THE 80'S TO THE DIVING AND SALVAGE NAVY

Editor's Note: This article is a written version of the remarks made by CDR A. Campbell, COMSERVRON FIVE, at the Salvage conference in February 1981.

1979 and 1980 showed an apparent bottoming out of the steady erosion of our Salvage and Diving Forces since the end of the Vietnam era. The first ARS replacement hull has been funded, and a request for funding of two additional hulls is included in the 1982 budget. Diver consolidation and the entry of the Deep Sea Diver community into the underwater maintenance field under the control of a diving orientated command is a fact in both Fleets. A new officer's community, the 1140, has been established, which will permit the future development of true professionals in the Diving and Salvage Forces. A brand new Diving and Salvage Training Center has been opened in Panama City, Florida. All of the signs point to a renewed interest and support at the highest levels of the Navy in developing and maintaining the Navy's Salvage Forces.

With things starting to look up, I've been asked what possible challenges are there to face in this next decade?—the ubiquitous "They" will take care of Us won't "They?" Gentleman, it's this very head-in-the-sand, don't borrow trouble attitude which brought us to our present state of readiness. It's time for us to examine closely our real reason for being and then consider what steps we can take to meet our responsibilities.

We must first accept the basic premise that the only possible justification for a Navy Salvage Force is to provide combat salvage in the event of a major sea war. Acknowledging this, we then need to examine the present world environment in which we may have to conduct operations.

The continuous and prolonged growth of the Soviet Navy has resulted in a major change from their former preoccupation with coastal defenses to the development and deployment of a true, deep water Navy capable of inflicting great damage to our Fleet in any location or ocean of the world.

During the past few years the majority of statements issued by both the JCS and CNO indicate that a major sea war would not be long-term, probably of 6 to 18 months duration, with the ultimate victor being the Navy with the most Forces capable of conducting combat operations at the end of this interval.

Our battle organization is built around the battle group tailored to achieve specific objectives and is generally composed of a carrier, a surface action group, submarines, and, possibly, an amphibious group and MLSF force as appropriate.

Opposition to this battle group might be air, surface, or subsurface forces employing conventional weapons with a radiological, chemical, or bacteriological hazard. The short duration of such a major sea war imposes new constraints on the Salvor. There will be no time available to lay down new hulls and bring them on line in the manner of World War II. Nor will there be time to stabilize a damaged ship at a 58-foot draft and then spend 3 years to restore it, as was done with the USS TENNESSEE at Pearl Harbor.

There will be no time to organize, train, and equip a large salvage service recruited from the civilian world of tugs and Salvors as was done in World War II. The tugs are few and the Salvors are even farther between.

This limitation of time means that the Salvage Forces we have at the commencement of a major sea war will probably be all the resources we can expect to have in carrying out our mission. It means our attention and efforts must be focused on providing the maximum aid to our rescued ships while doing the least possible damage so that they can be put back in a combat mode in the shortest time.

To effectively execute such a salvage effort will require an overall upgrading in the sophistication of both our methods and, most importantly, in our thinking. For too long we have been content to consider the command of our salvage ships as the "capstone" tour of 20 years service if we were a "mustang" (or of a small, slow destroyer if we were a Surface Line Officer passing through the community).

With the establishment of the 1140 community, we are now assured of leadership with repeat tours in the Salvage Community. We must now upgrade our professional salvage standards. "The nuts and bolts" of laying out beach gear, implanting a multiple moor, or hooking up for an emergency tow are still essential, but must no longer be considered the end point of our training.

It's time for some dedicated thinking, writing, and planning addressed to improving our combat salvage posture. What and how we accomplish salvage is too often a complete mystery to anyone outside our community. There are Naval warfare publications on every other facet of navy operations from ASW to replenishment, but no such guidance exists for salvage. Our ships are manned and organized for battle, but you will look in vain for a complete salvage organization tailored to support the many elements of salvage. We need a "Condition-One Sierra" similar to the "Condition One ALFA" of the AMPHIBS. We have paid so much lip service to the "unique aspect of each salvage job" that we have failed to realize that all salvage has some common elements that can be and are in fact utilized time after time. Our basic salvage training is geared to those elements. We should take the next logical step and organize our ships in a manner geared to best conduct each one.

We have a Fleet of new combatants; but, we have very little information readily available to the Salvor about this new Fleet. It is imperative that each ship have ready, and immediate, access to the general plans, DC diagrams, and curves of form of each class hull in our Fleet inventory. With these we can follow damage reports, make initial preparations enroute, and effectively develop and execute a Salvage Plan tailored to do the least possible damage to the ship being aided. A complete library of micro-fiche on each hull class should be on board every Salvage Command.

Orientation visits to each type hull must be made on a continuing basis: some to be in drydock to familiarize the divers with an overall view of the underwater body and the location of significant hazards, and others underway to observe her damage control organization in a battle problem to understand how the salvage ship's rescue and assistance party's tasks can be effectively integrated into the total damage-control effort. This requires additional training for our Officers and Chiefs, such as attendance at Damage Control Assistant School.

The continued loss, without replacement, of our salvage-experienced Engineering Duty Officers dictates the need for increased training for the 1140 in naval architecture from the salvage viewpoint. A rapid means for making fast, accurate salvage calculations which the on-scene Salvage Commander can use to arrive at sound decisions is essential. We have a start in such a method with the programmable calculator programs now being developed by CDR Maclin and Alex Rynecki. These also need to be in each Salvage Command's library.

The extensive design damage control criteria and studies conducted by NAVSEA which predict the survivability of each type hull plus the Fleet Training Group Damage Control Packages tailored to each class need to be studied and analyzed to pinpoint for the Salvor the weak and strong points of each hull so that he can effectively consider these factors in developing his salvage plan.

With the expectation of arrival on scene in a battle group in which more than one casualty may be present, the Salvor must have a "quick and dirty" method of determining which vessels are salvageable and which are not. Some handy, dandy, eyeball gauge, perhaps based on list, trim, remaining freeboard, and type and location of damage plus a priority list might be an answer.

A current OPNAV study and proposal recognizing the paucity of salvage hulls recommends the prepositioning of pumps and fire fighting gear onboard MLSF ships. The deployment, maintenance, and personnel to operate this floating ESSM Pool was not addressed. If it does come to pass, then the Salvor's of the Fleet will need to be prepared to develop plans to put this equipment to use.

With few exceptions, our combatant staffs are not prepared to consider salvage as part of their operations. While it is admirable to be absolutely convinced that you are going to be the complete victor in any engagement with an enemy, it seems foolhardy to neglect the thought that you may get a few lumps. Our various Fleet exercises often request our services to tow targets, provide lock-out services, act as slow heavies or as an Orange Force KRIVAC II. In no exercise, to my knowledge, has the Task Force Commander been required to schedule a rescue and assistance effort as a post engagement type of salvage exercise.

These are just a few of the areas in which we, as Salvors, need to devote a good deal of time, effort, and, above all, thought. To gain some insight into the many problems confronting the modern-day Salvor, we have started a program of SALVSITS modeled after the TACSITS used by our Line Officer brothers. These are admittedly in their infancy, but they are a start. If they stimulate thought on how to best accomplish our mission, then we will be on the way to our coming of age.

The developing 1140 community has been briefly mentioned, but some special attention needs to be paid to preparation of our Commanding Officers to effectively serve as the on-scene Salvage Commander. A solid PCO/PXO curriculum at the Diving and Salvage Center needs to be developed. It should not be a review of diving physics and medicine, but should cover such topics as the Salvage Survey, developing the Salvage Plan, realistic time standards for various phases of salvage elements, and how to apply recognized management techniques to effectively monitor and execute the Salvage Plan. The necessary calculations for towing, the proper way to inspect tows, and how to prevent them from sinking or getting away need to be included in such a course. The whole 1140 community, if it is to succeed, must develop a basic set of professional standards similar to that of the Surface Warfare Officer's PQS, but which also addresses those items peculiar to the Salvage, Explosive Ordnance Disposal (EOD), and Expendable Ordnance Management (EOM) specialties. In addition, programs which parallel the Surface Warfare Officer (SWO) progression in Surface Warfare Tactics with advancing rank and billet need to be developed which address the 1140's needs. Further integration of the Salvage, EOD, and EOM areas of operations must be made to provide easier access and cross-training to achieve the 1140's mandatory proficiency in two specialties.

Salvage efforts will always be built around the most important weapon in our inventory, the Deep Sea Diver. I think all of us are satisfied that the day of the Hairy-chested Deep Sea Diver who only suits up for disaster is long past. Diver consolidation is a fact on both coasts, and the most important results we have observed here are the decided up-turn in diver retention once we started putting divers in the water doing useful work—exactly what we trained them for in the first place. Having divers working for a diving-oriented command rather than a maintenance-dedicated command has caused some growing pains. The need for ensuring proper quality control and documentation of our underwater work has been driven home on several occasions. The need for more underwater tools has also been an annoying problem which hopefully will be resolved. The development of new tools such as color UDATS and stereo photography, which enable the diver to show the topside engineer the actual problem so that a sound engineering solution can be made, are in-hand or enroute. An inhouse, in-water, certifiable welding capability is being planned and will one day prove of immense value. With the cost of docking an FF approaching $400,000, any in-water work we can perform to prevent an unscheduled docking gains immediate, appreciative recognition at all levels of command. In-water screw changes are now common on both coasts. We need to develop the skills, jigs, and tools to accomplish in-water sonar dome changes such as the Canadians have been doing for years. Hull cleaning QA and running gear cleaning are bringing to light problems in the antifouling paint systems presently being used on Navy ships which may result in changes either to cleaning methods or the paint systems. There is a pressing need for a standardized, underwater work methods manual which describes in detail the labor, equipment, and standards or procedures to be utilized in executing recurring jobs. Input from the divers and top-side engineers for the development of new tools, habitats, etc. to employ new technologies or adaptations of dry land ones to the underwater environment are needed. The in-water maintenance program needs to be standardized in the individual ship's PMS package so that each ship is aware of their responsibilities and schedules its underwater and innerhull-related maintenance. New, standardized diving boats to support this increased work load need to be designed and purchased. A substantial increase in the manning levels of our Consolidated Diving Units to meet the increasing work load is required.

Development of new, or modification of existing, diver training programs to meet our in-water maintenance requirements are urgently needed. Once again, this is but a short shopping list of the many problem areas or opportunities for new developments which should be thoroughly investigated during this coming decade.

Few, if any, of the things I've mentioned are new or revolutionary. What is unique is this opportunity to give my views of the path we must take to improve our Diving and Salvage posture during the next years. This symposium is hopefully the first of a continuing series of dialogues between the major Salvage and Diving Commands. It will give us the opportunity to forge a strong chain of common interests that will permit us to become a fully integrated and recognized component of our Navy and not the neglected orphan we have seemed so often in the past.

During the numerous workshops scheduled over the next 2 days, please keep in mind some of the things I've discussed this morning:

- Our primary mission is Salvage in a combat environment, and the outcome of a major sea war of limited duration may well hinge on our ability to bring the cripples home in the best possible condition so they can quickly be put back on line.
- We need to develop a set of professional standards for our community.
- Exposure and knowledge of our capabilities must be given to all levels of Command so that we receive the opportunity to practice with our new Fleet and become expert in its salvage.
- The training we provide to our Salvors and Divers must become more sophisticated and remain current with our changing needs.
- The impact of peacetime underwater maintenance requires study and planning to direct the development of the tools, techniques, and training to assure an increased capability.
- We need to provide experienced Fleet Salvage and Diving personnel to billets with the Type Commander, Fleet, and Washington levels to ensure our needs and programs are adequately publicized and receive necessary budget support. We need more input to OOC to ensure that he can plan, develop, and provide the equipment we need.
- Lastly, and most important of all, we need to establish the vehicle to permit the continued and periodic dialogue between all elements of our community so that we can all march off in the same general direction. I would much prefer not to go to an Exchange Program with the Canadians or Brits to find out what is going on in our own Navy.

Gentlemen, there are many challenges for each of us in the coming decade. We must ensure that we can meet and resolve each one to uphold our tradition that:

"When the Fleet is sinking
or the ships have run aground,
the Salvors of the Fleet
will be there to heave around."

Thank you.

Diving Scientists at the Naval Oceanographic Office

Mr. Doug Huddell
Naval Oceanographic Office

In the early 1960's, scientists at the Naval Oceanographic Office (NAVOCEANO) recognized that NAVOCEANO's capabilities would be considerably enhanced if diving were an additional tool available to them. Thus, in 1964, a scientific diving capability was established with a small group of oceanographers trained as divers at the Navy schools. Since that time, diving has proved to be a distinct asset to scientists engaged in oceanographic work. The scientist who dives has the opportunity to improve his knowledge through direct observation of the marine environment. He is able to select optimum locations for the installation of recording instruments and can check on their operation.

The Naval Oceanographic Office is located on the grounds of the National Space Technology Laboratories, Bay St. Louis, Mississippi. Very little diving is done at this location, however. NAVOCEANO's mission is world-wide and, in support of this mission, its diving scientists travel around the world from the arctic to the tropics.

The scientific divers at NAVOCEANO perform a variety of tasks, many of which do not involve diving. For instance, the installation of instruments on the sea floor by divers may be only one phase of a study measuring many environmental parameters. The oceanographer/divers not only do the diving required, but also collect the other data in a more conventional fashion.

Many of the jobs assigned to the NAVOCEANO divers involve the installation of current meters. A good example is the support provided to the Commander, Operational Test and Evaluation Force during tests of the Submarine Launched Mobile Mine (SLMM) off Kauai, Hawaii. These operations require that current meters be at an exact depth on a buoyed array in water depths up to 400 fathoms. The NAVOCEANO divers devised a technique to adjust the depth of the current meter in the array to the required depth after the array is installed. During the most recent SLMM test in July 1980, the NAVOCEANO team installed the current meters from on board the USS BEAUFORT (ATS-2) with the assistance of the BEAUFORT's divers.

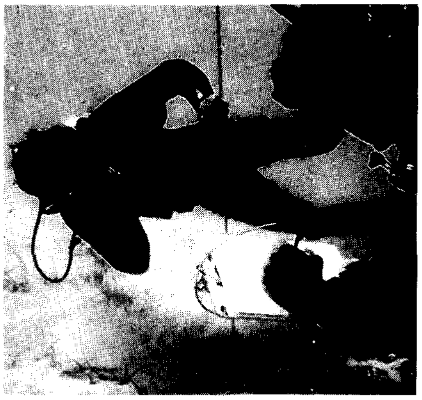
To NAVOCEANO's marine biologists, diving is an indispensable tool. In support of the Navy's environmental concerns, NAVOCEANO biologists have conducted coral reef ecological monitoring studies at such locations as Hawaii and Guam. The primary method used to monitor coral reef areas is mapping of small areas of the coral reef and subsequently revisiting the areas at intervals to detect changes. A wire grid is laid on the bottom, anchored at each corner with concrete blocks. A map of the reef under the grid showing the identification and location of attached plants and animals and a complete photo-mosaic are made of each area. A weighted string is payed out from a small boat over a 1/4- to 1/2-mile course. The scientist/divers then swim along the string recording plant and animal density and photographing the bottom.

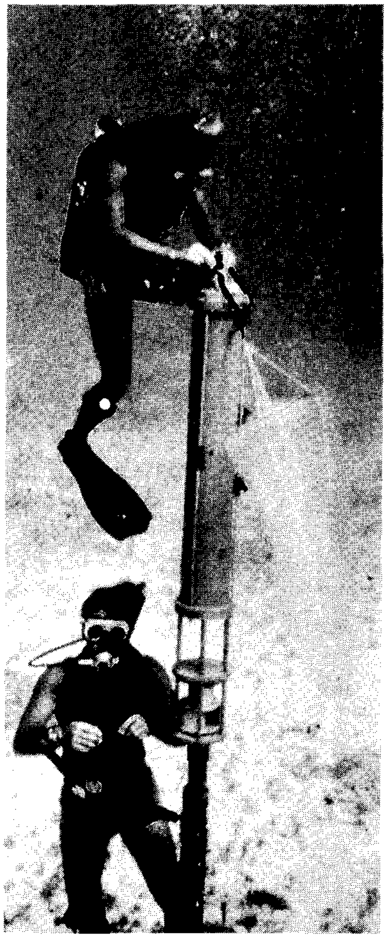
Not all the diving done by NAVOCEANO is in warm tropical waters. In November 1970, at Fletchers Ice Island, A NAVOCEANO team dove through 15 feet of sea ice to study the underside of the ice. The team made 14 dives, most lasting longer than 1 hour, in 24-hour darkness less than 300 miles from the North Pole.

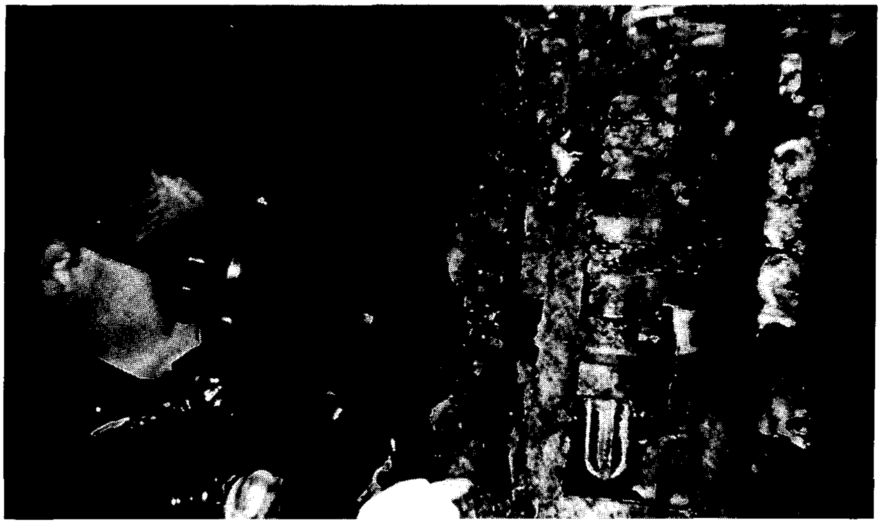
Since the NAVOCEANO divers' tasks usually take them far from their home base, they sometimes ask for on-site support from other Navy diving activities. Thus, the scientist/diver may find himself working with EOD or salvage divers or borrowing tanks or air from an SRF locker or Fleet tug. During one interesting series of surveys in the Baltic Sea, a NAVOCEANO scientific team conducting diving operations from West German and Danish Navy ships was assisted by a team of German Navy divers.

However, most NAVOCEANO diving jobs are done as self-sufficient operations. Two 19-foot Zodiacs powered by 50-horsepower outboard engines are shipped wherever necessary. Portable gasoline and electric compressors also contribute to the mobility of the diving team. An impressive collection of underwater still and movie cameras and lighting equipment is used to document underwater conditions.

NAVOCEANO's current roster of qualified divers includes seven oceanographers and one engineer. All received their training at one of the Navy schools and are expected to maintain their qualifications in accordance with Navy regulations. When the NAVOCEANO divers aren't diving, they can be found doing the same things other scientists and engineers do. This usually means analyzing data, writing reports, and preparing for the next operation.







NAVOCEANO diving scientists at work.

SDL-1 Recertified at NEDU

LT Ed Pahl
Navy Experimental Diving Unit

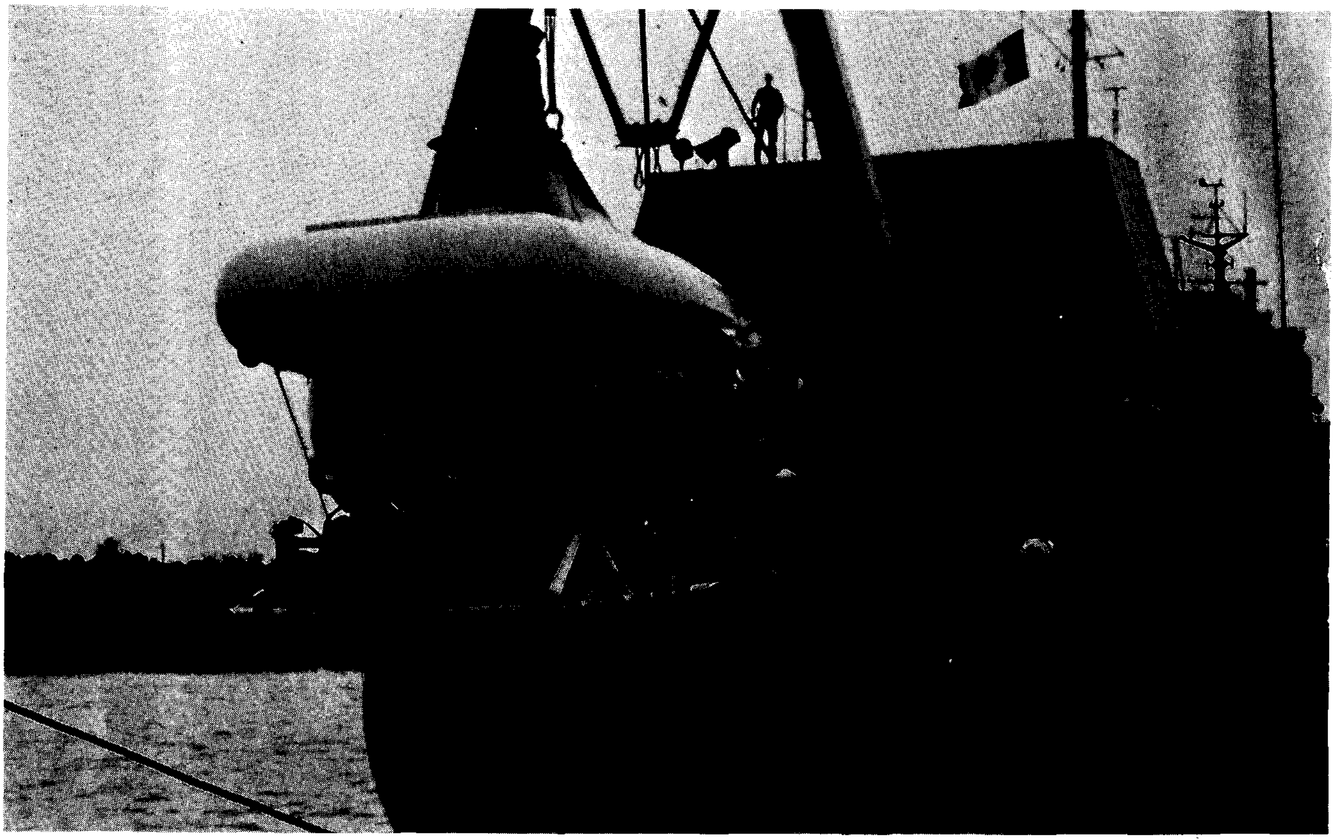
Under the auspices of the Information Exchange Project (IEP C-21), the U.S. Navy and Canadian Forces (Navy) undertook a significant joint project at the Navy Experimental Diving Unit (NEDU). The successful completion of this effort further demonstrates the ability of two allied Navies to work together harmoniously in the accomplishment of a particular goal.

On 6 February 1981, the Canadian Navy's Submersible Diver Lockout Number ONE (SDL-1) arrived for a week of extensive testing at the Navy Experimental Diving Unit (NEDU) from Port Canaveral, Florida, where its mother ship, HMCS CORMORANT, had put in for repairs.

The SDL-1 is a Canadian submersible designed for observation diving to 2,000 feet-of-seawater (FSW) and for diver lockout diving down to 1,000 FSW. The SDL-1 had recently completed a prolonged refit, and it had to be recertified to ensure that all systems were functioning properly before further operational use. NEDU promulgated a schedule that conformed to the technical requirements and objectives required by the Canadian Navy to ensure a proper recertification effort.

One of these objectives was to ensure that the SDL-1 floated at an even trim while surfaced. This was accomplished during a trim and stability test by placing the SDL-1 in the NEDU test tank, filling the tank with water, and observing and measuring the angle of trim while it floated. The NEDU test tank is 15 feet deep, and therefore capable of conducting this test.

SDL-1 in NEDU test tank.



SDL-1 is loaded aboard CORMORANT.

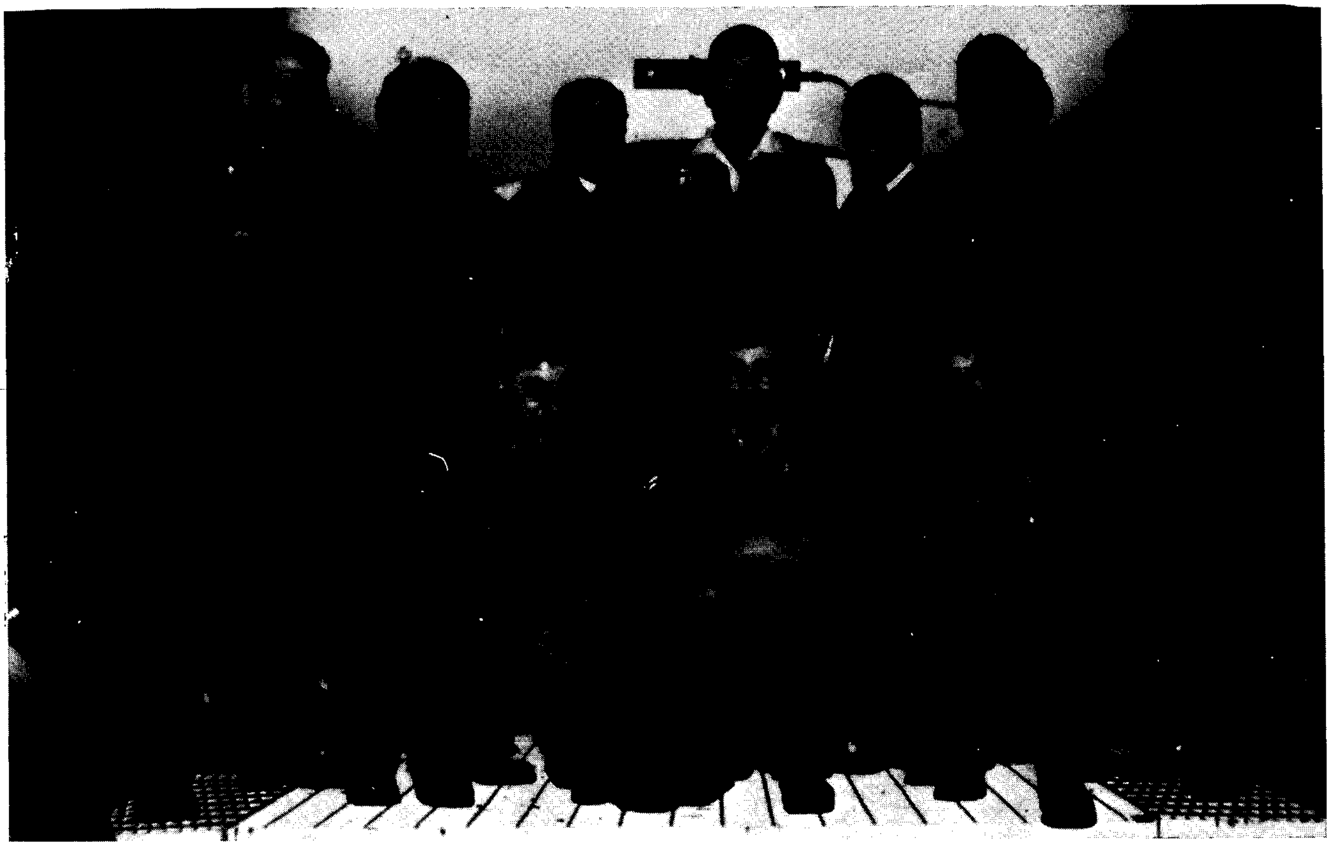
LT Pahl (left), CF Exchange Officer at NEDU, discusses testing with CDR Cwiklinski, NEDU's XO.

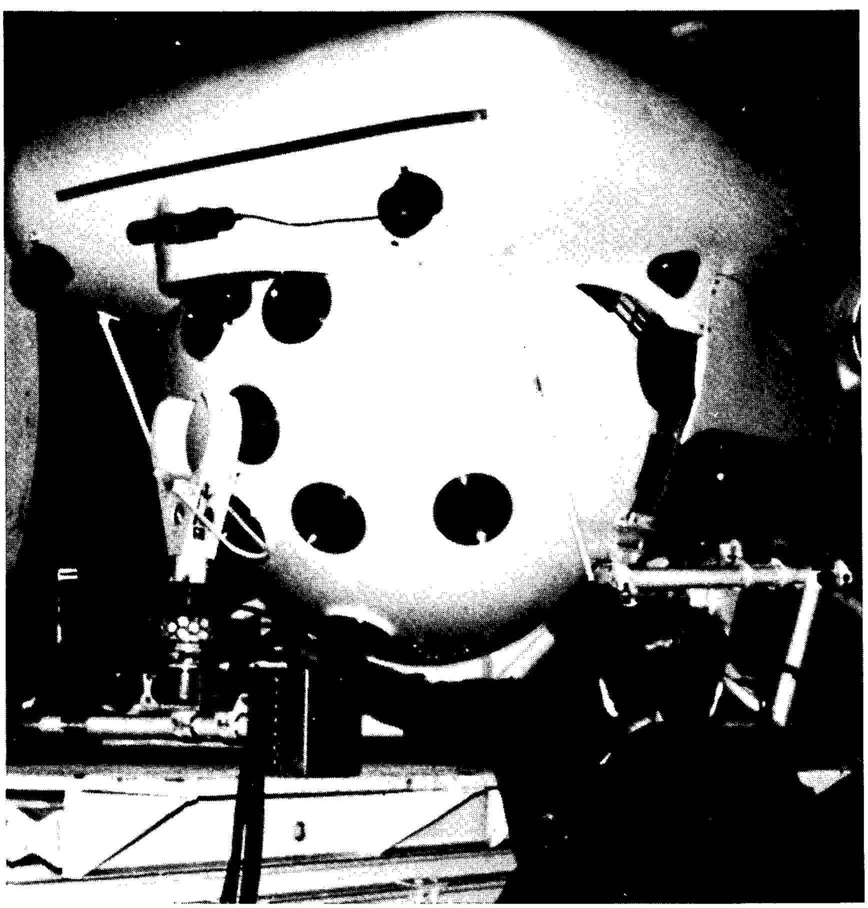
After completion of the trim tests, the SDL-1 was transferred to the Ocean Simulation Facility (OSF) hyperbaric chamber "wet pot" for the next phase of recertification. Once in the wet chamber, the chamber was filled with water chilled to 38° F. Recertifying the SDL-1 for operational purposes required two dives to 2,000 FSW. The first dive was unmanned, to ensure that there were no interior leaks or pressure build-up inside the SDL-1's command sphere. The second dive was manned, and required stops at 500, 1,000, 1,500 and 2,000 FSW. At each stop, all ancillary equipment of the SDL-1 was operated to ensure that all was working properly.

The Dive Watch Officer—LT(N) Pahl, CF, the Dive Supervisor—BMCM(MDV) Woody, and the Chamber Operators—BMC(DV) Bloechel and BMC(DV) Chancellor, monitored all systems throughout both dives. The SDL-1's command sphere is designed to be a one-atmosphere vessel, i.e., the internal pressure remains equivalent to sea-level pressure. During the 2,000 FSW dives, pressures against the SDL-1 exposed surfaces varied between 0-890 psig with no apparent change to the inner sphere pressure.

On completion of the manned dive, the SDL-1 surfaced and was removed from the OSF, placed on a trailer and transported to HMCS CORMORANT. CORMORANT had arrived in Panama City during SDL-1 testing after having completed the necessary repairs.

The imminent success of the SDL-1 Recertification Trials can be attributed to the close cooperation between the personnel of NEDU, NCSC, and the SDL-1 support crew.



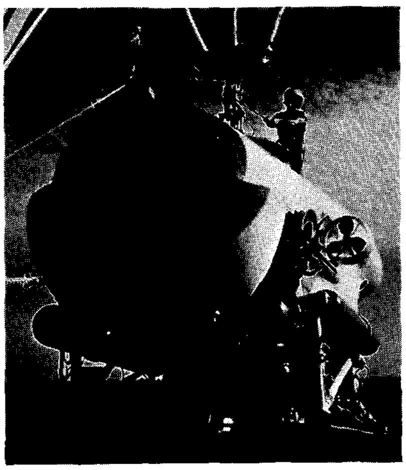


Above: SDL-1 support crew posing in OSF wet chamber. Left: SDL-1 being loaded into the OSF wet chamber.

Canadian Forces Personnel on the SDL-1 support crew:

LCDR G.H. Rank
Commanding Officer of SDL-1
LT S.A. McDougal
SDL-1 Pilot
LT G.H. Mailoux
Training for SDL-1 Pilot
CPO M.L. Semple
SDL-1 Crew Chief
P1 R.P. Boucher
P2 R.C. Hawkley
M/S A.B. Rogers
M/S A.G. Ferrie
M/S L.P. Dooling
M/S F.C. Munden

A Look at the USN Diving Exchange Billets in Great Britain and Canada



SDL-1.

The Canadian Forces (Navy) Challenge

LT Forrest Brooks, USN

Where can one pilot his own submersible to 2,000 feet-of-seawater, use state-of-the-art diving equipment, bask in southern sunshine for 3 months while his neighbors shovel snow and work with and for very qualified and knowledgeable people all steeped in Canadian Naval tradition—as the U.S. Navy Personnel Exchange Officer serving aboard Her Majesty's Canadian Ship (HMCS) CORMORANT, of course!

Homeported in Halifax, Nova Scotia, HMCS CORMORANT is a unique Fleet diving support ship. She is designed to provide underwater surveillance, search, inspection, limited salvage, repair, explosive ordnance disposal and submarine search and rescue. CORMORANT supports and operates the Submersible Diver Lockout (SDL-1) and has the capability to embark a second similar submersible as well.

The SDL-1 is a PISCES class submersible capable of diving to 2,000 feet-of-seawater. CORMORANT has a 100-meter-of-seawater (328 FSW) surface-supplied diving system (air and helium-oxygen). Also on board are a variety of state-of-the-art diving equipment ranging from hand-held sonar and the Kirby Morgan SuperLite (SL)-17B diving helmet to underwater CCTV. In addition to other duties, the ship performs Technical and Operational Evaluations on new diving equipment before issuance to the Canadian Fleet.

This particular Personnel Exchange billet is Diving Department Division Officer. As such, the incumbent is assigned as the Surface-Supplied Diving Division Officer aboard CORMORANT. He is responsible for the operation and readiness of the surface-supplied diving system and its associated equipment—including underwater tools, SCUBA, and the recompression chamber. He is also required to qualify as an SDL-1 pilot during the course of his tour of duty.

The submersible is operated and maintained by Canadian Forces Mine Clearance Divers and Diving Officers, equivalent to U.S. Navy First and Second Class divers and HeO_2 Diving Officers, respectively. The CF Mine Clearance Diver performs essentially the same functions as the First and Second Class USN diver with a few exceptions. Once the individual has qualified as a Clearance Diver, he leaves his previous rate and remusters as a diver. He is then considered for promotion and all further detailing solely as a diver. In addition, the EOD training he has received qualifies him to render safe military and civilian ordnance and explosives. Some divers receive training in disarming terrorist improvised explosive devices (IED's).

Recently, CORMORANT—with SDL-1—sailed south to Panama City, Florida, to the Navy Experimental Diving Unit for a post-refit recertification dive to 2,000

FSW in the Ocean Simulation Facility (see page 18). Subsequent to recertification, SDL-1 completed several open sea dives to 1,900 FSW in the Gulf of Mexico and diver lockout dives north of the Florida Keys. Port-of-call visits were made at New Orleans, Houston, and Little Creek on the way back to Nova Scotia.

Any qualified US Navy HeO_2/ Diving Officer (LTjg or LT) who wants to experience the demands of diving by Canadian Forces standards should refer to OPNAVINST 5700.7 series and contact his detailer.

Exchange Experience With the Royal Navy

LT Bert Marsh, USN

Exchange duty with the Royal Navy (RN) means variety. The tasks one is assigned can vary from compiling trial orders for commercial diving equipments through a variety of project duties to making a 142-meter (470 FSW) saturation dive to a sunken submarine in waters off the Isle of Arran in Scotland.

Variation of mission and the training required results from a difference in the role performed by Royal Navy Clearance Divers and the First or Second Class diver "Stateside." Clearance diving's primary role entails explosive ordnance demolition, utilizing the semi-closedcircuit Clearance Diver's Breathing Apparatus, (CDBA). In contrast to USN diving, shallow water (0-50 meters, 0-165 FSW) salvage tasks within United Kingdom waters are conducted under the direction of the Civilian Director of Marine Salvage personnel. However, RN divers complete many ship's husbandry tasks such as screw changes, sonar dome replacements and some salvage tasks when circumstances dictate.

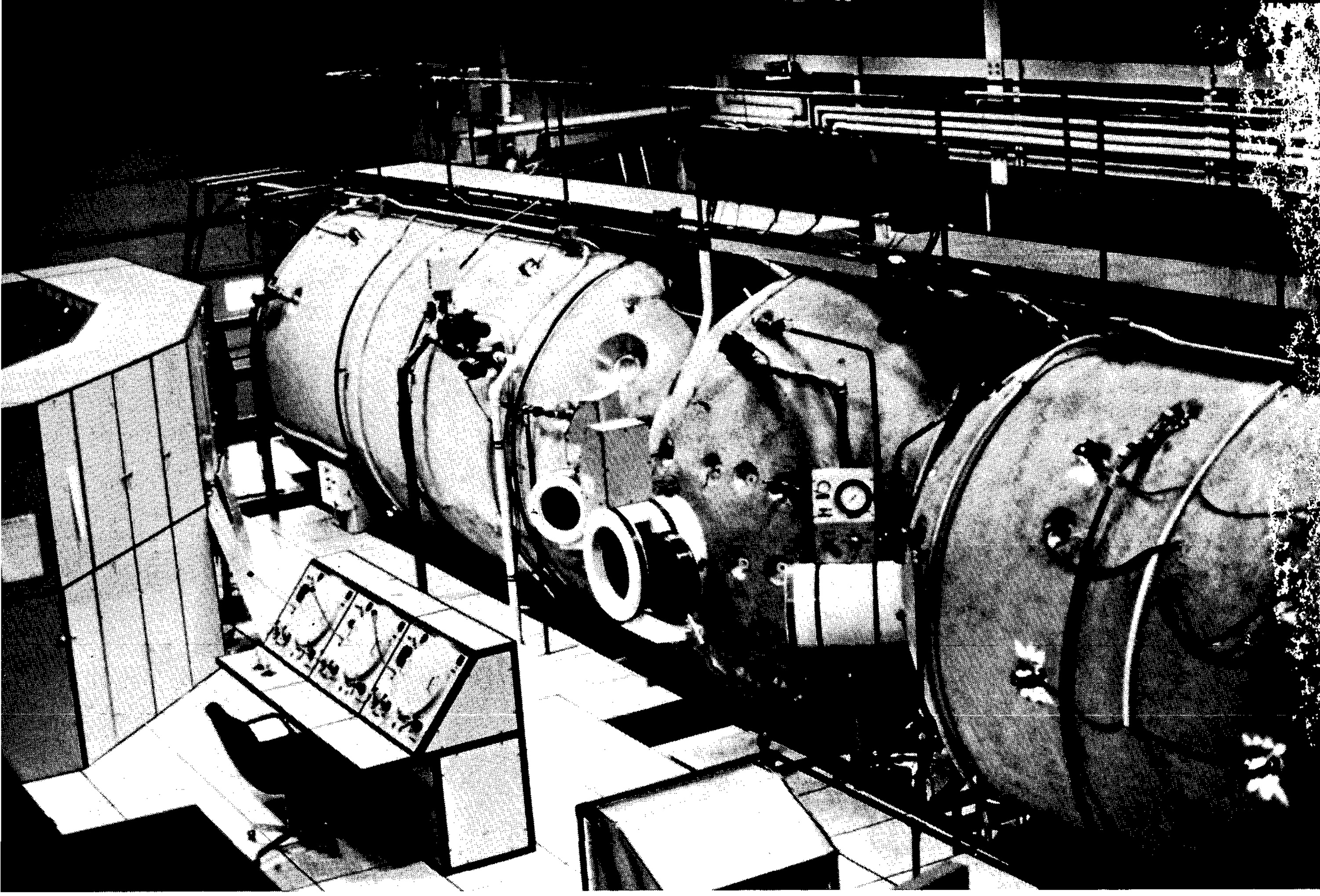
To maintain an operational capability to dive to 75 meters (248 FSW) in a mine clearance role, Fleet Clearance Diving Teams utilize a variation of the USN MK 1 surface supplied diving rig. The variety occurs when you compare the USN and RN method of diving to 248 FSW. Diving from a Gemini (Zodiac) rubber dinghy using a KMB-10 with high pressure mixed gas, and O_2 cylinders supplying (through a panel) the breathing media, the clearance divers quarterly work up to 75 meters. Contrast the USN required open bell, Medical Officer, and chamber on scene and partial pressure tables with surface decompression, and the variation of method is obvious.

Consider the various gas mixtures a diver breathes in diving, then add tri-mix (He, N_2, O_2) and variety again typifies the exchange billet. The RN is presently working on developing decompression tables utilizing tri-mix to allow 75- to 80-meter (248 – 264 FSW) dives with 15-minute bottom times while reducing the in-water stops for decompression. This project will eventually fulfill a required mission area when equipment and physiological research produce a solution.

RN saturation diving is alive and well. MV SEAFORTH CLANSMAN (see *Faceplate*, Spring 1979, for details of CLANSMAN) has recently completed her 29th open sea saturation dive, averaging three in-water excursions per dive. Depth of dives has varied from 80 meters (264 FSW) to 240 meters (792 FSW), but she regularly conducts training sats quarterly to 110 – 142 meters (363 – 469 FSW). Old hands from the MK 1 DEEP DIVE System State-side may remember CLANSMAN's Chief Diver Chris Ballenger, who has recently been relieved by CPO I.C. Caldwell.

The future of RN saturation diving is evolving with the launch of the Seabed Operational Vessel (SOV), to be christened HMS CHALLENGER in May 1981, and her 12-man 300-meter (990 FSW) Deep Dive System. The SOV is designed to incorporate dynamic positioning by computer controlled thrusting, eliminating a static moor of wire and/or chain. This method of positioning and the handling arrangements for launching the SDC (Submersible Diving Chamber) vary greatly from USN ASR-21 and -22 methods.

Variety is thus the order of the day in the USN diving exchange job with the RN, allowing the "max-flex" approach a full work-out.



DCIEM 5600-FSW Hyperbaric Complex.

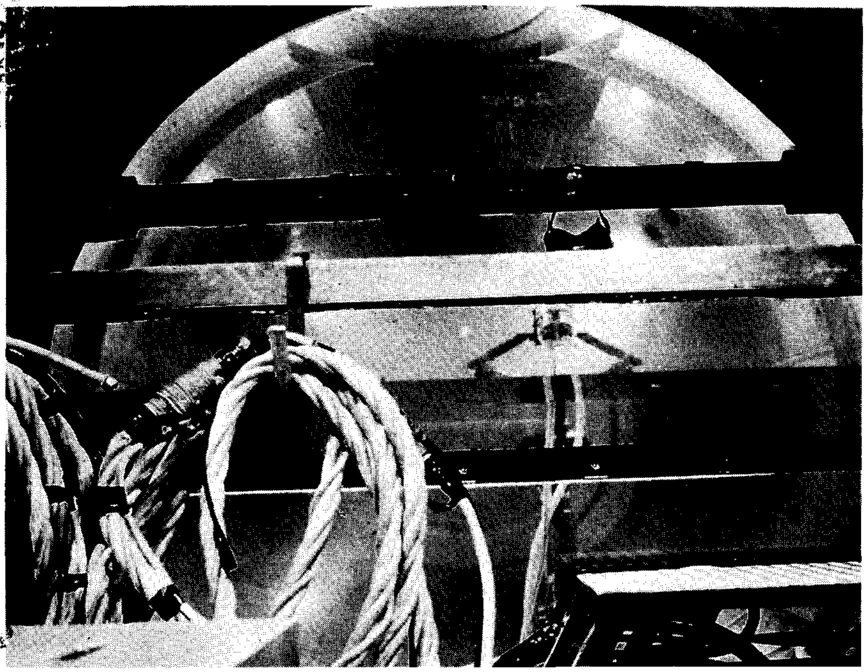
Canadian Saturation Dive 1981

LCDR J.T. Harrison, USN
Navy Experimental Diving Unit

Culminating over 4 years of design, construction and testing and 3 months of intensive watch station training, the Canadian Defense and Civil Institute of Environmental Medicine (DCIEM) successfully completed a 153-meters-of-seawater (502 FSW) saturation dive on 16 March 1981, the first official saturation diving mission in their new hyperbaric chamber complex. The Institute, located on the outskirts of Toronto, has endeavored to combine the best ideas in hyperbaric engineering and human factors design in the development of their new complex which is capable of pressures equivalent to 5,600 FSW. The complex consists of both dry chamber and wet chamber facilities.

The facility has three chambers with a total internal floodable volume of 2,370 cubic feet. The living chamber has accommodations for five Diver-Subjects. The wet chamber has a transparent partition that allows the horizontal chamber to be filled two-thirds with water while the dry tenders have full sight of the divers at all times. The living chamber and wet chamber are joined by a transfer sphere housing shower and lavatory features.

The four Canadian Diver-Subjects who participated in the dive represented the breadth of Canada's mili-

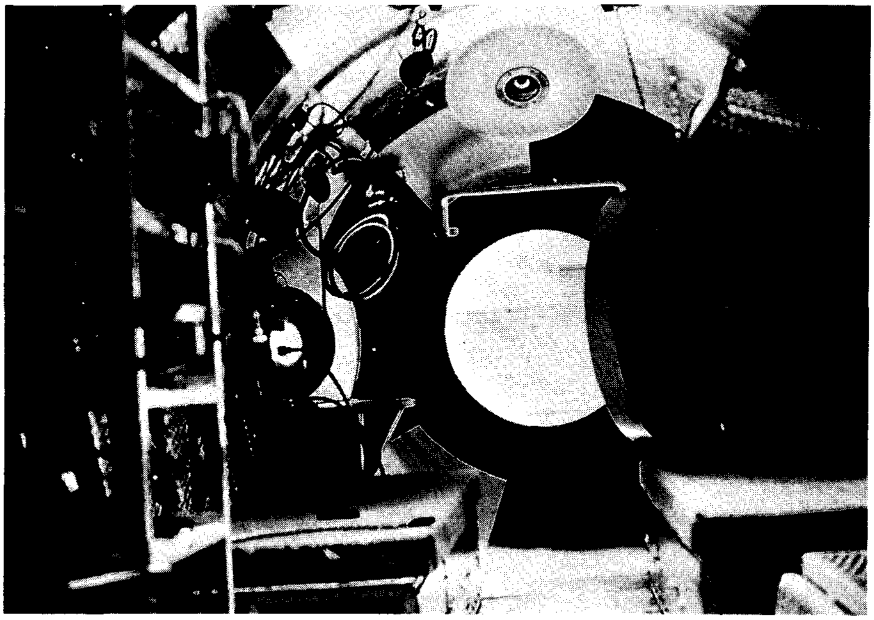


Internal view of the wet chamber—with diver umbilicals in the foreground—in front of the water barrier partition which houses the bicycle ergometer, visible in the background.

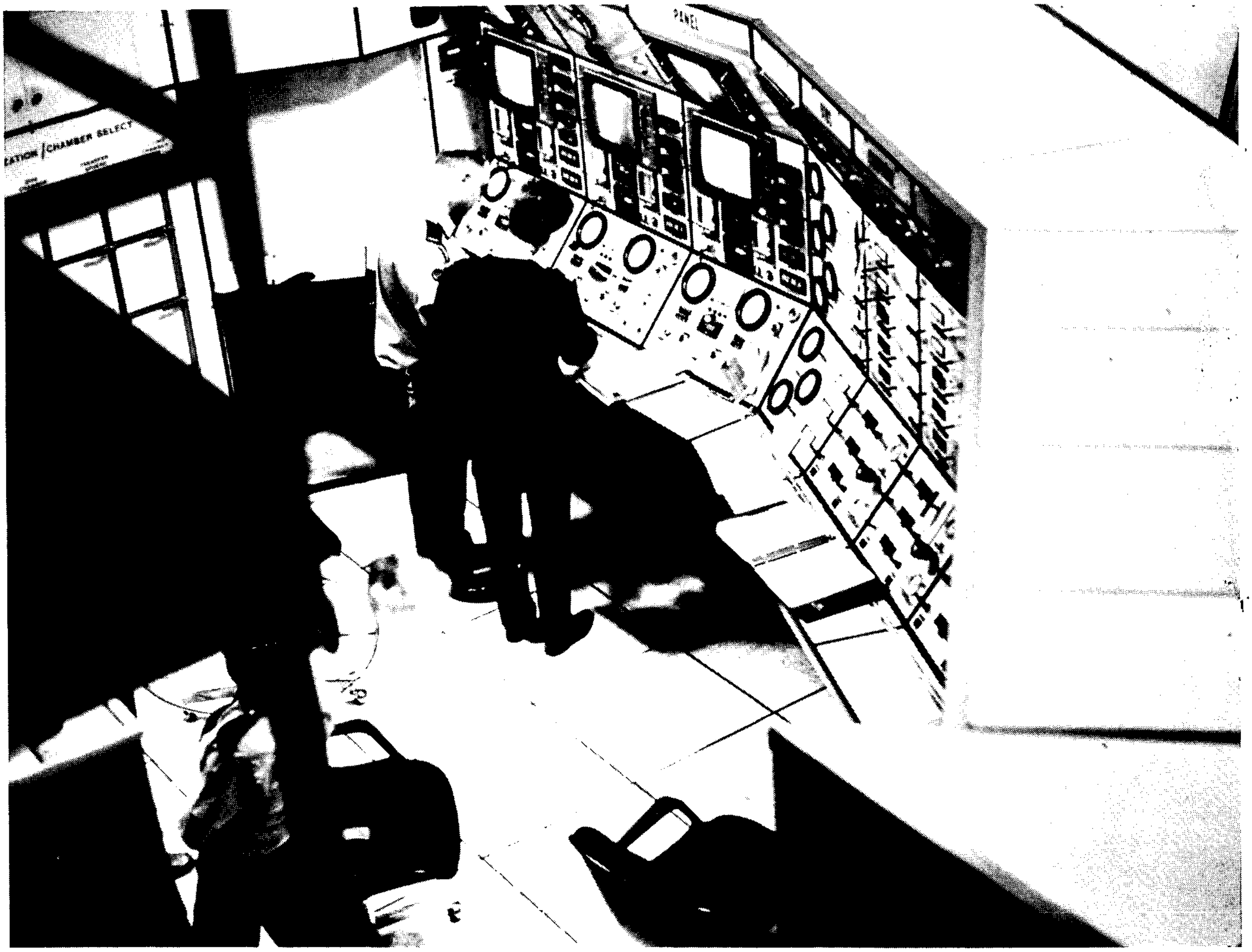
tary diving resources. Petty Officer Dick Van Ek, from HMCS CORMORANT, was the Dive Team Leader. He also was a dive team member of the 10-day DCIEM experiment in 1979, during which initial testing of the chamber complex, environmental controls and life support characteristics were conducted. CAPT Alan Campbell, the DCIEM Diving Training Officer, is also a commissioned medical assistant, paratrooper, para-rescue specialist and survival instructor. Leading Seaman Bill Burton is from the Pacific Diving Unit, Victoria, British Columbia; and Leading Seaman Mike Atkinson is currently in charge of the Surface-supplied Diving Division at DCIEM. Both Burton and Atkinson are experienced Fleet divers who contributed significantly to the successful completion of SAT DIVE 1-81. The fifth Diver-Subject, LCDR J.T. Harrison, USN, is currently stationed at the Navy Experimental Diving Unit (NEDU) in Panama City, Florida, and participated under the auspices of the International Exchange Project with Canada (IEP C-21). Two additional personnel from NEDU provided essential topside support to the dive, ENCS(MDV) Ron Mebust and ENC (DV) Tom Lenz. Both of these men participated as Dive Watch Supervisors, and their expertise as saturation divers was appreciated by both the topside duty dive watchstanders and the Diver-Subjects. CDR Ed Thalmann, Senior Medical Officer at NEDU, was also on hand during the decompression phase of the dive.

Major experiments conducted during the dive were divided into two categories, wet and dry. Wet experiments consisted of dive equipment evaluations of the commercial KMB-17B Superlite Helmet, and umbilical-supplied, open-circuit saturation rig, and the Norwegian AGA ACSC (Alternating Closed-circuit/Semi-closed-circuit) and Canadian CUMA (Canadian Underwater Mine Clearance Apparatus), both mixed-gas underwater breathing apparatus designed for use by mine countermeasure divers and explosive ordnance disposal technicians. Both the AGA ACSC and the CUMA were evaluated as the Diver-Subjects conducted various workloads on an underwater bicycle ergometer.

The dry experiments were designed to monitor subtle changes in the Diver-Subjects as they progressed through the 13-day saturation dive. Cardiovascular blood volume flow was conducted every morning for all



Internal view of the living chamber, with storage shelves on the left, bunks for dive subjects, and personal stowage locker underneath the bottom bunks.



Main dive control console, with TV monitors, gas analysis read outs, and diver gas supply valves immediately available to the two watchstanders.

divers as well as tremor monitoring and mood studies. At night, each Diver-Subject was monitored for brain wave activity and skin thermal heat flow, which required the attachment of 12 skin sensors before "lights-out" at 2300 daily.

One specific dry experiment involved Diver-Subject #5, LCDR J.T. Harrison. While the other divers were compressed to the maximum dive depth of the dive (502 FSW) over a 4-day period, LCDR Harrison was compressed on Dive Day 5 straight to depth during a 2-hour pressurization test. During the compression, he was monitored for heat flow, brain wave and tremor studies.

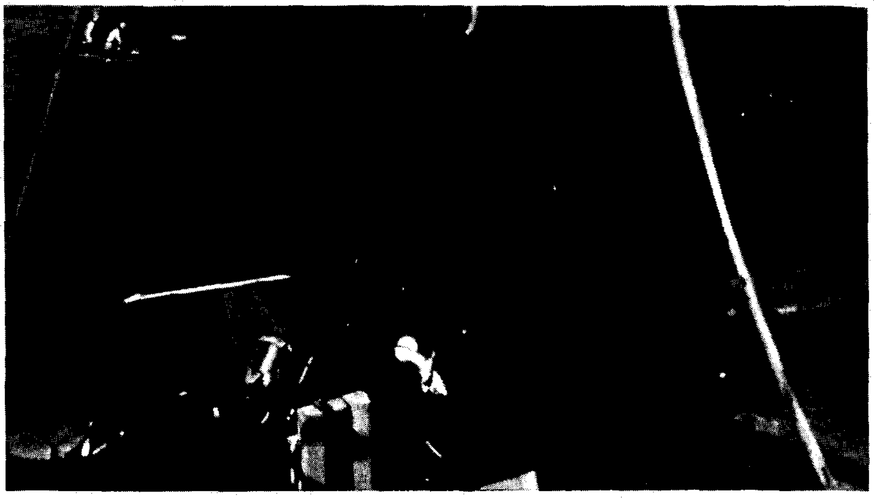
Finally, during upward excursion testing and four times daily during saturation decompression, all Diver-Subjects were monitored with the Doppler Acoustic Monitoring Device, which allowed the topside scientific technicians to listen to bubbles in the blood stream as possible signs of impending decompression sickness. This device shows promise for better understanding of decompression physiology.

Upon dive completion on 16 March 1981, it was unanimously agreed that it was a great success. All dive equipment had been tested to the specified depths, and the dry chamber studies had produced valid data for DCIEM to study and reduce to professional papers. According to LCDR Lauckner, the DCIEM Dive Coordinating Officer, "while there have been deeper dives, the results from this and future experiments will yield original and invaluable data on man's ability to live and work in the deep ocean. The results are available for use both by military divers and the civilian diving community at large."

Just as important, this dive showed the valuable link in the information exchange program which allowed scientists and divers from several nations to combine their talents toward a common goal. It is hoped that future multi-national dives will be conducted, which will provide an excellent environment for the cross-exchange of information and the forging ahead of new frontiers in diving.

RECOVERY Completes F-16B Salvops

LT Rande M. Kessler
USS RECOVERY



If a salvage team had the opportunity to select their own conditions for downed aircraft recovery, what would be their criteria? The list would include 0 to 2-foot seas, low winds, warm air and water temperatures, a 30- to 40-foot working depth, and would be entitled "Coastal Florida, Gulf Side."

Not too many salvage assignments meet the above desires, but the F-16B salvage of early April 1981, came as close as could be expected. The USS RECOVERY (ARS-43), commanded by LCDR H.A. Stephan, departed Little Creek, Virginia, on 28 March on an emergency request from the 9th Air Force. Her task was to locate and recover an F-16B aircraft that had experienced engine difficulty in flight and had entered the water approximately 7 miles off the coast of Sarasota, Florida.

RECOVERY was given an estimated crash position from the Coast Guard Station at Cortez and anchored upon arrival to begin initial search operations. Utilizing workboats and divers, the search team began to scan the bottom in search grids while awaiting the arrival of an EOD team and their side-scan capabilities. Also requested were the services of the USS ENGAGE (MSO 433) from St. Petersburgh, Florida.

After several days of searching and constant review of charted locations, the wreckage was discovered resting upright on a sandy bottom in 40 feet of water. Fortunately, the plane was intact, with the exception of the nose section forward of the pilot's seat-rail.

The salvage plan was divided into two operations. The first order of business was to recover the scattered debris of a shattered nose section. The second order was to attach lifting cables to fuselage support points. The debris field was discovered and cleaning operations were begun by several dive teams, headed by ship's Diving Officers LT Andrew T. Hammond (Executive Officer) and LT Rande M. Kessler. The salvage team, headed by LT Melvin Bell (Diving Officer) and ENS Michael Fair (First LT), decided to perform the aircraft lift utilizing the ship's after boom after settling into a two-point moor over the wreckage. EOD divers disarmed the ejection seats and, while the debris collection continued to progress, divers commenced the hook-up procedures.

Diving the MK 12 Surface Supported Diving System in the swimmer mode proved to be an effective method of maintaining clear communications and control of the divers, as well as allowing them sufficient mobility to work on the wreckage. Divers wore SCUBA in the collection of scattered debris as did the EOD divers for the seat disarming operation. Photography, conducted by EOD personnel as well as LT Bell, was also performed in SCUBA.

After a week of diving operations, the F-16B was prepared for the lift. But complications set in when the lifting line began to chaff through. It became necessary to attach the boom hook to the lifting sling as the aircraft remained suspended just beneath the surface of the water. A diver entered the water and attached the hook and quickly exited to view the plane as she was lifted from her watery runway and settled comfortably on RECOVERY's fantail.

Diving Personnel

USS RECOVERY:

LT. A.T. Hammond
LT M. Bell
LT R.M. Kessler
LTJG H.L. Pruitt
BMC(MDV) D.L. Williams
EMC(DV) D.E. Gallagher
HTC (DV) R.C. Watts
HMC (DV) G.B. Pope
HT2 (DV) M.A. Hansen
TM1 (DV) D. Merriman
ET2 (DV) J. James
MM2 (DV) D. Nedwick
IC2 (DV) A.B. Smith
HT3 (DV) W.R. Patterson

EOD DET:

LTJG Murry
STGC Tripuck

HOIST SURVEYS U–352

MK 12 diver is prepared to dive on the U-352.

LT Timothy B. Stark, USN
USS HOIST (ARS-40)

On 9 May 1942, the German submarine U-352 positioned herself for the first attack of her initial war patrol. The U-352's victim was the Coast Guard Cutter ICARIUS, which was enroute from Norfolk, Virginia, to Charleston, South Carolina. The U-352's first torpedo exploded prematurely, however, alerting ICARIUS, which in turn commenced a depth charge and 3"50 attack on the submarine. Approximately 25 minutes later, the U-352 sank in 116 feet of water. ICARIUS recovered the survivors and proceeded to Charleston. This skirmish took place 26 miles east of Moorehead City, North Carolina.

U-352 remained undisturbed until 1975, when local SCUBA divers from Moorehead City discovered the sunken submarine. It then became an attraction for the local SCUBA diving clubs and dive shops, which advertized: "diving on a World War II German Submarine".

With this amount of interest generated, Senator Lowell P. Weicker, Jr. (R.-CONN) made a dive on the U-352 himself. Determining the submarine to be a safety hazard to divers, Senator Weicker contacted the Chief of Naval Operations (CNO) and expressed his concern for diver safety because of unexploded torpedos and ordnance materials within and around the submarine.

CNO then tasked CINCLANTFLT to conduct an extensive internal and external survey of the U-352 to determine the extent of unexploded ordnance present in the area, then formulate a comprehensive plan to deal with any explosive, personnel, or environmental hazards existing.

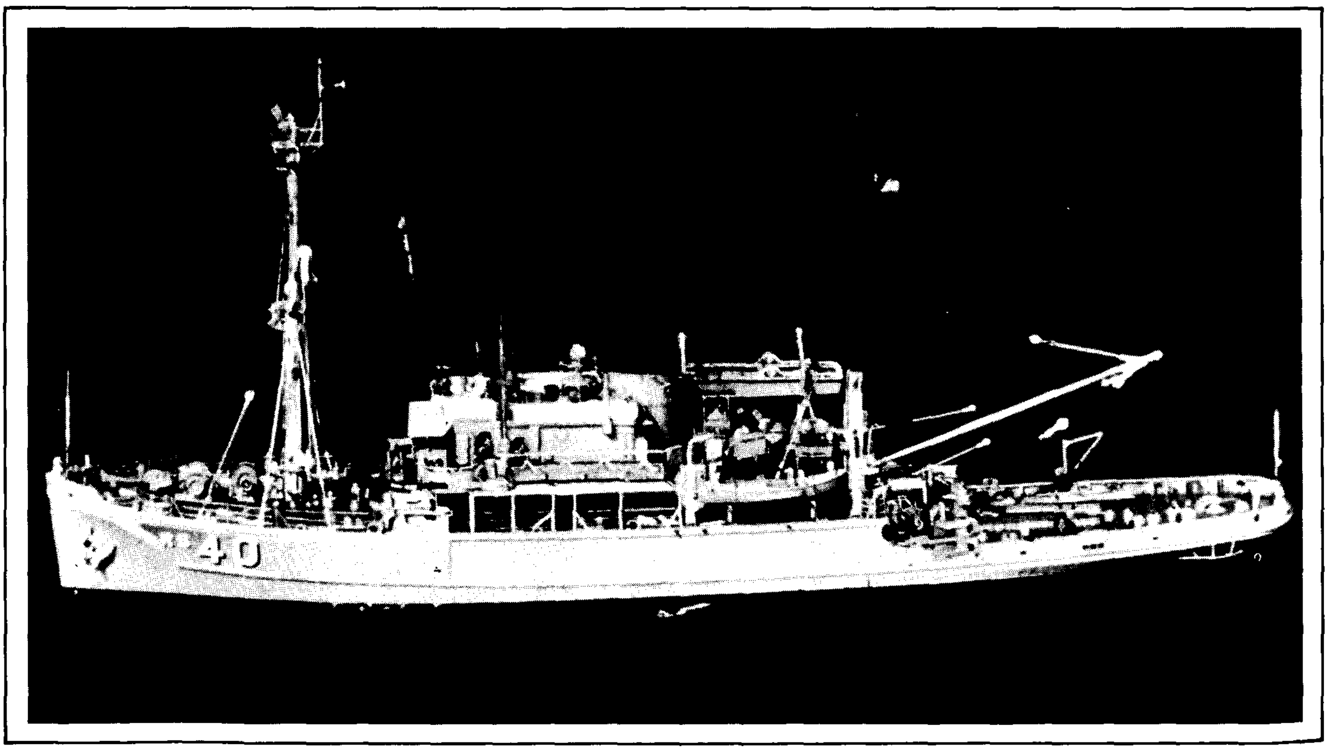
USS HOIST (ARS-40), under the command of LCDR John E. Driver, was tasked by COMSERV-RON EIGHT to conduct the underwater survey. After weeks of planning, it was determined that the following operational elements would be necessary: a multiple point moor that could maintain HOIST's position in the Gulf Stream current flows that ranged up to 7 knots; the Underwater Damage Assessment Television (UDATS); the MK 12 Surface Supported Diving System (SSDS) for internal survey of the submarine; airlifts and Peri-jets for excavation of the 38 years of sand and silt that had built up inside the U-352; a side scan sonar for locating the U-352 initially; underwater radiographic equipment; explosive ordnance disposal equipment; and various other logistic items.

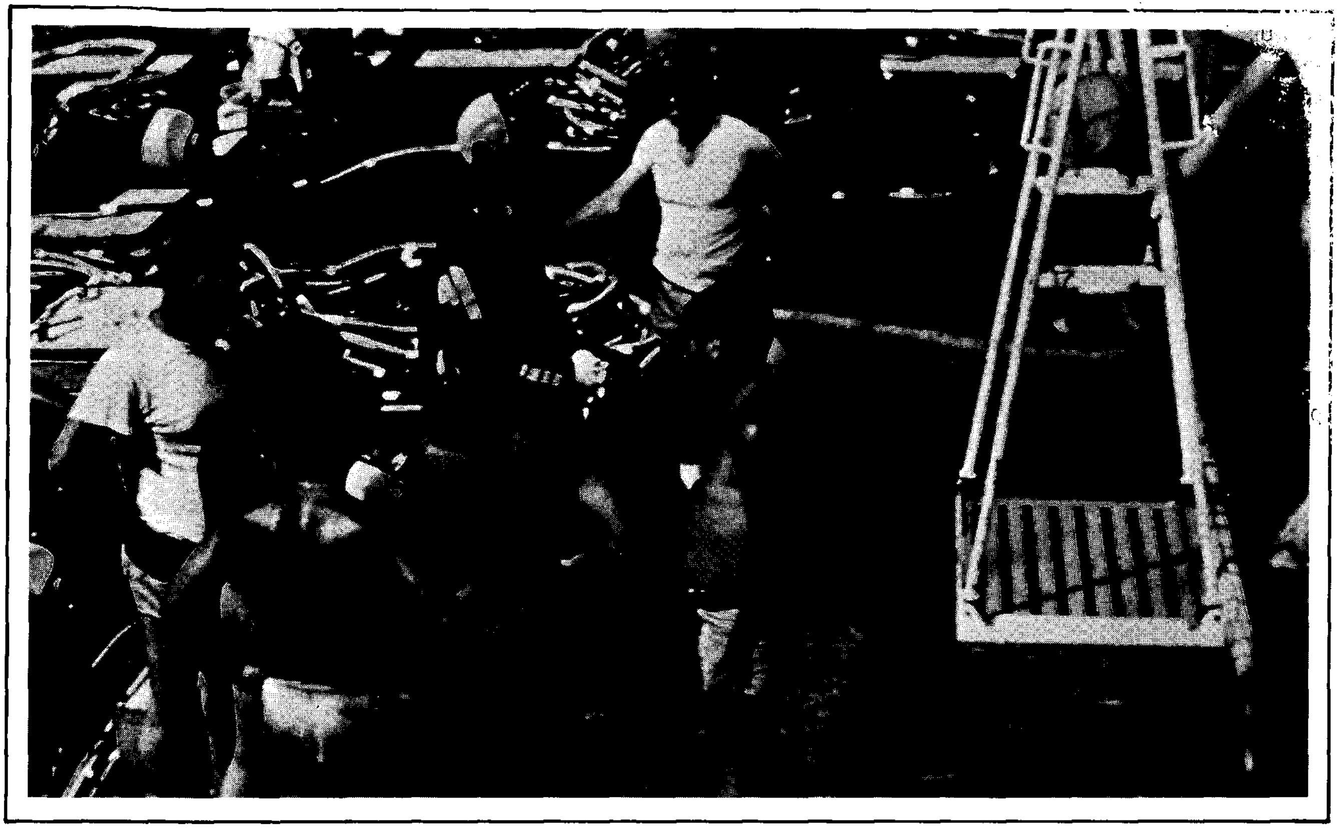
On May 27, HOIST got underway from Little Creek, Virginia, with an Explosive Ordnance Disposal (EOD) team, Master Diver, Diving Medical Officer, and radiographic technicians from the EOD Facility at Indian Head aboard. Transit to the approximate site, location of the U-352, and rigging, laying, and setting up a five-point moor was accomplished from 27 to 30 May.

Diving operations commenced on 31 May. A preliminary external survey found that the U-352 was listing 65°-75° to starboard; that the forward 30 feet of the bow was broken with a down angle of 30°; and that 75% of the decking was missing, with only framing remaining. Also, the hull was heavily encrusted with barnacles. The stern torpedo tube outer door was open with 2½ feet of torpedo protruding. In addition, several 88 mm rounds of ammunition (for the deck gun) were scattered around the submarine. Fortunately, the forward and aft torpedo loading hatches were open, allowing diver access to the interior.

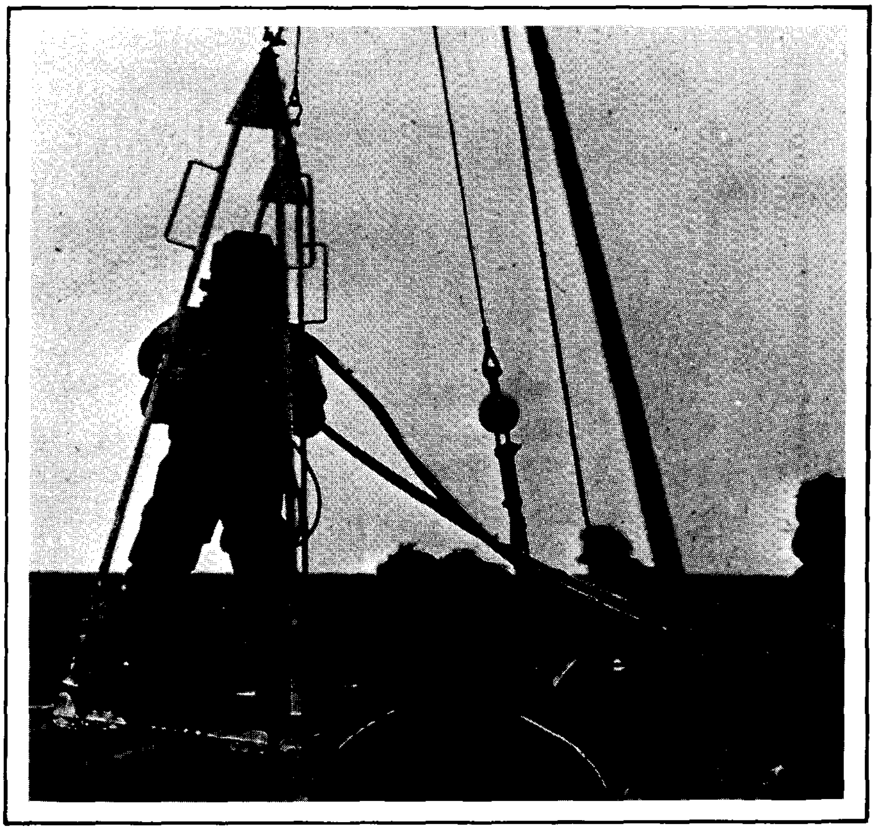
The internal survey began in the forward torpedo room and progressed aft to the control room hatch. The forward torpedo room was 75% filled with sand and silt; the next compartment aft was 35% filled. This sand and debris had to be removed before it could be determined whether any torpedoes or torpedo exploders were in the forward room. Removing this debris was a long and tedious process, using airlift and peri-jet equipment. Next, the torpedo room tube hatches were drilled and probes were inserted into them to determine whether they were loaded.

Page 28: Photo shows MK 12 diver preparing for dive. Below: HOIST underway.





Above: Fantail of HOIST during diving operations.
Below: MK 12 diver goes over the side of HOIST.



The aft torpedo room presented a similar build-up problem, only to a greater degree. Apparently, the after torpedo room of the U-352 was used to stow spare parts, motors, and cables that were frequent repair items during war patrols. The heavy concentration of debris in this space made excavation and diver movement very difficult.

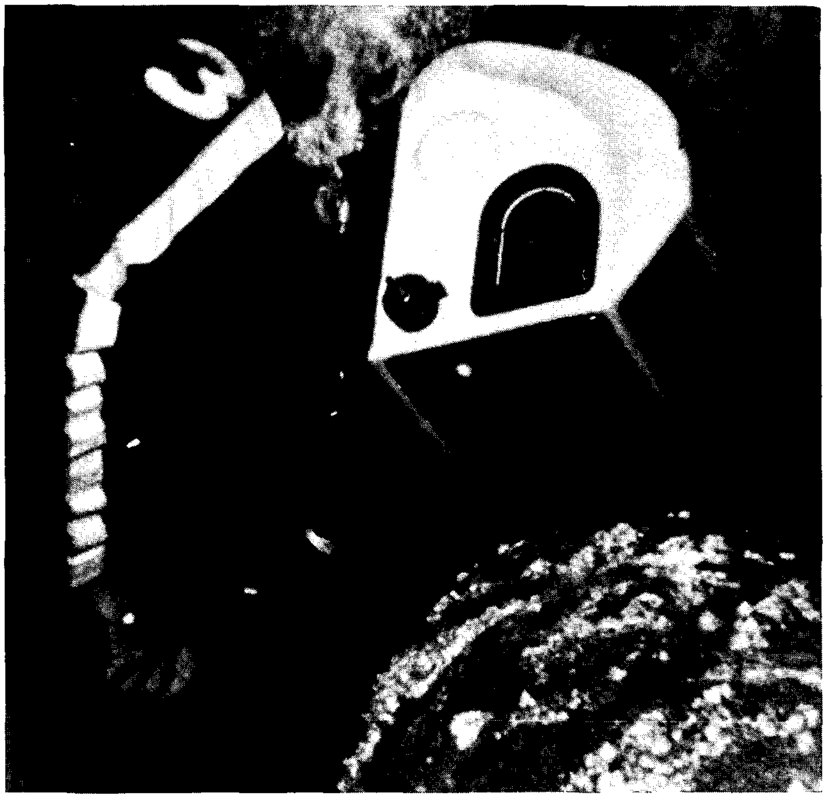
The torpedo that protruded from the stern torpedo tube outer door presented a problem in that a determination as to whether the warhead was armed had to be made. This was accomplished by taking an underwater xray of the warhead. A special team of EOD radiographic technicians set up the xray equipment, took the shot, and developed the film on board HOIST. This was the first time this procedure, which proved that the torpedo warhead was not armed, was used at a depth of 116 feet of seawater and in other than ideal conditions.

A complete UDATS survey was taken of the submarine, both externally and internally. Every compartment on the boat was covered by video tape, from the forward torpedo room straight aft to the after torpedo room. UDATS coverage of the xray procedures of the stern torpedo was also completed.

During the external survey, a torpedo warhead was located topside on the submarine and was removed by lift bags. This warhead was then towed 1,000 yards from HOIST and lowered to the ocean floor. An Incendiary Torch Remote Opening Device (ITROD) was used to conduct a safe burn of the high explosive inside the warhead. After the successful ITROD burn, the empty warhead body was recovered and delivered to EODGRU TWO for study.

A total of 98% of all dives conducted were made in the MK 12 SSDS. A few problems were encountered with this rig, but the diving outfit generally functioned as designed—outstanding. For nearly all the dives conducted, SVR D 02 procedures were used. With the ease of undressing a MK 12 diver, the surface interval never became a problem. Approximately 6,600 cubic feet of oxygen was used for surface decompression. During the survey of the U-352, the divers logged over 208 man hours of bottom time. Duration of each dive averaged from 10 to 82 minutes.

After 43 days of hard work and long days, the underwater survey of the sunken German submarine was concluded (7 July). It should be noted that, when given a task to complete and provided with logistical support, the professional Navy diver can and will get the job done.



Diver surveys a torpedo.

Salvage Element Organization
(Task Element 40.7.3.6)

On-Scene Commander/CTE 40.7.3.6:
LCDR J.E. Driver, USN
Commanding Officer, USS HOIST (ARS-40)

Diving Officer:
ENS A.J. Ashton, USN
Diving and Salvage Officer, USS HOIST (ARS-40)

Master Diver:
ENC(MDV) J.E. Cook, USN
Service Squadron Eight

USS HOIST Personnel:
LT T.B. Stark, USN
Diving Officer/Executive Officer

LT(JG) N.J. Schimming, USN
Diving Officer/Operations Officer

HMC(DV) M.L. Darius, USN
MM1(DV) S.R. Mathews, USN
BM1(DV) H.F. Gillman, USN
BM1(DV) C.W. Reed, USN
HT2(DV) C.W. Hill, USN
HT2(DV) H.D. Gither, USN
QM2(DV) J.L. Wingo, USN
BM2(DV) G.R. Forrence, USN
BM2(DV) S.H. Clayton, USN
IC2(DV) T.S. Flemming, USN
BM3 (DV) R.S. Albertoni, USN
MR3(DV) J.S. Washam, USN
BMSN(DV) J.S. Anfuso, USN
ENFN(DV) S. Abel, USN

EODGRU TWO DET USS HOIST Personnel:
LCDR M.J. Duignan, USN (OIC)
CW04 C.E. Wharton, USN
MMCS (DV) H.S. Lapping, USN
BM1(DV) R. Gautier, USN
PH2(DV) C. Muller, USN

HCU TWO Personnel:
LCDR R.W. Shroeder, MC, USNR
BM1(DV) J.E. Morrow, USN

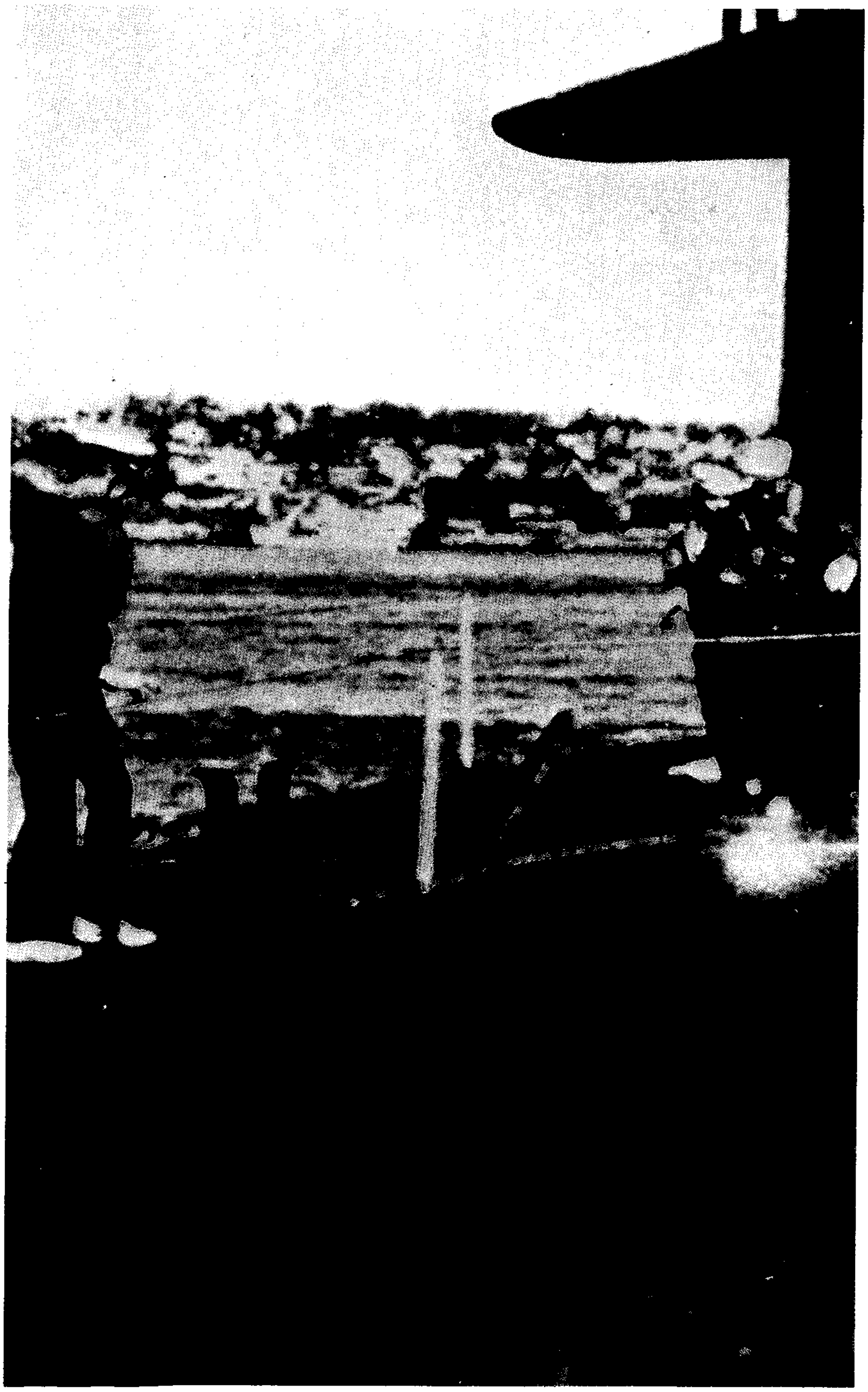
USS PIEDMONT Personnel:
MM2(DV) J.A. Mendler, USN

NAVEODFAC Indian Head Personnel:
GMGCM W.S. Lee, USN
Radiation Safety Officer/Senior Radiographer

Mr. Pence
Diver/Assistant Radiographer

Nylon Line: Friend or Foe?

Mr. George Prentice
Naval Sea Systems Command



A rare view of a line in the process of failure.

When a nylon line breaks, it snaps back with terrible force at a speed of 700 feet per second. Compare that to a 45-caliber bullet's velocity of 850 feet per second, and it is obvious that line can be lethal. In fact, it has been deadly on several recent occasions during Fleet use. As a result of these accidents with synthetic rope, the Navy and Coast Guard (both users of great quantities of rope) have undertaken a program to resolve the problems associated with its use. Among the areas under investigation are: snapback, "talking" lines, non-destructive rope testing, eye-splice strength, loss of rope strength under continuous high loads, used rope inspection and retirement criteria, photo chemical deterioration of rope, rope fiber "finish," improved rope stoppers, detrimental effects of longitudinal rope excitation, the effect of abrasion on rope strength and the stretch characteristics of rope. A safety film is also being produced to graphically demonstrate the hazards of improper handling of synthetic lines. This extensive program, initiated in Spring of 1980, is beginning to shed new light on the characteristics of synthetic rope. This article will provide a brief overview of the ongoing work.

Snapback is perhaps the most dangerous characteristic of synthetic rope. As a line is stretched toward its breaking point, it stores up tremendous energy. When the line breaks, it is the rapid release of this stored energy that causes the line to "snap back" or recoil like a slingshot. The simplest way to prevent snapback is to never permit a line to break; however, this is impractical or even impossible. The real problem recently uncovered is that one cannot reliably predict when a line is going to break. It is, therefore, important that any rope be treated as though it might break at any time, and, whenever possible, a line handler should perform his job from the safest position. The drawing below shows the events of a recent accident in which a snapping line injured two and killed one crew member.

Very little in-depth research on the snapback phenomenon has been done, so the Navy and Coast Guard are currently performing tests to determine how and why lines snap back. From their work, they hope to develop a standard test for snapback so that various "low-snapback" lines can be evaluated for effectiveness.

The Navy is also working on a "no-snapback" line. It is thought that such a line could help reduce the number of serious injuries that occur from line failures. Based on previous work directed by Mr. Rick Swenson at the Naval Oceanographic Research and Development Activity (NORDA) in Bay St. Louis, Mississippi, it is now believed that such a rope can be developed.

NORDA's approach is two-fold; both approaches employ Kevlar (or Arimed fiber). Kevlar is a fiber that feels like nylon, is yellow in color, is stronger than steel, and can be made into a rope that has a stretch as much as 50 percent of its original length at break.

NORDA's first approach is the development of a rope that has a stretchy inner core made of fiber similar to nylon and an outer cover made of Kevlar. The Kevlar cover is the load-carrying part of the rope. When the line breaks, the Kevlar snaps back along the line, leaving the center core intact. The load is thus transferred to the center core, which can withstand only a small load compared to the Kevlar. When the lightly loaded core breaks, there is almost no snap back.

NORDA's second approach is a rope that dissipates the stored up energy by unlaying as it breaks. This is done by designing the rope with several strands. When the line breaks, each strand breaks separately instead of all breaking at once. As a strand breaks, it begins to unlay or unwind violently for several feet. The stored energy is dissipated in this way. When the final strand breaks, there is very little energy left in the line and the two broken ends simply fall to the deck. This latter method has recently been demonstrated aboard one of the Navy's T-ATF's. A 3-inch circumference, 3-strand Kevlar line was broken between a capstan and bitt; the line snapped back only 4 inches. More testing is needed before a commercial product can be developed and at least one hitch is anticipated: the high cost of Kevlar. Kevlar costs almost $7.00 per pound; nylon costs only $2.00 per pound.

In conjunction with the snapback study, another aspect being investigated is "talking" line. Manila line makes a marked snapping or popping sound just before it breaks. However, such a characteristic warning is hardly ever heard from a synthetic fiber line. The Coast Guard is currently testing various ropes for the occurrence of this phenomenon. One of the ropes being studied has large nylon monofilaments woven into it. These monofilaments start snapping a few seconds before line failure. A few seconds isn't much warning, but a lot of deck space can be covered in that time when one knows a line is about to break.

Other rope research efforts being pursued also involve "listening" to line. In this work, sensitive listening devices are attached to line and then listened to while rope is loaded to the failure point. So far, experiments have been done with new rope and with new rope in which increasing bundles of filaments have been cut. It's been discovered that an extremely short but detectible burst of noise occurs at approximately 1/3 of the final breaking strength, no matter how many bundles of filaments are cut. This finding could pave the way for development of a device that could be placed on a line and used to measure the actual strength of the line without damaging it. Such an approach is called non-destructive testing. These findings, however, are only preliminary; hard and fast results are approximately 3 years away.

Several other potentially dangerous characteristics of rope are also currently being studied. A NAVSEA message dated April 1980 pointed out a serious safety hazard with eye splices in double braided nylon rope. In response to this, the January/February 1981 issue of DECKPLATE offered an interim solution to the problem. The Navy and the Coast Guard are undertaking the testing of various eye splices in an attempt to find one that develops the full strength of double braided rope.

An oil company recently discovered that the double braided nylon mooring lines they were using were beginning to fail after only a few months in service. Following their investigation, they found that nylon double braided lines, when pre-soaked in sea water and tensioned for 24 hours to services loads, lost 50 to 65 percent of their breaking strength. However, they could not tell what the cause of early breakage was. They determined also that this loss did not occur in double braided polyester (dacron) lines. Since the Navy uses a considerable quantity of similar nylon line, they are preparing a Plan of Action and Milestones to perform the necessary testing to determine the cause of this strength loss.

Recently, the breaking strengths of several used lines, which had a generally good external appearance, were found to be only 20 to 30 percent of that of new line. The cause of this reduction in breaking strength is also unknown. Further, there is no existing field inspection method that can be used to determine what the remaining strengths of such used ropes are. To find answers to these questions, the Navy awarded a grant recently to the Massachusetts Institute of Technology (MIT).

MIT is currently dissecting used rope samples to better understand what is happening. Their methods include everything down to looking at the basic rope filaments under electron microscopes. These filaments are the basic building blocks of rope and are extremely small, with diameters of about 0.00107 inches. It would take 26-1/2 miles of a single filament to weigh 1 ounce. The breaking strength of a filament is only 1.7 ounces; however, a 9-inch circumference, three-strand nylon line contains approximately 4 million filaments. That adds up to a lot of strength.

Early work by MIT indicates that, in used rope, outside filaments undergo some photo chemical deterioration. One avenue they are exploring to overcome this is the possibility of increasing the diameter of filaments located on the outside of a line. This might both decrease photo chemical deterioration and increase abrasion resistance.

MIT is also looking at filament "finish". Finish is the lubricant applied to the filaments used to make rope. One can see it by putting a new rope in a bucket of water for 24 hours – the water turns the color of milk. This cloudiness is caused by the finish disolving in the water. Fiber finish is very important because ropes manufactured with filaments that have no finish cannot withstand many bending cycles. How long it takes for the finish to wash off a line in service, comparisons of various finishes, and the effects of finishes on rope are currently being studied.

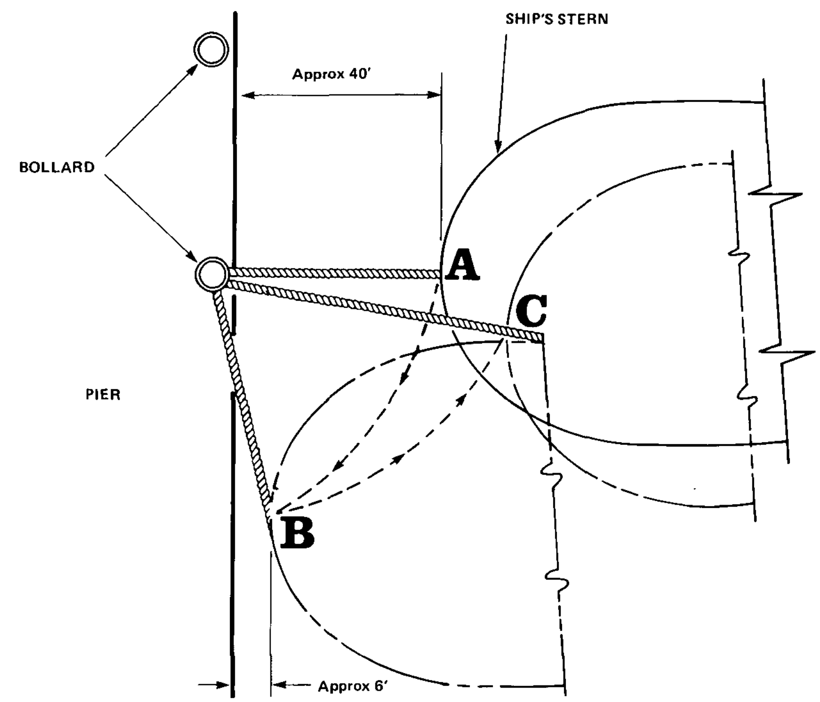
Several accidents over the past year involving line have resulted in death, loss of limbs, broken bones and internal injuries. In an effort to try and reduce these accidents, NAVSEA, the Naval Safety Center, the Coast Guard and the Navy Audio Visual Center are making a safety film. The film will show the proper manner and methods to be used when handling synthetic lines and some of the consequences of misuse. Filming began in early July 1981; the film should be completed by this September. Another film already exists on the hazards of line use. It is called "Locks and Lines", and it is available in cassette form. Multiple copies have been made, those desiring a copy should contact Master Chief Chick at the Naval Safety Center in Norfolk, Virginia, at autovon: 690-1561 or commercial (804) 441-1561.

Other areas of study under way include development of standard rope stoppers for synthetic mooring lines and determining the detrimental effects of longitudinal rope excitation (such as surging line on a capstan), the effect of abrasion on lines and the spring constants of different lines.

The problems discussed here are very real; however, it should be stated that *nylon line does have good features*: it's light, tough, extremely durable, and it gives a little under tension. In other words, it stretches. Yet, when it reaches its limit, *it will break*. At this point it turns from friend to foe.

There is a great deal of information about rope that remains to be learned, expecially with new synthetic fibers now being introduced. With the closing in 1974 of the Boston Naval Shipyard (the Navy's only Rope Walk) and its parent technical facility, a valuable test, research, and development capability for maritime uses of rope was lost. This left a void as to who would continue to undertake those responsibilities – the government or commercial organizations. So far, only the Navy and the Coast Guard have taken charge, by directing projects and awarding grants to conduct extensive laboratory and field test data studies on cordage problems concerning sea-going related uses. Considering the severity and number of accidents with line aboard military sea-going vessels alone, it is obvious that much work remains to be done.

As the studies progress and more is learned about rope, it should become increasingly safer to use. All would do well to heed some timeless advice, though: "Treat rope with the respect it's due!"



Above: Drawing shows sequence leading to the parting of a 10-inch stern line (a two-in-one double braided nylon line with an approximate tensile strength of 322,000 pounds) aboard an AS. The stern was forced south by the wind until dangerously close to the pier at point B. An ahead one-third bell of the port engine moved the ship forward again to position C. The line subsequently parted, snapping back toward the fantail with tremendous force injuring two and killing one crewmember.

the OLD MASTER

Who is really responsible for diving in a Command's heirarchy? What is the Medical Officer's authority? These questions have concerned U.S. Navy Master Divers since their first days in charge of the "diving side." Many attempts to interpret Chapter 4 of the *U.S. Navy Diving Manual* have resulted in just as many interpretations, all tempered differently, based on the individual's experience.

The *U.S. Navy Diving Manual* briefly defines the responsibilities of the Diving Officer, the Diving Supervisor and the Diving Medical Officer. However, little is said specifically about the responsibilities of the Master Diver. The Commanding Officer is tasked with "the ultimate responsibility (and accountability) for safe and effective conduct of all diving operations (conducted under his authority). His responsibilities are defined and his authority is confirmed by the provisions of U.S. Navy Regulations . . . ." The source of the Commanding Officer's authority allows him to delegate appropriate authority to selected members of his Command. This authority is delegated through the chain of command to the Diving Officer, the Master Diver and the Diving Supervisor, appropriate to diving operations.

The Diving Officer is functionally "in charge of all diving operations and training undertaken by the command and (is) responsible for the qualifications and safe diving practices of all divers assigned. The Diving Officer must ensure that equipment is in good repair, well-maintained and correctly stowed, and that any authorized modifications have been carried out by properly trained personnel." In addition, the Diving Officer is responsible for the preparation of basic plans for all diving operations, subject to final approval by the Commanding Officer, while coordinating his activities with other shipboard departments and with other Commands as required. In this respect, the Diving Officer is the administrative manager of the diving operation, relying upon the technical experience of the senior, qualified members of his diving team.

The Diving Medical Officer and assigned medical personnel receive special training in hyperbaric medicine and provide medical advice and service to the diving team. Diving medical personnel provide appropriate treatment to members of the diving team in the event of a diving casualty.

The *U.S. Navy Diving Manual* addresses the responsibilities of the Master Diver, very briefly to whom is delegated direct operational responsibility for detailed planning and safe execution of the diving mission. The Master Diver, as Dive Supervisor, is in charge of and responsible for coordinating the minute-to-minute tactics of the diving operation on-scene. He shall assist the Diving Officer in preparing for and executing the diving operation. Although the Master Diver may re-delegate his authority as Dive Sup to qualified, subordinate personnel, the Master Diver is still regarded as the most knowledgeable technical authority immediately available because of his superior demonstrated abilities and experience.

The BUPERS manual defines the inter-related responsibilities required by the "chain-of-command." This command hierarchy is also applicable to distribution of responsibilities within the Navy diving organization and must be adhered to by all diving personnel. Except in emergency situations, no provision should circumvent the chain-of-command. As a critical element of this distinct line of authority, the role of the Master Diver must be strengthened and clarified. His extensive experience is a very precious asset which must be fully recognized and used as a primary resource of the diving organization.

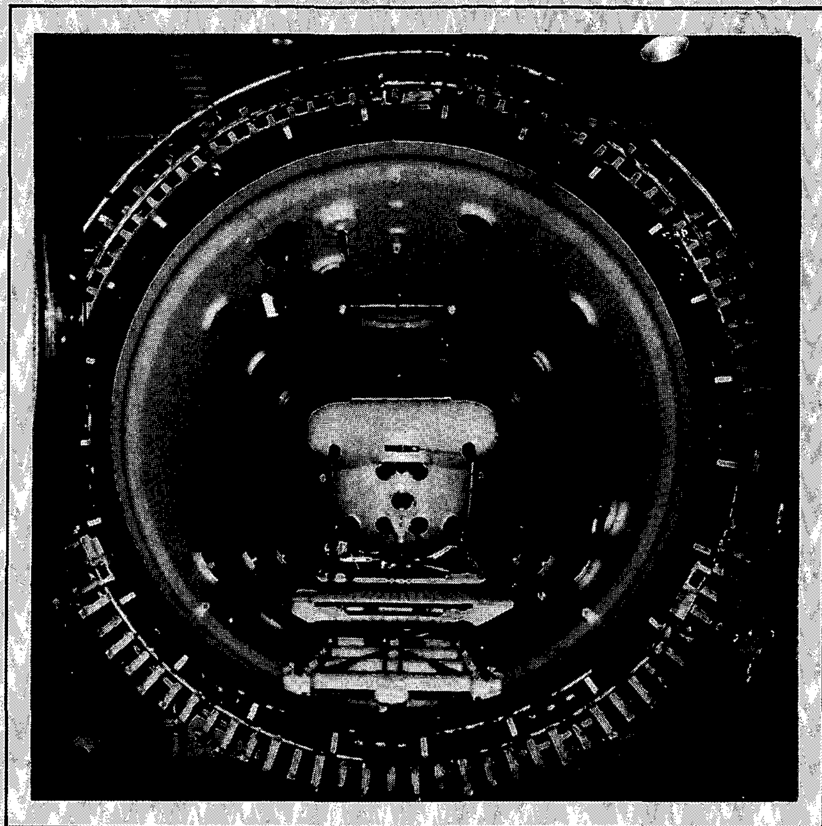
Normally, a Master Diver will receive all the responsibility he will accept, and he is encouraged to take full charge of all diving evolutions. Master Diver designation is not easily achieved; it is a respected position and a vital part of the diving team within the framework of the established chain-of-command. In addition, the Diving Medical Officer is also a vital part of the diving team. His role is advisory rather than one of command, wherein he provides recommendations for diving medical matters to the Commanding Officer/Diving Officer/Master Diver. Naturally, these recommendations carry heavy weight in the ultimate decision-making process; but, in the final analysis, they are only qualified recommendations. The ultimate decision rests with the Commanding Officer. Mutual respect within a diving team is the key to safe, efficient diving and can only be achieved if each member contributes to the best of his ability at his assigned level.

In order to assure greater utilization of this resource, several precepts have been advanced which would enhance the authority of the Master Diver and thus serve to benefit the diving team and promote more efficient use of personnel and material:

(a) You will receive all of the responsibility you are willing to accept. Even though there is nothing "in writing" delegating to you specific responsibilities, it is your duty as the "expert" to take charge.

(b) The authority given you will be determined by your diplomacy toward your superiors and the confidence they have in you.

(c) Your relationship with your Diving Medical Officer should be one of mutual respect and realizing that, if there is disagreement, a Diving Officer will make the final decision.



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