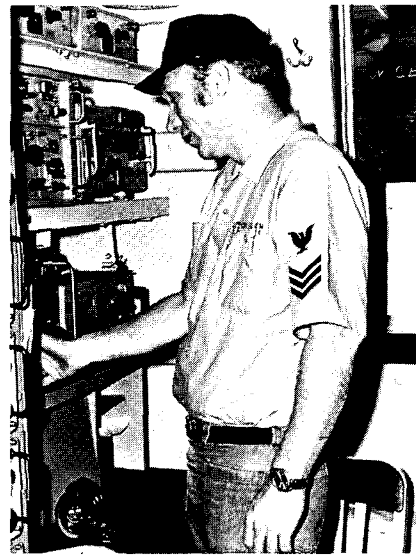
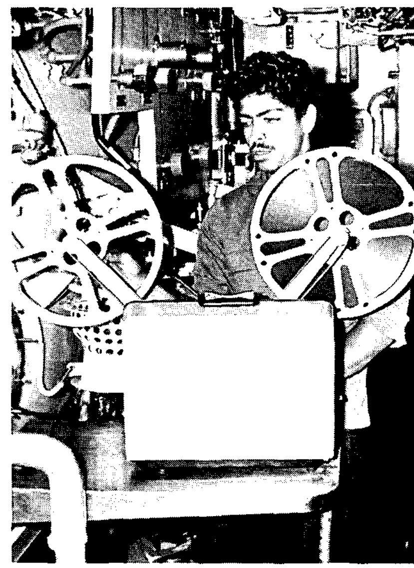
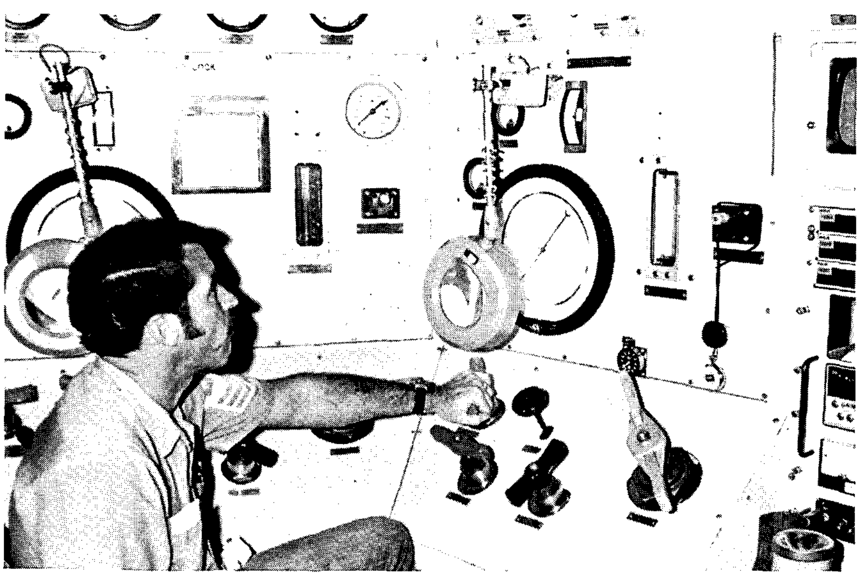
FACEPLATE

SPRING 1978


FACEPLATE

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

VOLUME 9, NO. 1

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

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Front cover photo shows PIGEON (ASR-21) setting a moor. Inside front cover photos show some of the participants in PIGEON's all-hands effort for DDS Mk 2 certification. Top row, l-r: CWO2 Ruden and MMC(MDV) Moore stand watch; RM1 Thompson mans the communications station. Middle row,l-r: SN Roland prepares food; SKC Patterson ensures system's readiness; SN Esquivel rigs movies for divers; EM1(DV) Gerdom operates gas control console; and ENFN Luce maintains auxiliary boiler. (All PIGEON photos taken by PH3(DV) M. Brooks.) See page 12 for story.
Back cover photo shows divers out during Mk 1 DDS dive when system was still on active list. See page 23 for farewell story.

NSDS TRAINING SAVES LIFE

It is apparent that training received at the Naval School, Diving and Salvage, Washington, DC, is being retained by the students. Recently an NSDS student, MM3 James Richard Wilcox, USN, had an opportunity to use the diving medicine he had just finished learning at the school. While having dinner at a restaurant in Pope's Creek, Maryland, a waitress with a heart condition collapsed. MM3 Wilcox promptly took charge of the situation by administering cardio-pulmonary resuscitation, treating her for shock, and by maintaining control of the scene until an ambulance arrived. MM3 Wilcox is credited with preventing a possible fatality. The message to divers is clear: Diving medicine and first aid is not just applicable to diving stations; one should stay abreast of the latest developments in these areas.

GUMMEL MAKES MASTER

USS PRESERVER (ARS-8) announces the recent qualification of Engineman Chief Wesley J. Gummel, USN as a Navy Master Diver. A native of Trenton, New Jersey, ENC(MDV) Gummel (a veteran of 10 years of navy diving) underwent the rigorous 5-week evaluation at the Naval School of Diving and Salvage in Washington, D.C. The Master Diver Evaluation Program includes an indepth study in diving medicine, diving physiology, treatment of diving-related injuries, and the most updated management techniques for diving and salvage. ENC(MDV) Gummel will head up PRESERVER's diving locker and will be responsible for directing the activities during diving and salvage operations.

CHANGING THE "BRIT" AT NEDU

LCDR Mike Harwood, RN, relieved LCDR Julian Malec, RN, on April 26, 1978, as the Royal Navy Exchange Officer at the Navy Experimental Diving Unit in Panama City, Florida. LCDR Malec had served as Operations Officer since August 1975.

LCDR Harwood will be at NEDU for 2 years in the Projects Office, where his major concerns will include the fly-away diving system, explosive ordnance disposal projects, and the Mk 14 closed-circuit saturation diving system. Before coming to NEDU, LCDR Harwood was a Diving Training Officer aboard HMS VERNON in Portsmouth, England. He has also served as Commanding Officer of a minehunter, during which time he worked with NATO (Standing Naval Force Channel). He spent 4 months in the Suez Canal involved in check clearance operations.

In 1972-73, LCDR Harwood formed the Royal Navy saturation diving team at the Admiralty Experimental Diving Unit in Portsmouth and served as second in command there to LCDR John Naquin, USN (now retired). LCDR Harwood claims that his former service with the USN personnel aided his understanding of the American language and qualifies him as an Anglo-American interpreter.

INTERNATIONAL DIVING SYMPOSIUM—1978

More than 1,500 persons attended the eighth annual International Diving Symposium in New Orleans, Louisiana, on January 30–February 1, 1978. One hundred separate booths gave exhibitors an opportunity to display their individual products and/or services. Symposium papers discussed such topics as equipment, recent operations, government and diving, and biomedical concerns.

A separate addition to the gathering was the Symposium on Decompression Sickness and its Therapy, which convened on February 1. Session 1 of this program was titled Decompression Sickness: Causes of Disability and Progression of Effects in Diving from the Surface. Session 2 concerned decompression sickness therapy in specialized diving.

The first annual John Galletti Memorial Award was presented to Dr. George F. Bond during the symposium. This award will be given each year in memory of the founder of J. & J. Marine (now J. & J. Machine and Welding Co.).

The International Diving Symposium is sponsored by the Association of Diving Contractors, the Undersea Medical Society, the National Ocean Industries Association, the Association of Offshore Diving Contractors (United Kingdom), the Marine Technology Society, the American Society of Mechanical Engineers' Ocean Engineering Division, the Louisiana chapter of the Associated Builders and Contractors, and the Association of Commercial Diving Educators.

INSTITUTE OF DIVING COMPLETES FIRST YEAR

The Institute of Diving was formed on March 5, 1977, in Panama City, Florida. Incorporated under the laws of the State of Florida as a non-profit organization, the Institute is international in scope and was established for the advancement of professional, literary, and scientific knowledge related to human oriented activity in the undersea environment.

Initial activities of the Institute include establishing a diving museum and library in Panama City, Florida; publishing a journal that addresses all aspects of diving; organizing a diving information exchange program; and establishing an annual Institute of Diving meeting in Panama City. (The first annual gathering was held April 21-22, 1978.)

Membership will consist of sport, government, and commercial divers as well as individuals, organizations, and corporations interested in diving or diving related concerns. Categories of membership are as follows:

Type of Member:	Contributions:
Regular	$ 25.00 (Annually)
Regular Fellow	50.00 (Annually)
Regular Life	250.00
Sponsor	1,500.00
Patron	5,000.00
Benefactor	50,000.00
Corporate	500.00

Family memberships are available in the Regular and Regular Fellow categories for an additional $15.00 contribution. Corporate membership is limited to the Sponsor, Patron, and Benefactor categories. The membership year goes from August 1 to July 31.

Current officers for the Institute of Diving are President—Dr. George F. Bond, CAPT, MC, USN Ret.; Vice President—Mr. Thomas W. James; Secretary—BMCM W. N. Bruhmuller, USN; and Treasurer—Mr. Edward Wardwell.

The Institute is the only international organization that will be oriented solely toward divers and diving activity. For more information, write to The Institute of Diving, P.O. Box 876, Panama City, Florida 32401.

CEL ESTABLISHES NEW DIVISION

To consolidate support of its ocean operations and diving services, the Civil Engineering Laboratory (CEL), Port Hueneme, California, has established a new division in the Ocean Engineering Department.

The Ocean Operations Division (Code L41) was formed to enable the Laboratory to more effectively coordinate at-sea operations and to provide all diving services to support ocean and underwater programs. Under the reorganization, the CEL Diving Division was disestablished and its personnel were assimilated by the new division under Director LCDR John Stamm, CEC, USN, former Officer in Charge of Underwater Construction Team TWO, Port Hueneme.

The Laboratory has ocean operations in progress continually; and the new division will provide the required effectiveness in planning, material procurement, safety, and affiliated logistics. The new division also will manage the West Coast Ocean Construction Equipment Pool for the Chesapeake division of the Naval Facilities Engineering Command (NAVFAC).

NEDU REPORTS

Navy Experimental Diving Unit Report 12-77. *Mk 1 Mod 0 Divers Mask Performance at Reduced Supply Pressures.* J.L. Zumrick, R.K. O'Bryan, W.H. Spaur.

Abstract: The performance of the USN Diver's Mask Mk 1 Mod 0 at reduced supply pressures was studied. The oral-nasal differential pressures developed by divers working at near maximum levels were measured at supply pressures at and below 135 psig overbottom at depths from 30-190 fsw. Oral-nasal differential pressures with respiration were found to increase sharply for overbottom supply pressures less than 115 psig. To preclude slight variations in supply pressure from causing unacceptable breathing resistance and reducing a diver's ability to work, a minimum supply well in excess of 115 psig overbottom pressure is recommended. The relationship of respiratory flow, work of breathing, and carbon dioxide retention to increased oral-nasal mask differential pressures is discussed.

Navy Experimental Diving Unit Report 10-77. *Manned Evaluation of the Prototype Mk 12 SSDS, Helium-Oxygen Mode.* LCDR R.K. O'Bryan.

Abstract: The Prototype Mk 12 SSDS, Helium-Oxygen System was evaluated to test the ability of the system to support a diver performing sustained heavy work, and to establish the life expectancy of the carbon dioxide absorbent bed. During graded exercise the divers' heart rate and helmet CO_2 levels were measured. During cannister studies, the cannister effluent was continuously monitored for CO_2. Analysis of the data revealed that the system can support a diver performing heavy work (3.0 L/Min O_2 consumption). However, the carbon dioxide absorbent bed was shown to have a life expectancy incompatible with operational dives at normal working depths.

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

Operating Procedure-Diver's Mask Mk 1 Mod S

Date ____________
Dive # ____________
Dive Depth ____________
Chamber No. ____________
PTC No. ____________

Emergency Bottle Percentage ______
Diver's Umbilical Percentage ______
Gas Analyzed By ______
Time ______

Divers' Names & Helmet Stock Numbers:

Red ____________
Green ____________
Standby ____________

PRE-DIVE CHECKOUT
(Accomplished before PTC launch by Divers and PTC Operator Under the Direction of the Diving Supervisor)

CAUTION

Come-home bottle must be analyzed for compatibility with diving mix.

STEP	PROCEDURE	CHECKOFF			REMARKS
		RED	GREEN	STDBY	
1.	Check all rubber, metal, and molded plastic components for damage and/or deterioration.				
2.	Check all appropriate come-home bottle vests. Ensure all straps, pockets, and zippers are in good working condition.				
3.	Check hot water suits for proper fitting. Ensure zippers and hot water manifold are in working condition and that booties and gloves are in good condition.				
	NOTE Come-home bottle first stage regulator is normally set at 135 psi over ambient for mixed gas diving.				
4.	Connect come-home bottle to mask.				
5.	Shut steady flow valve.				
6.	Shut emergency gas valve.				
7.	Open emergency come-home bottle valve.				
8.	Check emergency come-home bottle 1st stage setting to 135 psi over ambient and record. Red Green Stdby				
9.	Open emergency gas valve.				
10.	Check steady flow valve.				
11.	Check dial-a-breath.				
12.	Check purge.				
13.	Check non-return by applying Leak Tek on supply side of non-return valve.				
14.	Shut emergency gas valve.				
15.	Check strain relief and umbilical connections for signs of damage.				
16.	Check gas umbilical percent and record. %.				
17.	Set and record facility regulator as directed by diving supervisor.				
18.	Connect gas umbilical.				
19.	Set and record hip-mounted regulator to 200 psi.				

STEP	PROCEDURE	CHECKOFF			REMARKS
		RED	GREEN	STDBY	
20.	Re-check non-return valve: a. Disconnect gas umbilical. b. Connect spare snap-tite to hip-mounted regulator. c. Apply Leak Tek to open end of snap-tite. d. If no leaks, disconnect spare snap-tite and reconnect gas umbilical.				
21.	Check all communication leads to ensure good contact and appropriate lubrication.				
22.	Check communications with all appropriate stations.				
	PRE-DIVE CHECKOUT (Accomplished at Depth by PTC Operator Under the Direction of the Diving Supervisor)				
23.	Apply anti-fogging solution to inside of faceplate.				
24.	Don mask; diver on gas at time: R G S				
25.	Check communications.				
26.	Leak check emergency come-home bottle and all gas connections.				
27.	Check: Steady flow valve Set dial-a-breath Purge button				
28.	Check accessories Weights Knife Gloves Fins				
29.	Record Hot water temperature at the temperature indicator. °F.				
30.	Connect hot water.				
31.	Verify diver is comfortable.				
32.	Verify diver is breathing ok.				
	IN-WATER CHECKOUT (Accomplished by divers under the direction of the Diving Supervisor)				
33.	Check communications.				
34.	Divers check each other for leaks.				
35.	Check steady flow valve.				
36.	Verify diver is comfortable.				
	POST-DIVE CHECKOUT (Accomplished by PTC operator under the direction of the Diving Supervisor) CAUTION Ensure diver's come-home bottle is well clear of the PTC mating surface before diver enters the PTC.				
37.	Remove mask. Record diver off gas at time. R G S				
38.	Shut emergency come-home bottle.				
39.	Remove rig.				
40.	Gage come-home bottle and record. R G S				

END OF PROCEDURE

PTC Operator Date

Diving Supervisor Date

Diving Officer Date

HCU-1 Certifies Fly-Away Mixed Gas System

LT Timothy B. Stark, USN

Harbor Clearance Unit ONE (HCU-1), located at Pearl Harbor, Hawaii, has designed, constructed, tested, and completed system certification of a portable mixed gas diving system called the "Fly-Away Mixed Gas System" (FMGS). The purpose of the system's construction is to establish a portable mixed gas diving capability at HCU-1 for the Pacific Fleet.

The system can operate from any platform of opportunity that is equipped with a boom or crane capable of lifting 4 tons or more. It is capable of supporting 18 dives (with two divers each) to a depth of 300 feet of seawater (fsw) for a maximum bottom time of 30 minutes without gas resupply. Gas resupply in the field can be accomplished with either pre-mixed gases or gases mixed on the site. With this capability to mix gas at the operational site, the FMGS provides a gas resupply duration of unlimited length should the need arise. The system has been operationally deployed by aircraft from Hawaii to a host platform of opportunity (ARS) 5,000 miles away (in Korea), where it was set up to conduct mixed gas diving operations to a depth of 198 feet.

Mobilization time for deployment of the system is 24 hours. Thus, when a call for deployment is received at HCU-1, the system will be ready for loading aboard either ship or aircraft 24 hours later. The entire system has been loaded aboard a C-141 aircraft in 6 hours.

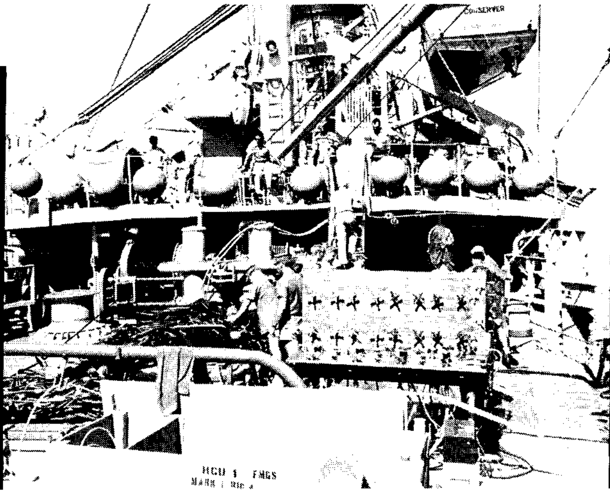
The basic components of the system include mixed gas stowage modules (35,000 cubic feet of helium oxygen), oxygen stowage modules (14,000 cubic feet of oxygen), an air stowage module (8,400 cubic feet of air), and a gas distribution console. Also included are a two-man Open Diving Bell, the U.S. Navy Mk 1 diving outfit, and miscellaneous support equipment.

Final system certification of the FMGS was attained during the period of September 26-29, 1977. This effort culminated with a series of open sea dives to 300 fsw. The Naval Sea Systems Command System Certification Authority then reported that HCU-1 had completed all the requirements for system certification and recommended that a 2-year certification be granted for the Fly-Away Mixed Gas System.

The demonstration of the system for certification began when the FMGS was loaded aboard the host platform USS CONSERVER (ARS-39). When the loadout phase was completed (after approximately 7 hours), CONSERVER sailed to the dive site with an HCU-1 dive team and the NAVSEA SCA aboard. The ship moored near Pokai Bay, Oahu, Hawaii, in approximately 350 feet of water.

The next day, a series of four dives was conducted to 150 fsw, 200 fsw, and 300 fsw (two dives). Because of the importance of the test results, the operations were observed by several key figures from the diving community. Included in this group were the Commanding Officer and Facility Engineer from the Navy Experimental Diving Unit, the COMNAVSURFPAC Salvage Officer, several Diving Medical Officers from the Pearl Harbor area, a representative from HCU-2, and an EDO exchange officer from the Chilean Navy. Media representatives from two of the local television stations were also present to document the event.

The FMGS is a comparatively inexpensive means by which an activity may obtain a 300-foot surface supplied



Above: Fantail of CONSERVER during dive ops break.

Above: He-O_2 diver surfacing from 300-fsw certification dive.
Below: Diving station aboard CONSERVER.

mixed gas diving capability. The full benefit of what the Fly-Away Mixed Gas System means to the Navy and Pacific Fleet is finally being realized. In essence, any ship, barge, or platform in any location in the world, whether at sea or on inland lakes, rivers, or canals, is now a potential mixed gas diving facility.

To HCU-1, a major significance of the certification of the FMGS is that the system was solely designed, constructed, and certified by fleet divers stationed there. This accomplishment proves that fleet divers have the ability to design, construct, and certify a diving system. Since the HCU-1 FMGS is now the first and only certified portable surface supplied mixed gas diving system in the Navy, they find it easy to say, "It's Hard To Be Humble."

CERTIFICATION LIST OF PLAYERS

CO, HCU-1	LCDR A. ERWIN
CO, USS CONSERVER (ARS-39)	LCDR H. GEHMAN
NAVSEA SCA	Mr. A. DIETRICH
HCU-1 CERTIFICATION COORDINATOR	LTJG T. STARK
FMGS DIVING OFFICER	CWO2 K. BASSETT
FMGS MASTER DIVER	MMCS(MDV) M. ANDERSEN
DIVE SAFETY OFFICERS	CWO2 P. MARTINEZ
	HTCM(MDV) J. JENNINGS
CERTIFICATION DIVERS:	
150 FSW	BM1 E. LACROIX
	EN1 K. DAVIS
200 FSW	BM1 H. RYLES
	HM3 C. BUSHE
300 FSW	HMC M. GIBNEY
	EM1 S. KNIGHT
300 FSW	LTJG T. STARK
	HT1 R. ZINNA

WORKING DIVER 1978

Representatives from every area of military and commercial diving gathered on March 7 and 8, 1978, at Battelle Memorial Institute in Columbus, Ohio, for the biannual Working Diver Symposium. The conference followed the same format it has in its six previous meetings, featuring presentations on updated diving equipment and problems, various naval facilities, and several relatively current diving/salvage operations (topics are listed on page 11).

Following the call to order by CAPT Robert B. Moss, USNR, Director of Ocean Engineering, Diving, and Salvage, greetings were given by representatives of the other sponsors. RADM Curtis Shellman, Jr., USN, Deputy Commander Fleet Support Directorate, Naval Sea Systems Command, emphasized the need for those who work in the ocean environment to conserve resources. He noted that "we in the Navy are striving to keep pace with commercial advances," adding that it is important to keep one another appraised of technological advances to solve the common problems more economically and efficiently that both military and civilian groups encounter.

Other welcoming speeches were given by Dr. Milford, Associate Director of Battelle-Columbus Laboratories; CAPT W. F. Searle, Jr., USN, Ret., Chairman for the Committee on Salvage and Diving, Marine Technology Society; and Dr. Jack R. Maison, Chairman of the Ocean Technology Division of The American Society of Mechanical Engineers.

A high point of the symposium was CAPT Searle's discussion concerning a national diving program. After reading several comments from past Working Diver Symposium proceedings, he noted that "the great promise discussed in 1970 either has not come to pass or has come and gone." CAPT Searle questioned whether there is a "lead shop" in a national diving program in this country. Among the "players" he included in such a program were the U.S. Navy diving community, NOAA, NIOSH, OSHA, and the Coast Guard (the last of which he said has already taken an active role).

CAPT Searle (whose Navy career included serving as the first Director of Ocean Engineering, Diving, and Salvage) went on to say that though the advances in diving technology have been impressive, the U.S. Navy has not recognized an official role of leading a national diving program. In regard to this need for such a project, he proposed that a National Diving Center could be established in Panama City, Florida, provided the Navy diving community did not fight it. He included as part of such a center the Navy Experimental Diving Unit (now in Panama City) and the Naval School, Diving and Salvage (soon to move there). In concluding his discussion, CAPT Searle encouraged the aforementioned government agencies "to get their collective act together and get on with a national diving program. . . We've been on standby long enough."

The full text of all the presentations given at this Working Diver Symposium—1978 will be available in a bound Proceedings to anyone desiring a copy. Those interested should contact the Marine Technology Society, 1730 M Street, NW, Washington, DC 20036.

The Working Diver Symposium is sponsored by the U.S. Navy Supervisor of Diving, Naval Sea Systems Command; the Salvage and Diving Committee of the Marine Technology Society; the Ocean Technology Division of The American Society of Mechanical Engineers; and Battelle Memorial Institute, Columbus Laboratories.

Scenes from the symposium, clockwise from lower left: CAPT Searle and Herman Kunz (left); Ken Wallace and CDR Bartholomew (left); (l-r) RADM Shellman, Art Coyle, and CAPT Moss; and (l-r) CDR Duff, LTjg Stark, LCDR Demchik.

Call to Order
CAPT R. B. Moss, USNR
Director of Ocean Engineering, Diving and Salvage

Greetings from the United States Navy
RADM C. Shellman, USN
Deputy Commander
Fleet Support Directorate

Welcome to Battelle-Columbus
Dr. Milford
Associate Director, Columbus Laboratories

Greetings from MTS
CAPT W. F. Searle, Jr., USN, Ret.
Chairman, Committee on Salvage and Diving, Marine Technology Society

Greetings from ASME
Jack R. Maison, Ph.D.
Chairman, Ocean Technology Division
The American Society of Mechanical Engineers

SESSION I
Ken Wallace, Chairman
President, Taylor Diving and Salvage

SHIP HUSBANDRY
Dale Uhler
Office of Supervisor of Salvage

THERMAL PROBLEMS IN DIVING
Glen H. Egstrom, Ph.D.
University of California

THE NAVY EXPERIMENTAL DIVING UNIT TODAY
CDR C. A. Bartholomew, USN
Navy Experimental Diving Unit

NOAA DIVING OPERATIONS
Donald C. Beaumariage
U.S. Department of Commerce

LARGE OBJECT SALVAGE SYSTEM
Joseph M. Brown
Naval Coastal Systems Center

SESSION II
CAPT W. F. Searle, Jr. (USN, Ret.), Chairman
Committee on Salvage and Diving, MTS

NORTH SEA HYPERBARIC CENTER
Andre Galerne
President, International Underwater Contractors, Inc.

DEVELOPMENT AND TEST OF THERMAL PROTECTION SYSTEMS FOR THE NAVY DIVER
Maxwell W. Lippitt, Jr.
Naval Coastal Systems Center

MK XII SURFACE SUPPORTED DIVING SYSTEM THE MIXED GAS MODE
LCDR R. P. Demchik, USN
Navy Experimental Diving Unit

CANADA'S NEW DEEP DIVING RESEARCH FACILITY
D. J. Fullerton
Defence and Civil Institute of Environmental Medicine

MONITOR MISSION
Roger M. Cook
Harbor Branch Foundation

DIVING TO 1500 FEET IN THE OPEN OCEAN
COMEX

SESSION III
CDR Frank Duffy, USN, Chairman
Deep Submergence Systems Division (OP-23)

THE LNG TANKER AND CARGO—CONSIDERATIONS OF CASUALTY CIRCUMSTANCES AND SHIP SALVAGE
Alex Rynecki
Ocean Engineers

UNDERWATER CONTROLLED BLASTING AND CONSTRUCTION OPERATIONS
LT William Hall, USN
Underwater Construction Team One

DIVING AT PEARL HARBOR NAVAL SHIPYARD
CDR Colin M. Jones, USN
Pearl Harbor Naval Shipyard

DEVELOPMENT OF THE NAVY'S MK 14 CLOSED CIRCUIT SATURATION DIVING SYSTEM
Raymond L. Bentz
Naval Coastal Systems Center

SESSION IV
Douglas Elsey, Chairman
Can-Dive Oceaneering

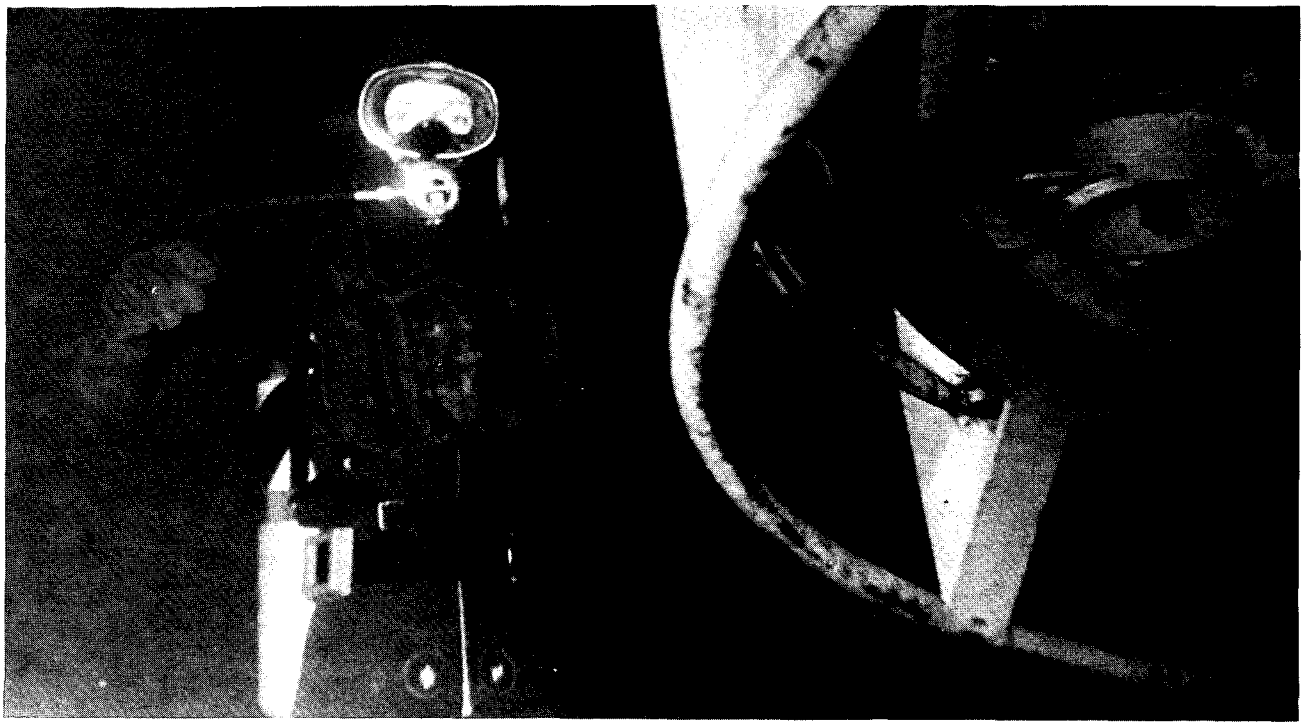
UNDERWATER TV AND THE WORKING DIVER
Mel Suddeth
Hydro Products

COAST GUARD OPERATIONS
CDR Peter Muth
United States Coast Guard

JIM—ATMOSPHERIC DIVING SYSTEM—ARCTIC OPERATIONS
Jim English
Can-Dive Services, Limited

A DIVING SYSTEM FOR POLLUTED WATERS
William C. Phoel
U.S. Department of Commerce

FIELD USE OF NAVSEA DIVER TOOL PACKAGE
John Mittleman
Naval Coastal Systems Center



DDS Mk 2 Mod 1 Nears Certification

USS PIGEON (ASR-21), the first ship in a new generation of submarine rescue vessels, has now completed all work-up dives of its deep dive systems. The success of the two-stage project was the result of (and was the fruition of) years of a dedicated all-hands effort by PIGEON crewmembers.

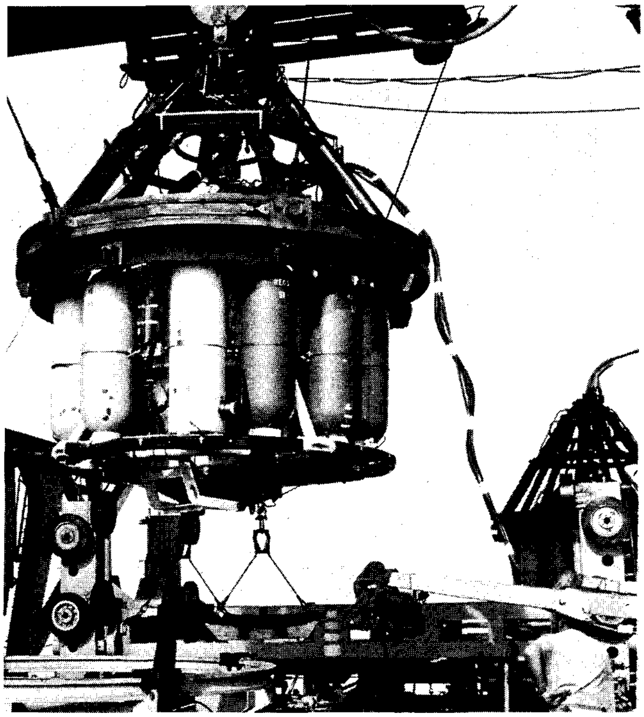
The primary purpose of the DDS Mk 2 Mod 1 is to transport a team of divers from the ocean surface to depth, maintain them at the work site, transport them to the surface, and decompress them to atmospheric pressure. Saturation dives may be conducted in which divers are maintained at depth pressure in the Deck Decompression Chamber (DDC) and/or in the Personnel Transfer Capsule (PTC). The PTC transports divers to and from the underwater work site. The diving system may be used for shallow (non-saturation) diving, or for hydrostatic observation dives (1 atmosphere internal pressure).

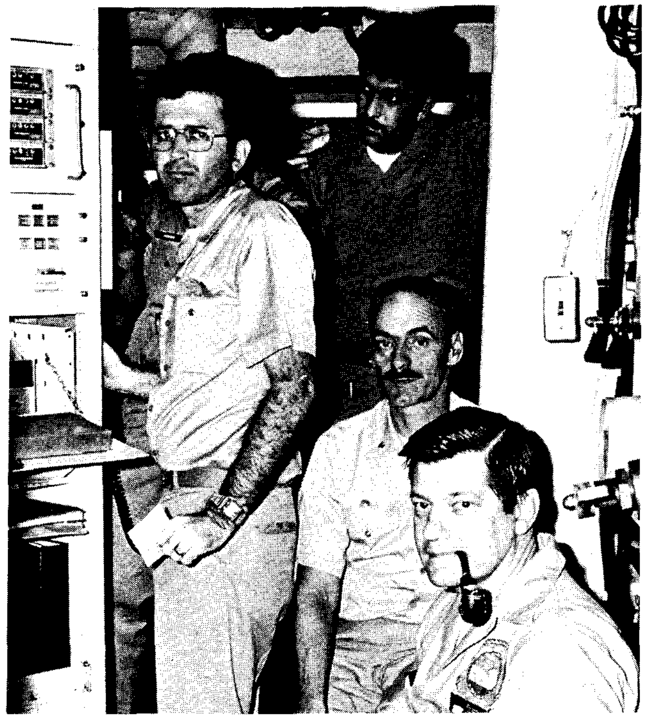
Both the starboard and the port Mk 2 deep dive systems (DDS) underwent the same regimen in pursuit of certification. This entailed performing sliding helium-oxygen saturation dives to 850 fsw, with stops at 60 fsw and wet excursions at 200, 500, and 850 fsw. In addition to proving both complexes, dive objectives included training and requalifying dive teams and training DDS watchstanders.

Compression during the dive on the starboard DDS complex and personnel transfer capsule (PTC) began on December 5, 1977. During the dive, the port DDS complex was kept in a standby condition of readiness for emergency use. (Likewise, the starboard system was kept ready during port system dives.) The dive site was in the eastern lee of Santa Catalina Island, off the southern California coast, where PIGEON laid a two-point moor in 930 feet of water for the open sea dives. This series was the first open sea saturation diving conducted using PIGEON's PTCs. In addition to the manned dives, a 935-foot unmanned hydrostatic dive was made for a system check. Members of this first dive team were EMC(DV) Carella (team leader), BMC(DV) Penter, BM1(DV) Senones, IC1(DV) Starr, and HM2(DV) Brisse. (Other participating personnel are listed on pages 14 - 15.)

The first series went smoothly and without incident. Decompression continued as PIGEON recovered her moor and returned to her home port in San Diego, California, where the dive "surfaced" on December 18, 1977.

System grooming of the port complex began immediately after the first dive surfaced. The training cycle for dive team two began in January 1978. This program included academic and in-water training and "air" dives through the ship's centerwell to prepare both the divers and handling crews for the at-sea phase of $He\text{-}O_2$ saturation diving. Divers for this second effort were HT2(DV) Mason (team leader), HMCS(DV) Kleckner (from





Page 12 photo: ET1(DV) Sproule checks PTC at 30 fsw. Above, left: Mk 2 DDS PTC. Right (front to back): Mr. Dietrich, NAVSEA OOC on-scene rep.; CDR Smith, PIGEON's CO; CWO2 Ruden; and HMC(DV) Gibson stand by during certification dives.

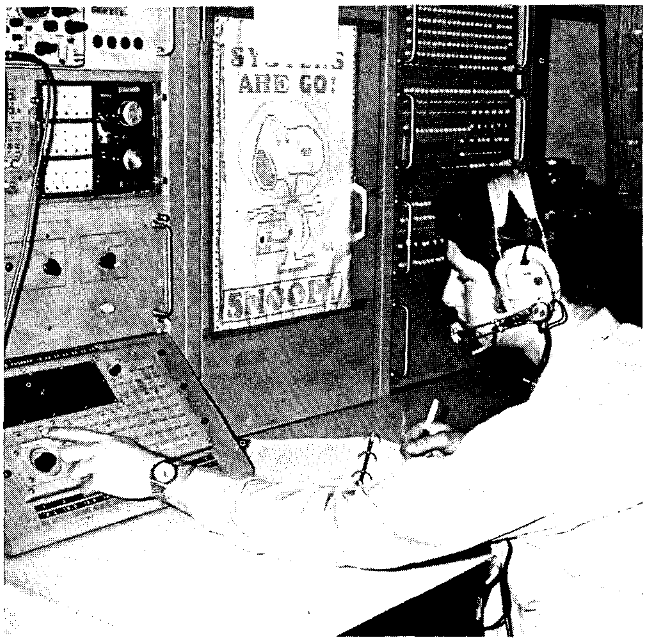
Submarine Development Group One), MMC(DV) Bradbury, HTC(DV) Paxton, and HT1(DV) Woodworth. Before this second series commenced, divers from the USS ORTOLAN (ASR-22) (PIGEON's sister ship) arrived to participate as watchstanders.

Before diving operations got under way, however, two separate tasks arose. An unexpected salvage job sent the ship to sea with only 1 hour's notice. Then, enroute to Catalina Island after completing that mission, PIGEON was sent to San Francisco, California, for an at-sea rendezvous with an SSBN for submarine sea trial escort duties.

Once at the dive site, inclement weather (55-knot winds and 16-to 20-foot seas) created delays in training dives and caused a 10-inch double braided nylon mooring hawser to part. This forced PIGEON to anchor close into Avalon Harbor, where the 200-foot excursion was performed the next day. The complex was pressurized to 500 fsw that evening; and by 8 a.m. the following morning, PIGEON had arrived at the open sea dive site to launch the 500-foot excursion dive. From this point on, the series for certification of the port dive system continued without interruption until its "surfacing" on February 28, 1978.

For each excursion during both the port and starboard certification dives, the PTC was unmated from the deck decompression chamber (DDC), launched through PIGEON's centerwell, and then lowered to depth. During their excursions, divers wore the USN Mk 1 Mod S Diver's Mask with an emergency come-home bottle, diver's gas heat exchanger, and hot water suit. Once in the water, each diver was attached to the PTC by a gas and hot water umbilical. Two divers went out at a time. After completing an underwater television inspection of the PTC, the two divers out exchanged equipment with two others, who then swam out of the PTC to perform the same task. Final decompression was carried out enroute to PIGEON's home port.

The successful completion of these certification dives involved every member of PIGEON's crew, now under the command of CDR Albert J. Smith, USN. Divers and watchstanders from the Deep Submergence Department, centerwell handling crew from the Deck Department, and bridge crane electricians and PTC tracking personnel from the Operations Department all played vital roles. In addition, the Engineering Department had the responsibility for the life support services, steam power, water, propulsion, hotel services, bridge crane and SPCC hydraulics, and the closed-circuit tv system. Meals, spare parts, and administrative support came under the jurisdiction of the Supply Department. Assistance was also provided by Navy personnel from other diving commands (see list). In addition to those listed here, there are many who have added their own talents toward certification since the dive system was installed in January 1972. All who have taken part over the years can take great pride in this final success.



Above: OS3 Lordanich mans the 3-D sonar tracking system.

Above: Dive team one, l-r, 1st row: HM1(DV) Brisse, EMC(DV) Carella; 2nd row: BM1(DV) Senones, BMC(DV) Penter, IC(DV) Starr.

ABOUT PIGEON:

PIGEON is a catamaran, the first contracted for the Navy since Robert Fulton's twin hulled steam warship DEMOLOGUS, constructed at the close of the "War of 1812". PIGEON was launched August 13, 1969; and was delivered to Hunters Point Naval Shipyard, California, on January 27, 1972. PIGEON was placed in commission on April 28, 1973, at Hunters Point Naval Shipyard with LCDR James J. McDermott, USN, as Commanding Officer.

USS PIGEON (ASR-21) is the third United States ship to bear this name. The first PIGEON was built in Baltimore, Maryland. The minesweeper was commissioned in the Norfolk Navy Yard on July 15, 1919. She was converted twice, once to a gun boat to serve on the Yangtze River Patrol Force at Shanghai, China, and a second time to an ASR. As a Submarine Rescue Vessel, PIGEON (ASR-6) saw heroic service in the second World War until May 1942, when, while conducting subversive maneuvers against the Japanese, a dive bomber shelled her starboard quarter and she sank.

The second PIGEON (AM-374) was named in commemoration of Submarine Rescue Ship PIGEON (ASR-6). The minesweeper was commissioned on October 30, 1945. She remained active or reserve until December 1966, when her name was struck from the Navy list.

FIRST 850-FT. SLIDING SATURATION DIVE:
Start Date: Dec. 5, 1977; surface: Dec. 18, 1977

Diving Watch Officers:
- CWO Ruden
- LT Hatcher
- LT Evans (SUBINSURVPAC)
- LTJG Williams
- ENS Brown

Diving Medical Officers:
- CDR Harvey
- LCDR Goad
- LCDR Strauss

Diving Watch Supervisors:
- MMC(MDV) Moore
- ENC(DV) Miller
- MMC(DV) Bradbury

Dive Team:
- EMC(DV) Carella (Team Leader)
- BMC(DV) Penter
- BM1(DV) Senones
- IC1(DV) Starr
- HM2(DV) Brisse

Diving Watchstanders:
- HMCS(DV) Cooper
- HMCS(DV) Kleckner (COMSUBDEVGRU ONE)
- ETCS(DV) Kaufmann
- HTC(DV) Paxton
- EM1(DV) Gerdom
- MM1(DV) Russell
- HT1(DV) Shirley
- BM1(DV) Emery
- ET1(DV) Sproule
- MM1(DV) Dickerson
- HT2(DV) Mason
- TM2(DV) Locke
- ETN2(DV) Pavlow
- PH3(DV) Brooks
- SKSN Varella
- SN Dorsett
- SN Esquivel

SECOND 850 FT. SLIDING SATURATION DIVI
START: FEB 16, 1978
SURFACE: FEB 28, 1978

Diving Watch Officers:
- CWO Ruden
- LT Hatcher
- LTJG Williams
- ENS Brown

Diving Medical Officers:
- LCDR Goad (COMSUBDEVGRU ONE)
- LT Netter (COMSUBRON SIX)
- LT Pruett (COMSUBDEVGRU ONE)
- CDR Harvey (COMSUBDEVGRU ONE, Senio

Diving Watch Supervisors:
- MMCS(MDV) Moore (USS PIGEON (ASR-21)
- SMC(MDV) Delauter (USS PIGEON (ASR-21)
- BMCS(MDV) Goacher (COMSUBDEVGRU OI
- ENCS(MDV) Cave (USS ORTOLAN (ASR-22)

Dive Team:
- HT2(DV) Mason (Team Leader)
- HMCS(DV) Kleckner (COMSUBDEVGRU ON
- MMC(DV) Bradbury
- HTC(DV) Paxton
- HT1(DV) Woodworth

Diving Watchstanders:
- HMCS(DV) Cooper
- ETCS(DV) Kaufmann
- EMC(DV) Carella
- HMC(DV) Gibson
- BMC(DV) Penter
- BMC(DV) Medina
- BM1(DV) Senones
- IC1(DV) Starr
- BM1(DV) Emery
- EM1(DV) Gerdom
- ET1(DV) Sproule
- HT1(DV) Hill
- HT1(DV) Earnest
- MM1(DV) Russell
- MM1(DV) Dickerson
- BM1(DV) Morrow (U
- MM1(DV) Hesler (US
- ETN2(DV) Pavlow
- HT2(DV) Rolfe
- BM2(DV) McKay
- HM2(DV) Brisse (DD
- PH3(DV) Brooks
- SN Esquivel
- SN Dorsett

Above: Dive team two, l-r: HT2(DV) Mason, HMC(DV) Kleckner, MMC(DV) Bradbury, HTC(DV) Paxton, HT1(DV) Woodworth.

Above: BM1(DV) Emery at main control console during dive.

r Medical Officer)

Senior Master Diver)
Master Diver)
NE, DDS Mk2 Mod 0 Senior Master Diver)
Senior Master Diver)

SS ORTOLAN ASR-22)
S ORTOLAN ASR-22)

S Mk2 Mod 0 COMSUBDEVGRU ONE)

Other Commands Assisting:
Sub-board of Inspection and Survey, Pacific:
LT Evans, USN

Submarine Development Group One:
CDR Harvey (Senior Medical Officer)
LCDR Goad
LCDR Strauss
LT Pruett
HMCS(DV) Kleckner
HM2(DV) Brisse

DDS Mk 2 Mod 0:
BMCS(MDV) Goacher

Submarine Squadron Six:
LT Netter

USS ORTOLAN (ASR-22):
ENCS(MDV) Cave
BM1(DV) Morrow
MM1(DV) Hesler

Certification of Starboard System:

200-foot Excursion:
(December 6, 1977)
EMC(DV) Carella
HM2(DV) Brisse
IC1(DV) Starr
BM1(DV) Senones

500-Foot Excursion:
(December 7, 1977)
EMC(DV) Carella
BMC(DV) Penter
IC1(DV) Starr
HM2(DV) Brisse

850-Foot Excursion:
(December 8, 1977)
EMC(DV) Carella
BM1(DV) Senones
IC1(DV) Starr
HM2(DV) Brisse

Certification of Port System:

200-Foot Excursion:
(February 17, 1978)
HT2(DV) Mason
MMC(DV) Bradbury
HT1(DV) Woodworth
HMCS(DV) Kleckner

500-Foot Excursion:
(February 18, 1978)
HTC(DV) Paxton
MMC(DV) Bradbury
HT1(DV) Woodworth
HT2(DV) Mason

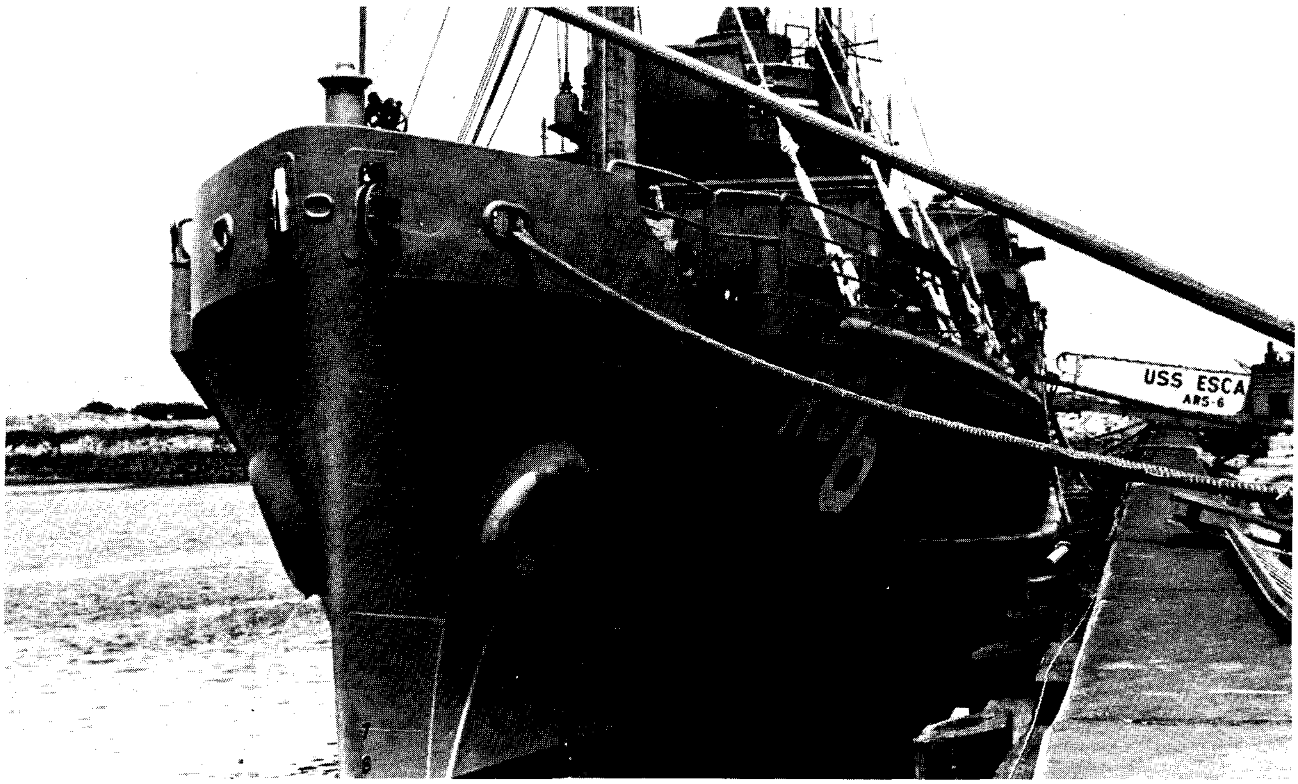
850-Foot Excursion:
(February 20, 1978)
HMCS(DV) Kleckner
MMC(DV) Bradbury
HT1(DV) Woodworth
HT2(DV) Mason

USS PIGEON MISSION:

The mission of PIGEON is to locate and rescue personnel entrapped in a distressed submarine on the ocean floor. This mission may be expanded to further involve deepwater inspection, equipment recovery, and limited repair/logistic support to submarines and various surface ships.

To accomplish this mission, PIGEON is equipped to transport, launch, and recover the Deep Submergence Rescue Vehicle for submarine rescue operations. The conventional McCANN Submarine Rescue Chamber is carried aboard for operations in depths to 850 feet. Precision deep water mooring, sophisticated underwater communications, and a three-dimensional sonar system enable complete coördination of diving and rescue operations from the surface. The Deep Dive System Mk 2 Mod 1 is a double complex saturation diving system that provides PIGEON with an open sea diving capability to depths in excess of 850 feet for extended durations. Conventional diving capabilities include helium/oxygen and air deep sea diving, shallow water, and scuba.

ESCAPE RECOVERS



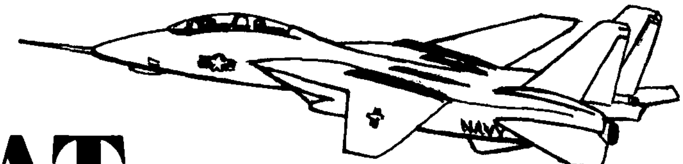
USS ESCAPE (ARS-6)

While attempting to land aboard the USS NIMITZ (CVN-68) on October 3, 1977, a U.S. Navy F-14 "Tomcat" careened over the side and into the Atlantic Ocean off the southeastern coast of Georgia. Both crewmen ejected safely; but the aircraft, carrying missiles, sank in approximately 160 feet of water.

USS ESCAPE (ARS-6) arrived at the crash site from Mayport, Florida, the following afternoon, augmented by 3 divers from EOD Detachment, Cecil Field, Florida, and 6 divers from the USS GRAND CANYON (AR-28). ESCAPE relieved the USS FISKE (DD-842) as on-scene salvage commander. FISKE, which had been in transit through the area at the time of the mishap, had already recovered the aircraft's tail section. USS FEARLESS (MSO-442), which arrived on the morning of October 5, quickly obtained a contact on its Variable Depth Sonar (AN/SQQ 14) of what appeared to be the wreckage.

This was a deceptively smooth beginning to what was to become a long and difficult recovery operation hampered by heavy seas, strong currents, deep operating depths, and equipment problems. The ultimate success in the recovery of the aircraft and its two missiles reflects credit on the divers and salvors involved during the grueling 17-day effort.

The events of the next 7 days centered around weather-related problems. Increasing winds and seas, coupled with a swift 4-knot current, caused marker buoy lines on the aircraft to part on two occassions. These conditions also severely restricted or postponed diving operations and hampered ESCAPE's efforts to remain securely moored. During this time, the USS PAIUTE (ATF-159) assisted by transporting a master diver, two Mk 1 band masks, side-scan sonar and precision navigation units, and a flyaway system that included an open bell.



F-14 TOMCAT

PAIUTE also provided operational support throughout the recovery effort.

Divers wearing scuba succeeded in locating the aircraft during a brief lull in the severe weather conditions on October 14. The next day, ESCAPE went into a 3-point moor and attached a crown buoy to the wreckage. One of the aircraft's two missiles was located apart from the main wreckage. After being disarmed by EOD and ESCAPE divers, it was hauled aboard the recovery ship.

Despite deteriorating weather conditions that shifted ESCAPE from her position, and despite continuing problems with the navigation system, the wreckage was relocated with the side-scan sonar. Divers then removed the second missile from the aircraft fuselage, rigged it with nylon straps for lifting, and hauled it aboard.

An attempt that same day to lift the detached nose section failed when the wire secured to it pulled loose, but a second attempt the next day was successful. ESCAPE was in a 5-point moor for the second lift and for the recovery of the main body of the aircraft. This concluded the operation and ESCAPE proceeded to Mayport with the 2 missiles and wreckage aboard shortly after midnight.

Diving Summary

The recovery operation involved a total of 48 dives. Divers wore Mk 5 (5 dives), Mk 1 (18 dives), and scuba (25 dives) rigs for a total of nearly 14 hours of bottom time and nearly 22 hours of decompression time. The average diving depth was 120 feet for scuba and 155 feet for the Mk 5 and Mk 1 dives. Divers using the diving bell were restricted in mobility on the bottom because of strong currents. During search efforts, it was possible for the divers to make only a 50-foot-diameter circle; and making a full circle was often impossible because of the current. For this reason, it was imperative for ESCAPE to keep its fantail directly above the wreckage until the divers completed their work. This illustrated the importance of establishing a proper 4- or 5-point moor as soon as the salvage site is located, especially in areas of strong currents and bad seas.

Participating Personnel

USS ESCAPE

P. E. Stanton, LTJG, USN
S. C. Duba, LTJG, USN
M. D. Magill, ENS, USN
D. Brown, BMC, USN
S. G. Hayslip, ENC, USN
S. L. Smith, MMC, USN
K. O. Doty, HT1, USN
T. W. Miles, BM 1, USN
S. E. Tripp, HM1, USN
R. E. Vermillion, MM2, USN
S. C. Miers, EN3, USN
R. H. Powers, ENFN, USN

COMSERVRON EIGHT STAFF

J. K. Edgar, LT, USN
J. L. Starcher, ENCS(MDV), USN

USS GRAND CANYON

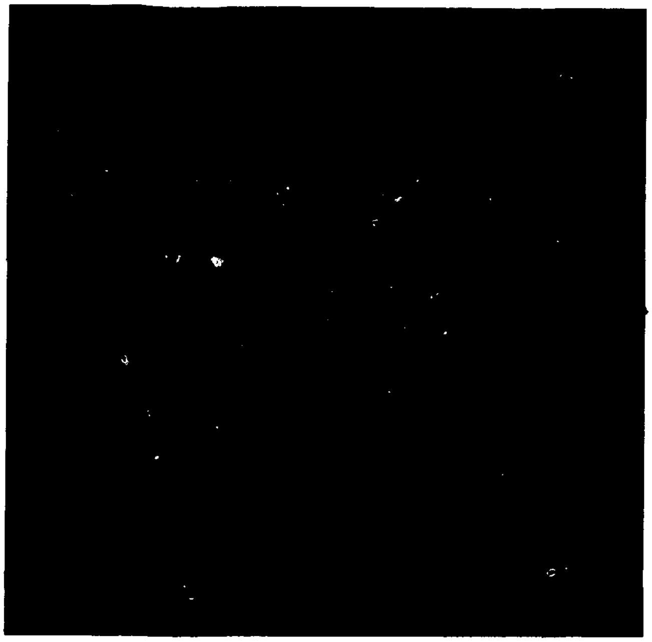
J. R. Arnold, BMC, USN
J. J. Russo, QM1, USN
E. W. Stevens, EM2, USN
C. R. Hensel, HT3, USN
R. Douglas, SA, USN

EOD GROUP TWO

E. W. Knight, CWO2, USN
S. D. Meltzer, TM1, USN
C. O. Muller, PH3, USN
R. N. Stanfield, MM2, USN

EOD DET CECIL FIELD

H. C. Maurer, LT, USN
W. C. Kaiser, EMC, USN
J. F. McKinnie, GMG1, USN
J. C. Crowe, HT3, USN



Reserve Harbor Clearance Unit 1 Det 419, San Diego, California, recently completed an operation that clearly demonstrated the capabilities of the RHCUs. The project, under the operational control of LCDR R. D. Jones, Commanding Officer of RHCU 1 Det 419, was a site survey off the southern California coast conducted for the Naval Facilities Engineering (NAVFAC) Command, Washington, DC, on San Nicolas Island. What was unique about this survey is that San Nicolas Island is over 200 miles from San Diego, and all personnel and support gear had to be transported to the remote site. Even with this extra requirement, the job was completed successfully on a drill weekend.

RHCU 1 Det 419 has completed numerous diving/salvage tasks for the Navy, Coast Guard, and local government agencies. The jobs have been selected to enhance unit readiness training while providing a needed and otherwise costly service to these organizations. Search and recovery, pier surveys, small craft salvage, retrofitting a floating breakwater, salvaging an oceanographic tower, and clearing a sunken pier are just several of the tasks undertaken by the Unit. Reserve Marine CH46 helicopters are used for transport to San Clemente Island for requal dives every 6 months. The expertise gained from these in-field evolutions was beneficial in the San Nicolas operation.

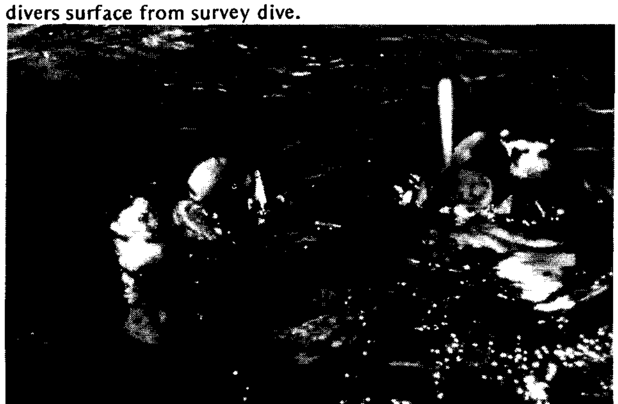
Since there are no diving facilities on the island, over 3,000 pounds of gear, including full dive bags, an h.p. compressor, and two Zodiacs were transported to the site by Navy helicopters. Two 65-foot patrol boats were provided as back up support craft by Reserve Coastal River Squadron One.

Surf conditions on the island prevented supporting the survey from the beach, which necessitated using the patrol boats as diving platforms. Since there are no piers on San Nicolas, all gear and personnel were transported to the patrol boats at a foul weather anchorage. Zodiacs were then used to transport the dive teams to the shallow water survey area.

The survey was originated by NAVFAC personnel and supervised by EM1(DV) Mike McGuire, HT1(DV) Rodger Phillips, HT2(DV) Ed Kirkeby, and EM2(DV) Will Ary.

The importance of advanced planning of backup support to this type of short time operation was illustrated when circumstances prevented the use of the helicopters for the return flight. The patrol boats were then made ready to transport the gear and personnel back to San Diego on schedule.

Above: Zodiacs transport divers to survey area. Below: RHCU divers surface from survey dive.



The Aging Diver:

"Research shows that young divers don't necessarily become old divers, and that the two groups do different types of diving."

Do The Older Become Bolder?

LCDR Robert J. Biersner, MSC, USN
Naval Submarine Medical Research Laboratory
LT Mark L. Dembert, MC, USNR
USS GRAYBACK (SS-574)
ENS Mark D. Browning, MC, USNR
National Naval Medical Center

Background

Not much is known about the medical, psychological, and performance effects of aging among U.S. Navy divers. The possibility has been raised that several medical consequences of diving, especially decompression sickness and osteonecrosis, may be complications of the aging process.[1,2] Both decompression sickness and osteonecrosis have been found to occur more frequently among older divers than among younger divers.[1,2] The possibility exists, however, that older divers may develop these adverse medical effects because they may make deeper, longer dives than younger divers. Such dives are known to result in a higher incidence of decompression sickness,[1,3] which in turn may lead to other medical complications such as osteonecrosis.[2] The only available data on this topic show a slight relationship between age and deeper, longer diving; but this relationship is not statistically significant.[3]

Approach

To obtain more detailed information on the effects of aging, data were collected on a group of 52 divers (both Divers First and Second Class) who were stationed in the New London, Connecticut area. They were asked to complete questionnaires about pre-service history (size of hometown, delinquency problems, age of enlistment, etc.), service and diving history (awards and recognition for diving performance, serving as an experimental subject or testing diving equipment, years of diving experience, number of diving accidents, disciplinary actions, etc.), General Classification Test (GCT) scores, age, marital status, and the Cornell Medical Index (CMI). The CMI is a list of 200 physical and psychological symptoms or problems, and the divers were asked to circle any symptoms that they had experienced in the past.

Diving performance was assessed using diving records maintained at the Naval Safety Center. Diving records covering the 5-year period from 1972 to 1976 were obtained, and the following information was extracted: Total number of dives, number of dives over 50 fsw, number of dives at surface temperatures of 40°F or less, and number of night dives. These four diving categories are measures of exceptional diving activity, either because these dives are physically or psychologically discomforting, or because these conditions are associated with frequent diving accidents.[1,3] The total number of dives in each of these four categories was then divided by the number of years each diver had been active in diving during this 5-year period. This correction provided a common basis for comparison. In addition, the medical records of each diver were reviewed and the number of sick calls made for each year of diving experience over this 5-year period was documented. Care was taken to avoid counting repeated visits for the same disease or injury. Treatments for decompression sickness and routine physical examinations were also excluded from this tally.

[1] *R. J. Biersner. "Factors in 171 Navy Diving Decompression Accidents Occurring Between 1960-1969."* Aviation, Space, and Environmental Medicine, *1975, volume 46, pages 1069-1073.*

[2] *W. H. Hunter, Jr., R. J. Biersner, R. L. Sphar, and C. A. Harvey. "Aseptic Bone Necrosis Among U.S. Navy Divers: Survey of 934 Non-Randomly Selected Personnel."* Undersea Biomedical Research, *in press.*

[3] *T. E. Berghage, P. A. Rohrbaugh, A. J. Bachrach, and F. W. Armstrong. "Navy Diving: Who's Doing It and Under What Conditions."* Naval Medical Research Institute Report, *December, 1975.*

The 52 divers were divided into three groups of nearly equal size according to age. To avoid the ambiguous and mixed results that could be associated with the middle section, which consisted of 17 divers between the ages of 26 and 32 years old, the group was dropped from the analysis. Only the youngest and oldest groups were compared. The youngest group contained 18 divers who ranged in age from 19 to 25 years of age. The oldest group consisted of 17 divers who were between 33 and 40 years old.

Findings

The average scores in each of the major diving categories are shown in Table 1. A statistical analysis of these results showed that the younger divers made significantly more dives and had more accidents per year of diving than did the older divers.[4] Commensurate with the higher frequency of diving accidents, the younger divers also tended to make more sick calls per year of diving than did the older divers. This difference in sick calls was not, however, statistically significant. Also, the difference between younger and older divers in the number of dives made over 50 fsw was nearly significant (with the younger group diving deeper).[5] The older divers, however, made significantly more night dives per year than the younger group. Although the results in Table 1 seem to show that the younger divers made more dives at cold surface temperatures than the older divers, the variability within each group for this type of diving made this difference insignificant. (Within the younger group, the number of dives at cold temperatures ranged from 0 to 42.5 per year, while for the older group this range was from 0 to 7.3.)

Although the finding that older divers have more years of diving experience than the younger group is not surprising, the difference in the years of service they had before they became divers was unexpected. This finding seems to argue that divers in the older age group wait a number of years after joining the Navy before qualifying in diving, while younger divers become diving qualified during the first enlistment. Older divers, however, remain qualified longer while younger divers appear to attrite from diving much earlier. This interpretation is supported by the small percentage of the older group who became divers during first enlistment (approximately 12 percent) compared to the younger group (100 percent), as well as the difference in total years of diving experience between the two groups.

In addition to the aforementioned findings, further comparisons showed that the two groups did not differ significantly from each other in verbal intelligence (GCT scores), self-reported medical problems (CMI scores), pre-Navy delinquency problems (truancies, high school disenrollment, traffic violations, and arrests for non-traffic crimes), Navy disciplinary actions (masts, reductions in rate, failure to obtain good conduct awards, and disenrollment from Navy schools), and special diving recognitions (awards for diving and participating as an experimental subject or testing diving equipment). (These last two measures—Navy disciplinary actions and special diving recognition—were adjusted or divided by the total years of Naval service and total years of diving experience in order to make the comparisons more valid.)

Implications

If the previous 5 years of diving experience for those divers who were stationed last year in the New London area can be taken as representative of U.S. Navy divers as a whole, then some important implications for U.S. Navy diving can be deduced from these findings. Contrary to previous assumptions, older divers do not make more hazardous or arduous dives than younger divers. Younger divers do substantially more diving than older divers, and also do more diving to deeper depths. The only exception is night diving, which is more frequent for older divers compared to the younger group. The rationale for this exception is unknown. Perhaps diving supervisors believe that older divers will remain better oriented during night dives than younger divers. Or, perhaps the type of tasks to be performed at night (such as emergency search and rescue) are assigned to the older group because they may have more experience with or knowledge about the equipment to be salvaged. Another reason might be that they may be more familiar with the local geography.

The more frequent diving accidents reported by the younger divers are probably related to a combination of the more frequent and deeper diving that they do, as well as to inexperience. Decompression sickness was rare among both these groups (two cases in each group). Thus, not much can be said directly about decompression sickness and the possible complications of decompression sickness (such as osteonecrosis) for these groups. Most of these self-reported accidents involved stings, bites, squeezes, and trauma (such as cuts, sprains, and bruises). These types of accidents are related largely to environmental conditions and to the tasks that are performed, thereby involving a combination of heightened exposure to danger (which may be largely unavoidable) and task familiarity (which may be improved through better training or experience).

[4] *For those who are interested, significance was determined using t-tests for independent samples. A significant "t" is equal to at least 2.040 (at 33 degrees of freedom). "Significant" means that the probability that these differences occurred by chance is equal to or less than 5 in 100 (two-tailed test).*
[5] *"T" was equal to 1.950; chance was therefore between 5 and 10 in 100.*

This situation, in which younger divers appear to be diving more frequently under more dangerous conditions and experiencing more accidents than older divers, may account for the finding that few of these younger divers last long enough to become members of the older group. They appear to join the diving ranks earlier (perhaps on impulse), volunteer for or are assigned to the more difficult diving situations, and then attrite more quickly from diving than the older group. Waiting as they do until after the first enlistment to volunteer for training, older divers appear to be more cautious about becoming divers and may be more career-motivated than younger divers. Once qualified, they seem to have adopted a slower, more conservative diving pace than younger divers (at least as they grew older). As a result, older divers are more durable and suffer fewer ill effects from diving than younger divers.

These results, however, do not say much about what the older divers were like as young divers. Did they, too, make more dangerous dives? If so, they may have remained in diving because of some motivational or personality difference between them and their peers. If, on the other hand, they did not differ much psychologically from their peers, then perhaps they were simply lucky and did not experience many of the fatiguing or dangerous diving conditions that their peers did (or at least not as often). Perhaps the difference lies in some combination of luck and psychology. Until more information is forthcoming, these results seem to be described best by paraphrasing the old adage, "There are old divers and there are bold divers, but there aren't many old, bold divers."

As stated earlier, the question remains unanswered about the extent to which the diving activity of these two groups is voluntary or the result of differential supervision. Perhaps younger divers are routinely sent to diving billets that involve making more numerous and hazardous dives. An answer to this question would provide a better understanding of the psychological dynamics of the two groups and of the accelerated attrition that is occurring among younger divers.

These findings also indicate that the higher incidence of decompression sickness and osteonecrosis found among older divers does not appear to be related to more frequent exposure to deeper, longer dives. The higher incidence of decompression sickness (and other medical complications associated with decompression sickness) found among older divers would appear, therefore, to be related to some biochemical or physiological effect of the aging process. This interpretation should, however, be validated on a much larger group of older divers who have had more decompression sickness.

Acknowledgements

The authors wish to thank the divers and diving supervisors in the New London area who cooperated in completing the questionnaires, and the Deep Sea Diving Medical Technicians who made health records available. The assistance of the Naval Safety Center, especially CDR William Mullaley of the Submarine Safety Division, in providing diving records is most appreciated.

TABLE 1
Diving Experience, Pre-Service and Service History, and Medical Information on Young and Old Divers

	Young Divers		Old Divers		t[a]	Level of Significance[b]
Diving Experience	*Average*	*Variability*[c]	*Average*	*Variability*		
Yrs. of Naval Service Before Qualifying as a Diver	2.17	1.69	7.88	3.59	6.088	Over 1 in 1000 (highly significant)
Yrs. of Diving Experience	2.22	0.65	9.65	3.57	8.682	Over 1 in 1000 (highly significant)
Total No. of Dives/Yr.[d]	38.13	19.19	22.51	15.77	2.622	Over 2 in 100 (moderately significant)
Dives/Yr. at 40°F or less	5.94	10.55	1.63	1.93	1.659	Between 10 and 20 in 100 (not significant)
Night Dives/Yr.	0.33	0.49	2.12	3.14	2.383	Over 5 in 100 (significant)
Dives/Yr. below fsw	8.09	5.60	5.15	2.78	1.950	Between 5 and 10 in 100 (nearly significant)
Diving Accidents/Yr. (self-report)	0.45	0.33	0.13	0.09	3.969	Over 1 in 1000 (highly significant)
Special Diving Recognitions/Yr.	0.14	0.22	0.23	0.18	1.244	Between 20 and 40 in 100 (not significant)
Pre-Service and Service History						
Pre-Service Delinquency Problems	2.06	1.35	2.53	1.28	1.064	Between 20 and 40 in 100 (not significant)
In-Service Disciplinary Actions/ Yrs. Service	0.08	0.15	0.10	0.15	0.566	
GCT scores	58.59	7.72	55.33	8.40	1.142	Between 20 and 40 in 100 (not significant)
Medical Information						
CMI scores	15.00	23.11	14.59	10.04	0.068	Near 50 in 100 (not significant)
Sick Calls/Yrs. Diving	2.29	2.26	1.54	0.96	1.266	Between 20 and 40 in 100 (not significant)

[a] *See footnote 4.*
[b] *See footnote 4.*
[c] *Variability is used to designate the spread of scores (standard deviation) around the average score; the lower the variability, the better (or more reliable) are the scores.*
[d] *"Yr." indicates per year of diving experience.*

Carl West and Lawrence Nichols weld skid assembly.

Mr. Eric W. Glaubitz
Office of the Supervisor of Salvage

Hydraulically powered wire rope pulling equipment has been in use for many years for such commercial applications as suspension bridge construction and repair, wire rope testing, and salvage work. The Supervisor of Salvage, NAVSEA, Code OOC has developed an adaptation of a commercial wire rope pulling machine (cable puller) both for use on the new TATF fleet tugs and as an addition to the Emergency Ship Salvage Material (ESSM) system. As part of the program to obtain approval for service use for the cable puller system, the Hawthorne Army Ammunition Plant (HWAAP), formerly the Naval Ammunition Depot, Hawthorne (NAD, Hawthorne), Nevada, was tasked to build the first few sets of cable pullers as a check on the NAVSEA generated drawings. With additional technical guidance from the Naval Surface Weapons Center, Dahlgren, Virginia, HWAAP will fabricate four hydraulic cable puller systems and perform testing on the completed systems. This important phase in the development cycle of the cable pullers will ensure an accurate set of fabrication drawings that will be the basis for a future procurement specification.

The Navy-developed cable pullers can generate 100,000 pounds of pulling force on a 1-5/8-inch wire rope and can be operated either by manual or automatic controls. The automatic control permits the puller operator to dial in a desired load setting that the puller will maintain by pulling in or paying out wire. The controls are housed in a separate control box and can be positioned at a safe distance from the cable puller. Powering the control box requires 110 VAC. Power for the cable pullers is provided by a 50 gpm, 2,500 psi diesel hydraulic prime mover. Both the control box and diesel hydraulic prime mover are being provided as part of the cable puller system.

Ground breaking at Hawthorne, Nevada was on July 24, 1928. On September 15, 1930, the Naval Ammunition Depot, Hawthorne was commissioned with a mission of providing an ammunition storage, servicing, and issuing point for the Navy. When the first shipment of high explosives was received on October 14, 1930, the number of employees had risen from the original figure of 11 to 90 civilians and 72 military personnel. During the early 1940's, NAD, Hawthorne's mission was expanded to include cast loading of munitions, mines, depth charge demilitarization, and renovation projects. Also added was other conventional weapons loading, including fuel-air explosive (FAE) weapons systems.

Employment at NAD, Hawthorne reached its peak during World War II; during August 1945, a high peak of 1,736 civilians and 3,889 military personnel worked there. On October 1, 1977, the depot was turned over to the Army under the single management concept and was renamed the Hawthorne Army Ammunition Plant. At present, HWAAP is the world's largest ammunition depot and the largest industrial activity in Nevada. It covers 150,000 acres and includes 3,000 buildings and structures. HWAAP has an ammunition storage capacity of 600,000 tons and is the only facility that handles the fuel-air explosive weapons system.

Fabrication and drawing correction of the cable puller system at HWAAP began during the first quarter of FY78. The experience and expertise of the personnel involved have contributed greatly to the project. Drawing corrections and several design modifications have improved both the operating characteristics of the puller system and the fabrication methods for future production.

NAVSEA, Code OOC has expressed confidence that any future tasks performed by HWAAP will be completed with the same professionalism that has been shown in the fabrication of the Navy Hydraulic Cable Puller System.

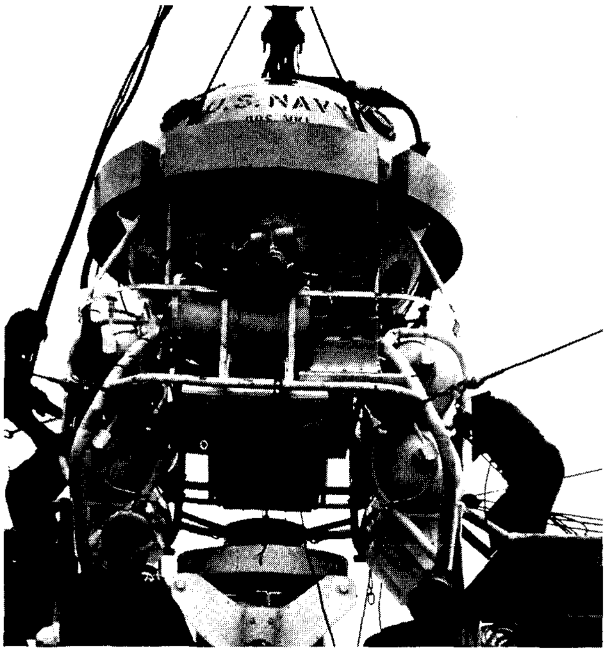
A Farewell to the Mk 1 DDS

MMC(MDV) C. D. Wetzel, USN
Harbor Clearance Unit TWO

Ten divers and 2 officers reported to Commander Service Squadron FIVE (COMSERVRON 5), Pearl Harbor, Hawaii, in October 1968 for duty on the Navy's new deep dive system being built in San Jose, California. After each man reported for duty in Pearl Harbor, he was sent to the Navy Experimental Diving Unit (NEDU), in Washington, DC, for training. These men would be the nucleus of the Mark One Deep Dive System (Mk 1 DDS). These first members were LT L. T. Bussey, WO1 McEntire, DDCS(MDV) F. H. Brauner, MM1(DV) C. D. Wetzel, EMC(DV) R. K. Merriman, DCC(DV) J. E. Langdon, BM1(DV) J. E. Mullen, EN1(DV) E. A. Landstra, BM1(DV) T. K. Goacher, HM1(DV) M. S. Smookler, SFC(DV) L. L. Pulliam, DC1(DV) J. T. Brady, ET3 J. Mulkey, and IC3 Grulke.

After the team arrived at NEDU, work-up dives started to test the divers and the new Mk 1 tables to 350 feet/60 and 450 feet/60. All divers "came away ok"; and, in December, the team headed for FMC Corporation in San Jose to start classroom instruction on the handling of the dive system. Soon thereafter, the dive system was shipped to Port Hueneme, California to be placed on board the USNS GEAR.

Ocean Systems, Inc. was contracted to assist the divers in installing the system on board. The after deck and ship's boom had to be "beefed-up" to bear the weight of the system and electric cables had to be run from the 200-kw diesel generators on the forward deck to the main control console. In addition, extra gas bottles were installed in both the forward and after holds and an enormous sheave was installed on the starboard side to accommodate the SPCC cable. After the system was installed, the ship steamed up the California coast to Santa Barbara for trials. The crew worked long, hard hours that first month getting the system ready for both its operational evaluation (OPEVAL) and its return to Pearl Harbor.

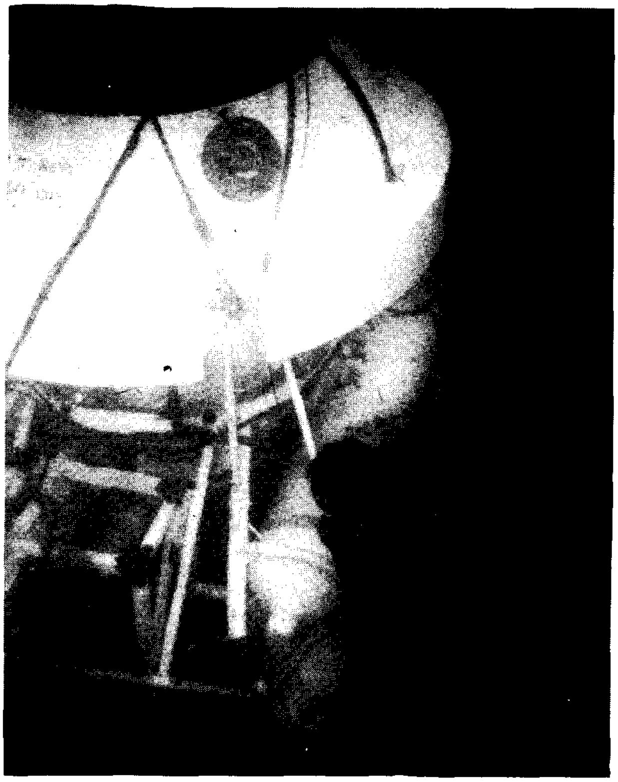


Mk 1 PTC being mated to deck decompression chamber.

Training began with the divers using the Mk 9 semi-closed rig and a Dunlop dry suit with wooley bear underwear for protection from the cold water. However, the hot California sun made this attire hot for a diver to wear on deck and consequently made him colder when he entered the water. It was apparent that other apparel was needed, and this problem was studied as diving operations continued.

After the barge was refitted, it was towed to Panama City, Florida, for trials and crew retraining. HCU-2 divers and non-divers assisted the Mk 1 crew in operating the system. Training started at the 100-foot depth. However, the crane and the hole in the deck did not work out, so diving operations stopped; and the barge (YDT-16) was made ready for sea and towed up to Portsmouth Ship Yard, Virginia.

While at the shipyard, FMC completed their contract by putting the system on board the USS EDENTON (ATS-1). The system was placed on board, but, because of the inadequate handling system and lack of berthing, the exercise was called off; and the system was put back on board the YDT-16. During the following year, the handling system on board the YDT-16 was taken off and the handling system that was used on the USNS GEAR was adapted to the barge configuration.



Mk 1 PTC at depth.

LT Coby was relieved by LT Bob Lusty, RN; and CPO Fraser relieved CPO Andrews. Dives were made in the Chesapeake Bay for training and upkeep of the system, and dry dives to 1,000 feet were made. During this period, BMC Goacher reported to the Mk 1 to relieve EMC Bates as the Master Diver; and CPO Fraser, RN, was relieved by CPO Humphrey, RN.

The barge was made sea-worthy and towed again to Panama City for training and testing of the system. Open sea dives were conducted from April to June 1975, during which time the system experienced some mechanical problems stemming mostly from the electrical and communication systems. The ET's, EM's and "valve shop" people solved these problems after many long hours. With most of the "bugs" out, the crew continued training with dives from 100 feet to 300 feet. It was decided to attempt a 1,000-foot open sea dive; and in the summer of 1975, ETC(DV) Rhodes, HMC(DV) Burwell, EN2(DV) Benoit, and CPO Humphrey, RN, entered the DDC's to start the dive. The PTC was lowered to a depth of 1,050 feet and EN2 Benoit exited into the water, establishing a new open sea record. Later in the afternoon, the PTC was lowered to 1,100 feet and ETC(DV) Rhodes entered the water to a depth of 1,148 feet. This not only broke EN2 Benoit's record, but established a new record for the Mk 1 dive system, proving that man can do useful work at those depths. (See *FP*, Summer 1975.)

During the decompression phase of the 1,148-foot dive, the Mk 1 was honored to host the British saturation diving team from Portsmouth, England. Their team was blended in with the Mk 1 crew, indoctrinated to the system, and trained with the Mk 1 team on all the operating procedures and watch-standing.

After the dive was completed, BMC Goacher left the team, HTC R. O. Brady took over the Master billet, and LT Lusty was relieved by LT Page, RN. The barge was then towed out to the 100-foot depth to train the British team on the PTC and chamber operation. In August 1975, a dive commenced to 300 meters. The divers in this effort were LDG/D Prichard, CPO/D Ballinger, MM1(DV) Leiland, and BMC(DV) McNeal. The dive was performed to prove the British saturation tables using .4 to .45 PP of oxygen vice our .3 to .35 PP of oxygen. The dive surfaced with no problems at all; and there were no complaints of "niggles" or "bends" during the project.

Ocean Systems' contract specified that they would make the first saturation dive to ensure the safety of the Navy divers. Thus, two civilian divers made the first dive to 450 feet in July 1969. A personnel change to the Mk1 team occurred when the team's first Master Diver, F. H. Brauner, was killed in a non-diving accident in San Diego. Master Diver R. C. McClanahan was sent from NEDU as a temporary replacement until Joe Bates reported on board as the new permanent Master Diver for the group. During this period, a British diving team came aboard to observe diving operations and to train in the system for 2 months.

The system was transferred in January 1970 from COMSERVRON FIVE to Harbor Clearance Unit TWO (HCU-2) in Little Creek, Virginia. The next month, the Mk 1 was pressurized to a depth of 850 feet on a dry dive. The first divers to test the system at that depth were BMC Goacher, DC1 J. T. Brady, DCC Langdon, and MM1 Wetzel.

Submarine Development Group One (SUBDEVGRU 1) personnel came on board to test the Mk 11 semi-closed dive rig, conducting numerous dives to various depths of from 100 feet to 600 feet. The Mk 1 DDS personnel transfer capsule (PTC) was then taken off the GEAR and sent to FMC to have a heating coil installed outside the bell and to rework the electrical panel. The heater on the PTC proved to be invaluable to the PTC operator, since his 1/4-inch wet suit was his only heat source to keep him warm in the 47°F water.

A dive was started in October in the open sea using the Mk 11 and a band mask diver. On October 22, GMGC Powell, DC1 Huss, EM1 Aven, and DCC Langdon reached the depth of 850 feet. The PTC was lowered to 870 feet and raised 30 feet to allow the divers to exit.

Another 850-foot dive was started in November. The divers in this effort were CWO Barns, BMC Goacher, EMCS Merriman, and SFC Pulliam. The PTC reached the depth of 870 feet and again was raised up 30 feet so the divers could exit to 850 feet. The dive attire adopted for the Mk 1 was the hot water suit and band mask. The ease and comfort with this rig was far superior to the Mk 9 and dry suit used initially.

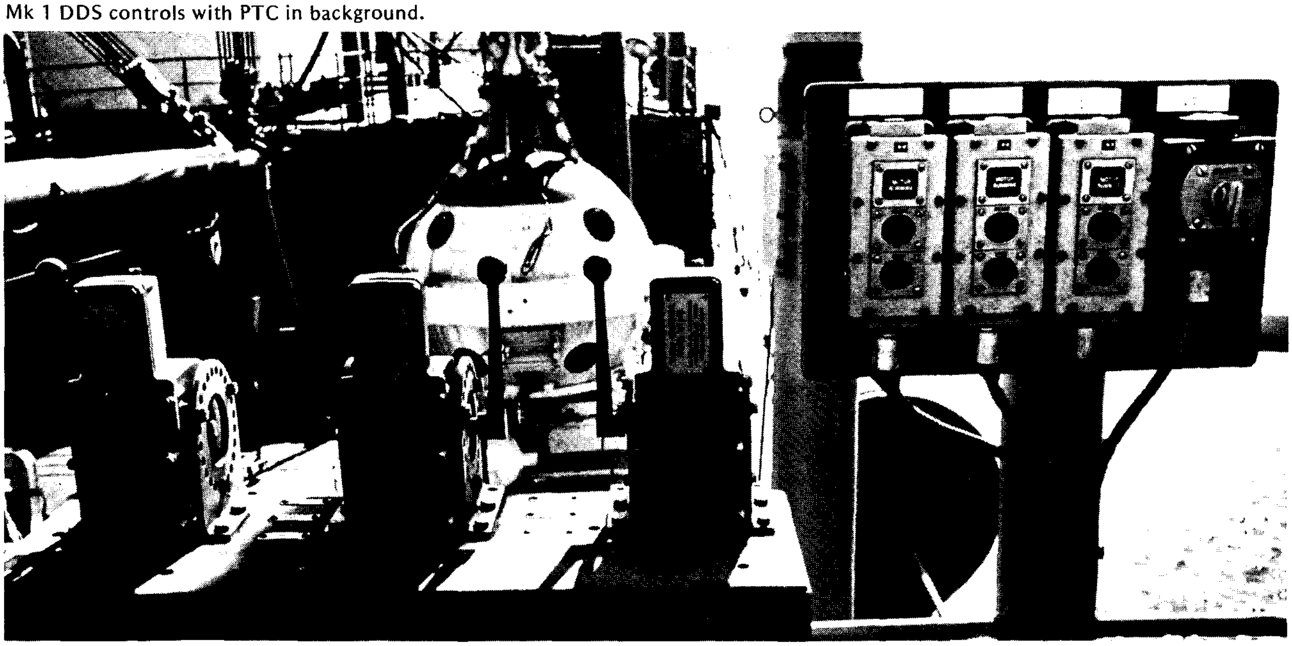
After the two 850-foot dives, the Mk 1 was again taken off the GEAR. The PTC was sent to FMC for repairs and the entire system was then sent to Moffat Field outside San Jose to be air-lifted to New Orleans, Louisiana, illustrating that it was in fact a portable system. At this time, LT Coby, RN, relieved LT Bussey as the Officer in Charge; and CPO Andrews came on board as the first Royal Navy Chief Petty Officer.

At Bolling Ship Yard in New Orleans, the YFNB-43 was converted into a diving tender (YDT-16) to accommodate the dive system. A hole was cut through the center of the barge to facilitate lowering the PTC in the water. Putting the PTC into the water through a centerwell would provide more stability and less movement on the center line during rough seas. During this period, a 500-kw diesel generator, air flasks, HP compressors, helium reclaim system, and mix maker were added to the Mk 1 DDS. The system also acquired an articulated crane to handle the PTC.

With the dive completed and the YDT-16 readied for sea, the "Brits" returned to England and the YDT-16 was towed back to Little Creek, Virginia. In September, the YDT-16 was scheduled to undergo a yard period to rework the barge and to rework the electrical system on the Mk 1. The team worked on the system to make it ready for another series of dives. Possible tasks included diving at Argus Island and working for NDAA off the coast of Maine to count lobsters at 600 feet. A Mk 1 type system would have been extremely valuable operating off Argus Island and even more so working with the Large Object Salvage System (LOSS) Project in Panama City, where conventional time at depth was short because of decompression times.

With our E. L. Scubber Squirrel Cage apart, the Mk 1 was "down" and could not accept any work. However, the crew worked as far as they could and saturation divers were ordered in. Work went on as usual. The new men learned the system as well as they could without actually running the PTC over the side or operating the chambers. The YDT-16 was slated to go to Perry Dive system at Riviera Beach, Florida, in February 1976, to be made operational when word came that the Mk 1 was going out of service. The crew had mixed feelings because of the last deep dive and new men on board thought the system was here to stay. No one wanted to believe that the U.S. Navy would put out of service the only Deep Dive System or for that matter the only long duration system they had regardless of depth involved. Long, hard hours had been put into this system, from day one at FMC Corp. in San Jose to its final location at Little Creek. Too many people were involved in the system; to name them all would take too long. Most have said that they were proud of being part of the Mk 1 deep dive system.

Mk 1 DDS controls with PTC in background.



MARS Comes To PANAMA CITY

Preprototype model of MARS being tested.

Scientists and engineers at the Naval Coastal Systems Center (NCSC), Panama City, Florida, pooled their talents in competition with other Naval activities and built a preprototype model of an inflatable boat with a silent propulsion system to replace the 25-year-old model now used by the Fleet. The NCSC model was chosen as the best one from those entered.

Called the Military Amphibious Reconnaissance System (MARS), the NCSC preprototype model was designed to secretly transport Marine Corps reconnaissance swimmers and Army Special Forces swimmers from a point 20 miles at sea to shore for a mission and back to their ship or other rendezvous.

The existing IBS (Inflatable Boat, Small) has been in use since 1952. One of the objectives for the replacement boat was to use new materials and new technologies developed over the past 25 years. Requirements established early in 1975 by the Army, Navy, and Marine Corps were refined and revised to become a joint service operational requirement.

NCSC personnel became involved in development of the boat in January 1977. One of the specifications was that the boat be built of polyurethane-coated Kevlar, a new material that was not available to the NCSC team. The task team constructed their model by adapting an available conventional material, neoprene-coated nylon. Simultaneously, a contract was established to study polyurethane-coated Kevlar to determine if it were the best material for the job.

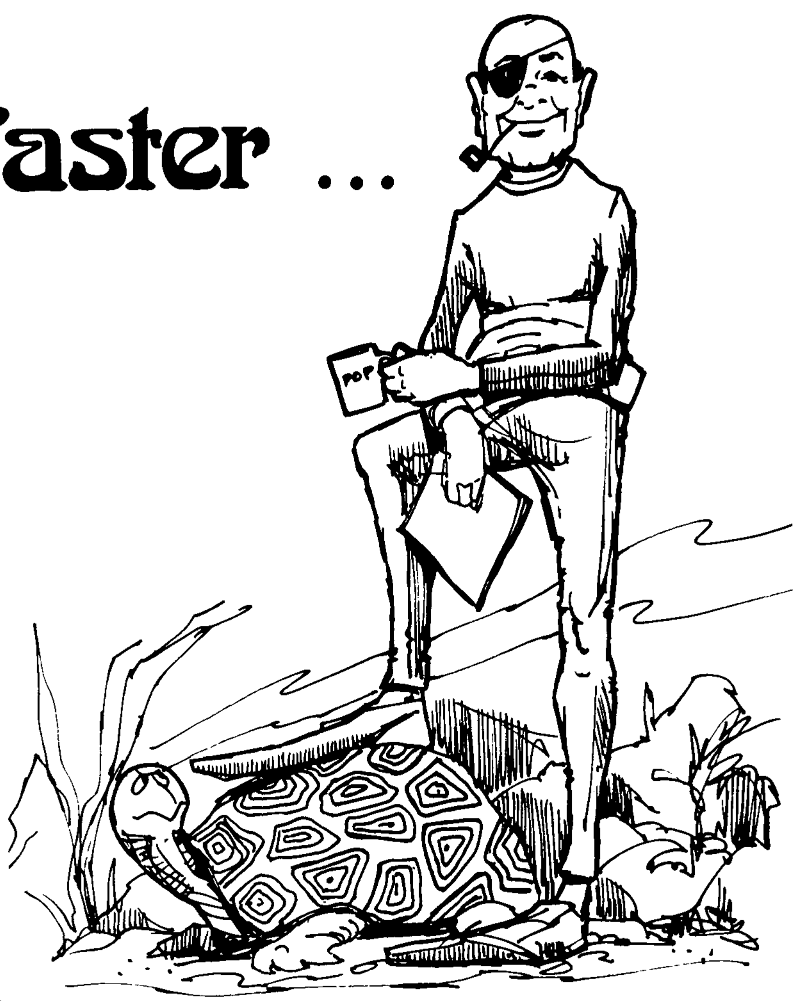
Six months later, the task team delivered a preprototype boat to the Marine Corps at Camp Pendleton, California for a 3-month evaluation. NCSC was selected to develop a total system, the MARS.

Engine performance was a major factor in the NCSC model. A modification kit was devised for silencing and dewatering the engine of a conventional 35-hp outboard motor. The dewatering valve allows the engine to be submerged for extended periods of time and be restarted upon surfacing without engine overhaul.

Another unique feature of the boat is that it can be propelled at speeds up to 31 miles an hour because of a special keelson the team designed. The keelson is a 3-inch diameter aluminum pipe that traverses transom to bow of the boat and has a cord in the center that allows it to collapse in sections for storing.

It is anticipated that a contract will be let in May for building 12 prototype boats, with delivery scheduled for August. Meanwhile, engine design tests are continuing in area waters (Bay, Gulf, and rivers) to measure load-carrying capability, speed capability, and quietness of the motor. Once the 12 prototype boats are received, the team will run acceptance tests for 6 months. During developmental and operational tests, some of the boats will be kept at NCSC while the Marine Corps and Army will use some of them in simulated operational conditions. The Marine Corps and Army will use the final design specifications to procure quantities of these boats for their stock system.

The Old Master . . .



A Master Diver's Conference was held in San Francisco, California, in September 1977. There were 50 master divers present at the meeting, and some 30 action items were discussed for solutions and/or recommendations. The Supervisor of Diving received the minutes of the meeting, and placed them into a format for review by CNO, CNM, CINCPACFLT, CINCLANTFLT, CHNAVPERS, CNTT, and NAVSEA (OOC). The review has been completed. Copies of the minutes and comments have been sent to all commands. All divers in all commands should have the chance to read these recommendations and comments. There were several items discussed that pertain to every diver in the Navy, both officer and enlisted.

The "Master Diver Notebook" is one result of the conference. The notebook contains AIG messages, SECNAV instructions, OPNAV instructions, NAVFAC instructions, NAVMAT instructions, NAVSEA instructions, BUMED manual, BUMED instructions, and safety notes. It is a notebook binder so pages can be added and updated. It should be a ready reference on the diving station.

There are a lot of things that the Supervisor of Diving cannot do for you. He cannot run a PMS or PQS program; that has to be done by you. Gun-decking PMS or PQS will get you nothing but embarrassment when you are called upon to do a job and your equipment does not perform or your divers do not know how to operate the equipment. It would be even worse if you had an accident and the investigation revealed that the equipment failed because of a lack of PMS. It is the responsibility of the diving supervisor to maintain a rigid PQS and PMS program.

The certification of systems and equipment is another area that is not moving as fast as it should. There are several reasons for this. Certification is fairly new; and, like all new programs, there are faults with it. People interpret things differently; one of the major problems is that people in the fleet feel that certification is unnecessary and that the paper-work is a burden. For one thing, certification tends to standardize systems and equipment. It should make systems and equipment safer. You cannot change something on a system just because you want to make a change.

As a result of the master diver conference, a meeting was conducted in January by NAVMAT with NAVSEA, NAVFAC, and CHTECHTRA. It was decided at that meeting that the diving school would soon revise their training curriculums to include system certification training. In addition, CNO recently directed that a system design manual be prepared. Guidance currently exists in NAVMAT P-9290 for system certification; and the Supervisor of Diving has a staff of people to help you.

One final subject I would like to discuss is the recruitment of divers. Everyone is short of divers today. How much recruiting are you doing? We all should be looking for good people and going after them. If your command has a good man and he wants to go to diving school, let him go. There are some commands that say "I can't afford to let him go." This is hogwash. When you keep a sailor from a school or job that he truly wants you are only hurting yourself and the Navy. That sailor will leave the Navy at the end of his enlistment, and you will have lost a good man. Go after good sailors and try to keep good sailors in the diving program.

BMCM James L. Tolley
Senior MDV USN

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