# Faceplate

Spring 1971

# Ceremony...

*On-scene commander*
*LCDR James J. McDermott*
*Legion of Merit*

*Officer in Charge of the Mark I DDS*
*LCDR Lawrence T. Bussey*
*Navy Commendation Medal*

*CWO Earl D. Barnes*
*Meritorious Service Medal*

*Chief Joseph D. Langdon*
*Meritorious Service Medal*

# Etc ...

*Mark I crew looks over equipment that went to 850 feet.*

*RADM M. H. Rindskopf presides*
*at San Diego news conference.*

(see page 12) **... all a part of the 850' dive**

# Faceplate

Vol. 2 No. 1

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

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

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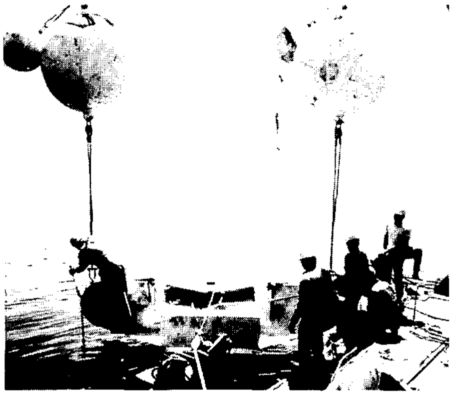
THE COVER: Artist Dorothy Weintraub has captured on canvas a montage of events surrounding the recent open sea dives to 850 feet. From the Personnel Transfer Capsule which actually took pressurized divers down to the working depth, to the topside crew who monitored the dive, to the actual diver, Chief George Powell, who has his fun with his southern cohorts by taping "Yankee" to his helmet for the benefit of the t. v. monitors, including the presentation of awards to the men involved, each event had special significance for the men who participated.

The back cover shows the entire Mark I Deep Dive System including PTC, Decompression Chambers and Entry Lock (bottom).The middle area shows divers preparing to leave the PTC on the ocean floor and the upper portion depicts a sailor operating the crane controls which lower the PTC into the water.

The original acrylic paintings were presented to LCDR James J. McDermott, the on-scene commander for the Mark I, by FACEPLATE Magazine.

Aboard the NUC diving boat, members of the crew discuss the next move in the diving operation. Pictured above are (clockwise from center), SFC A. L. Frontz (with Kirby-Morgan Band Mask and "come home" bottle), SFC (DV) J. S. Watts, author Worthy, MM1 (DV) E. L. Evans, MMC A. A. Nelson.



NUC Public Works Riggers prepare the beam assembly on board a floating crane. Guide wires are visible through the center of the beam assembly and held taut by a winch. The four spherical styro-foam filled buoys are shackled to a strong back (not visible).

# NUC Conducts Tests on Simulated Distress Submarine

by Chief E. H. Worthy, Master Diver

Testing and research is an ever present requirement for the Naval Undersea Research and Development Center in San Diego, California. A recent accomplishment, one which required some 250 dives and 80 hours of bottom time for the 20-man diving team, was the installation of a complex hauldown system for a Simulated Distress Submarine (SDS).

Test requirements for the Deep Submergence Rescue System program, dictate that the Deep Submergence Rescue Vehicle (DSRV) should demonstrate the capabilities of mating to a distressed submarine. The Simulated Distress Submarine simulating the upper half of the forward section of a submarine, was constructed for that purpose. The problem confronting LCDR H. W. Hensley was the installation of the hauldown system.

Due to operating depth and water temperature, bottom time for the diver was limited to 15 minutes, in order to reduce in-water decompression time and thereby decrease the time the divers were exposed to the cold water. Water temperature at the bottom was approximately 42°F. and 58°F. on the surface. Water decompression was established at one minute at 30 feet, four minutes at 20 feet, ten minutes at 10 feet.

The site selected by the NUC engineers for the test was off the east coast of San Clemente Island in an area formerly used for the Polaris pop-up tests. Water depth in this area is approximately 200 feet. Public Works provided surface support and support craft for the divers.

The hauldown system consisted of a boxbeam, index ring, and a beam assembly with associated sheaves and pulleys. The method for installing the system began with the divers installing both halves of the index ring below a collar on what is called a Stake-pile 5.

For all diving operations, the breathing apparatus used was the Kirby-Morgan bandmask (KMB-8) with an umbilical for surface supplied air. As a back-up, in the event of an emergency, the divers carried a 20 cubic foot "come home" bottle. Standard quarter-inch wet suits were used on most dives.

Working in pairs, the divers descended affixing the 200 pound index ring halves to the stake-pile, and secured it there by inserting six bolts. This required the divers to accurately position the ring and align the bolt holes.

Once the index ring was secured, the next operation called for installing the mounting box. The box, like the ring, was fabricated in two halves with each half weighing approximately 450 pounds. Each half of the four foot square box was hollow, resulting in actual weight in water of fifty pounds each. In order to position the box directly over the stake-pile, the divers first installed two guide wires through the index ring to the surface, then through guide holes in the box.

The box was assembled on the surface with the lower portion spread apart to fit over the stake-pile. Prior to lowering the box, a TV tripod was lowered to the operations site to monitor the lowering operations and the divers.

When the box was about one foot above the stake-pile, the divers maneuvered the assembly so that on their command to lower the box, it would slide over the top of the stake and onto the index ring. Once in that position, they were able to align the 16 bolt holes and firmly secure the box to the stake-pile. The final step in the operation was the installation of the 6,700 pound beam.

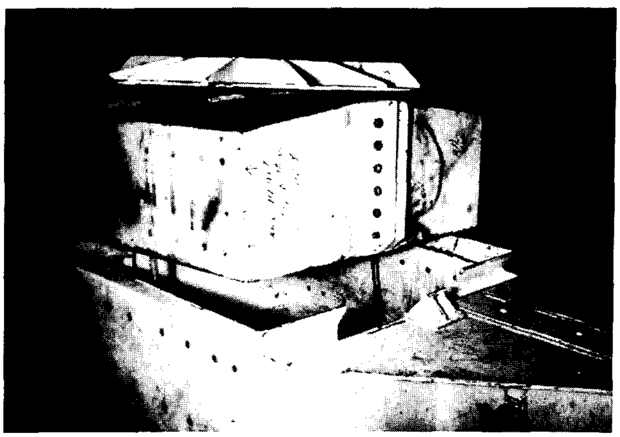
Several problems had to be overcome to complete this task. One was the relative motion between the beam and the box assembly caused by the ground swells on the surface. NUC divers devised a unique system in which the beam would be positively buoyant during bottom operations. To accomplish this, two 1,000 pound clumps attached to 10-foot chain falls hoists were attached to the bottom of the beam. Four spherical styro-foam-filled buoys, with a total positive buoyancy of 6,780 pounds were attached to the upper portion of the beam. The complete assembly was then lowered to the bottom.

Once the clumps were set on the ocean floor, the beam became independently buoyant due to the lift of the buoys. The divers then positioned the beam on the mounting box and over the stake-pile. Only one-sixteenth of an inch clearance was provided between the beam and the inter-box. This close tolerance was necessary to insure a snug fit and reduce the play in the assembly. When the beam was correctly aligned, the divers pulled the beam into position by using the chain hoists and secured it with 16 bolts. Included in the operation were the surveying of the site and preliminary inspection dives which madeup part of the total of 250 dives.

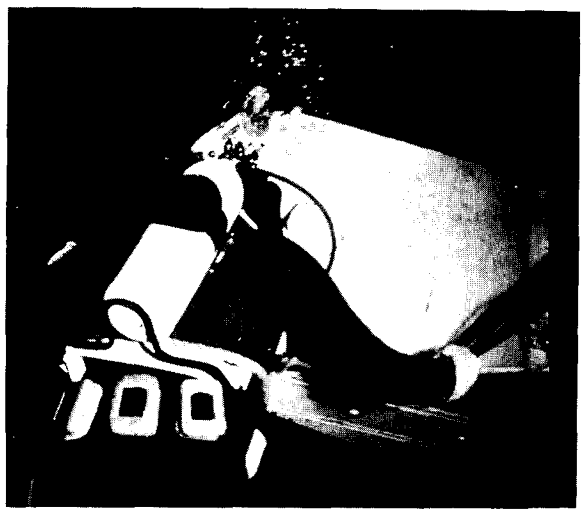
Due to the constant challenging schedule and the severe physical exertion imposed on the entire diving team, eight cases of the bends were experienced. Only one was considered serious. The NUC Long Beach diving team demonstrated their unique skills in the performance of a difficult task. For their endeavors, each of the divers named below received a letter of commendation for outstanding performance from CAPT C. Bishop, Commander, Naval Undersea Research and Development, Center, San Diego, California. They are LCDR H. W. Hensley, CWO J. J. Duran, BMCM E. H. Worthy (DV), SFC A. L. Frontz (DV), SFC J. Watts (DV), TMT1 M. F. Hillis (DV), MM1 E. L. Evans (DV), MM1 T. J. Sease, SF1 D. L. Perry (DV), BM1 D. Brown (DV), and SF1 D. J. Smith (DV).

Four divers involved in the project who have recently been transferred are MR1 B. C. Helstab (DV), SF1 C. W. Durbin (DV), LT C. L. Suler, and MMC A. R. Nelson (DV).

Divers that have recently transferred to this command are WO1 R. A. Owens, GMGC F. A. Stuckey (DV), SFC W. F. Curtis (DV), and HM2 M. W. Leonard (DV).



At the extreme bottom, the Index Ring is visible, above which is the box beam with its 6-bolt flange. This is directly below the beam assembly. Guide wires are visible between the box beam and beam assembly.



NUC diver attempts to align a 6,700 pound beam assembly to fit over the box beam at 200-foot deep working level.

## DIRECTIVES LISTING

The following is a listing of directives pertaining to diving which are available to any interested divers:

| DATE | SUBJECT | DESIGNATION |
|---|---|---|
| 4 Dec 63 | Exp. Diving Unit Tasks and Functions | SHIPS 5450.70A |
| 11 Jul 67 | Recomp. Chambers, Clinical Use for Non Diving Illnesses | MED 6320.38 |
| 22 Aug 67 | SCUBA Hygenic Maintenance of | MED 6420.1 |
| 27 Aug 67 | Oxygen Breathing Treatment for Decompression Sickness and Air Embolism | MED 6420.2 |
| 20 Aug 70 | Swimmer Delivery Vehicle | SHIPS 9280.17A |
| 10 Feb 70 | Navy Diving Program | OPNAV 9940.1E |
| 16 Apr 70 | Diving Equipment Use | OPNAV 9940.1C |
| 2 Feb 70 | Open Circuit Demand Type SCUBA Requirements and Procurement, Use of | SHIPS 9940.16 |
| 17 Jun 70 | Alum. SCUBA Cylinders Inspection of | SHIPS 10300.11 |
| 17 Nov 69 | Recompression/ Decomp. Chambers, Use of | OPNAV 10560.1 |
| 2 Apr 69 | Civilian Diving in Navy | SECNAV 12000.20 |

## HM'S ELIGIBLE FOR PRO PAY

HM's Medical Deep Sea Diving Technicians who were assigned NEC 8493/5342 or NEC 8493/5311 as appropriate effective 1 August 1970, are eligible for proficiency pay in accordance with BUPERS Instruction 1430-121. This change should have been reflected in the Command's 1080-14 and then entered in the individual's service records and proficiency pay started. If you are an HM NEC 8493/5342 or 8493/5311 and not drawing pro pay, see your personnel officer as soon as possible.

## NEW MANUAL READY

A new manual now available from the Office of the Director of Diving, Salvage and Ocean Engineering is one concerning the subject of Underwater Cutting and Welding (NAVSHIPMAN 0929-000-8010).

This book, which supersedes the old manual (250-692-9) is a must for libraries where these activities take place. It contains helpful information on the current status of cutting and welding in diving and gives up-to-date guidance for these operations. Divers will find a storehouse of both general and detailed information for the use of underwater cutting and welding equipment.

While this manual is not a guide for diving, it will prove useful to divers with a job to do involving cutting and welding underwater.

## ERROR IN DIVING GAS MANUAL

An error was discovered in an equation on page 17 of the Diving Gas Manual, 1970 edition. In an equation for standard liters per minute of oxygen available in the breathing gas at the surface or any other depth, the equation was given as

$$U=L \left[ (0_1 - 0_2) \left( \frac{1 - 0_1}{1 - 0_3} \right) \right]$$

The equation should read:

$$U=L \left[ 0_1 - 0_2 \left( \frac{1 - 0_1}{1 - 0_3} \right) \right]$$

The equation at the top of page 17 for liter flow is correct and all example calculations are correct.

FACEPLATE is indebted to LT Jarold M. Bartz of Submarine Development Group One for his discovery of this error.

## FRENCH GO TO 1,700 FEET

The French have recently announced the completion of a "dry" dive to 1,706 feet.

In mid-November, 1970, two divers, working for COMEX a French diving firm, entered the chamber of the Experimental Hyperbaric Center at Marseilles for a 12-day stay.

Commandant Claude Riffaud, Director for Development of the Continental Plateau for CNEXO, the French National Oceanographic Organization, toured the United States with news of the French accomplishment. He, and two others, Christian Aggarate of COMEX, and Jean-Claude Le Pechon, a researcher for CEMA (Center for Advanced Marine Studies) held seminars in Washington, D. C., New Orleans, La., San Diego, Cal., and Philadelphia, Pa., for the interested military, commercial and research community.

## HOSE DEFECT POSSIBLE

CNO's message 2818542 Jan 71 (NAVOP) promulgated information concerning deep sea divers' hose that was not manufactured in accordance with the current military specifications. All diving activities should examine/test their deep sea hose for possible defects as indicated in CNO's message. Hoses, clamps and fittings presently authorized for use are described in paragraph 2.1.2 of the U.S. Navy Diving Manual, 1970 edition.

Activities having hose not meeting the current military specifications should see their activity supply officer about filing a Defective Material Received report. In addition, notify the Supervisor of Diving of conditions found and request further instructions.

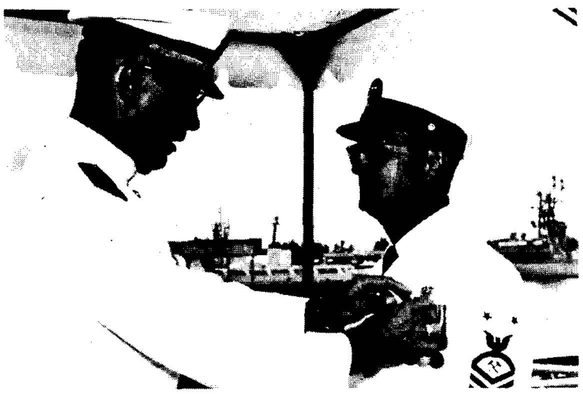
## ARROW REPORT AVAILABLE

At the request of the Canadian government, the U.S. Navy undertook a salvage project of the tanker SS ARROW and the recovery of her oil in 55 feet of cold water off the coast of Nova Scotia. Since the recovery and clean-up of the oil spill was a complete success, and because this success was accomplished by revolutionary applications of various conventional methods, the Director of Diving and Salvage has released a manual covering the entire operation. The ARROW report (NAVSHIPS 0994-008-1010) should serve as a basic source for similar operations in the fleets.

Since the report was published, the information it contains has been used extensively in the removal of oil and the salvaging of a downed barge off the coast of Puerto Rico.

Any library desiring a copy of the ARROW report should request such, using the above code numbers, through the regular supply channels.

# awards



## NAVY HONORS CHIEF EISSING

Congratulations are in order for Master Chief Petty Officer Frank E. Eissing, Jr. who was recently honored with the Navy Commendation Medal.

Chief Eissing's citation reads, in part, that he directly supervised "a prolonged deep sea diving effort conducted in water 300 feet deep with a 4 foot deep mud bottom in the attempt to locate and recover an aircraft lost with 26 persons embarked."

In the photo at left, Chief Eissing is presented with the medal by Commanding Officer, LT A. Trinka, on board the USS GREENLET (ASR-10) shortly before the ship was turned over to the Turkish navy.

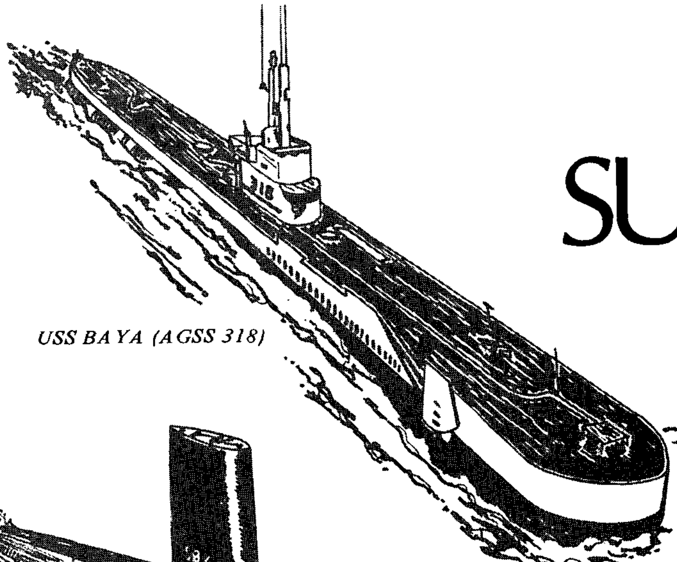
## LCDR BLADH RECEIVES MEDAL

LCDR James C. Bladh was the recent recipient of the Navy Commendation Medal for "meritorious achievement while serving as Officer in Charge, Admiralty Experimental Diving Team, HMS VERNON, Portsmouth, England as an Exchange Officer."

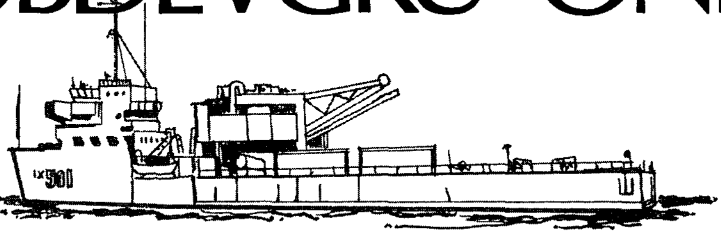
The citation accompanying the decoration, and signed by ADM W. F. A. Wendt, Commander in Chief of the U. S. Naval Forces, Europe, acknowledged LCDR Bladh's participation in a compression chamber dive to 800 feet.

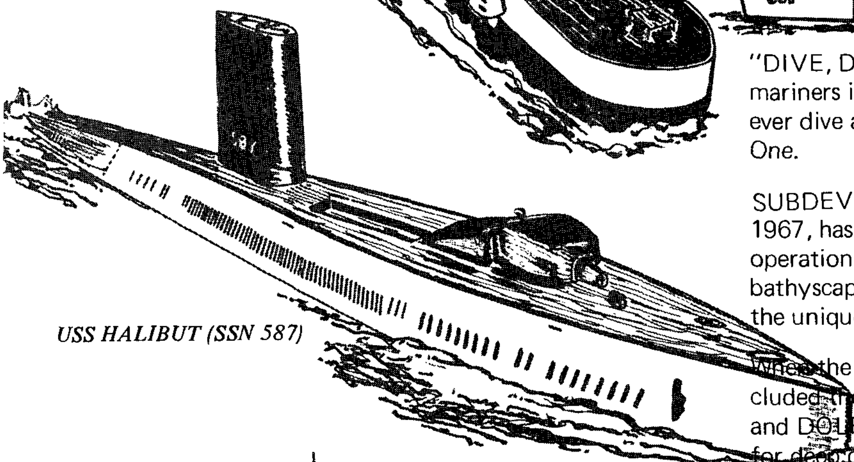
LCDR Bladh has since returned to the United States and is currently serving with the Naval Ship Systems Command, Washington, D. C.; continuing his work in diving.

# SUBDEVGRU-ONE



USS BAYA (AGSS 318)





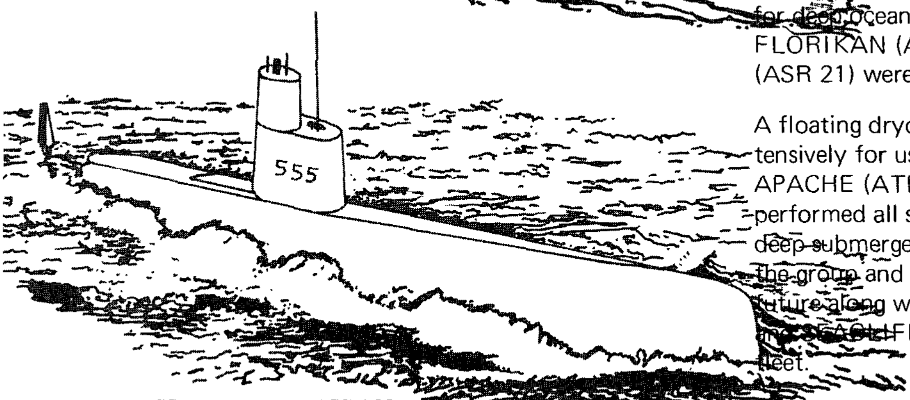
USS HALIBUT (SSN 587)

"DIVE, DIVE, DIVE," has been heard, time and again by submariners in almost every Navy of the world. Yet few men will ever dive as deep as the men of Submarine Development Group One.

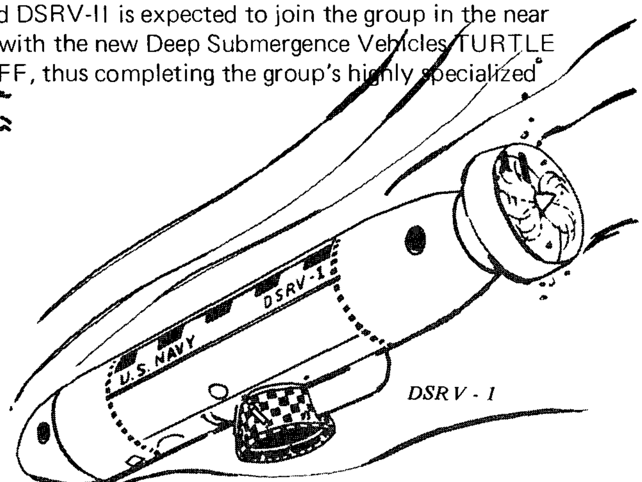
SUBDEVGRU-One , commissioned in San Diego, California, in 1967, has become the Navy's center of excellence for deep ocean operations. Originally formed around its primary vessel, the bathyscaph, TRIESTE, the group was soon expanded to become the unique unit it is today.

When the Operations Division of the group was formed, it included the submarines BAYA (AGSS 318), HALIBUT (SSN 587), and DOLPHIN (AGSS 555), all of which are specialized vessels for deep ocean research. Three submarine rescue vessels, FLORIKAN (ASR 9), CHANTICLEER (ASR 7), and PIGEON (ASR 21) were also assigned to the group.

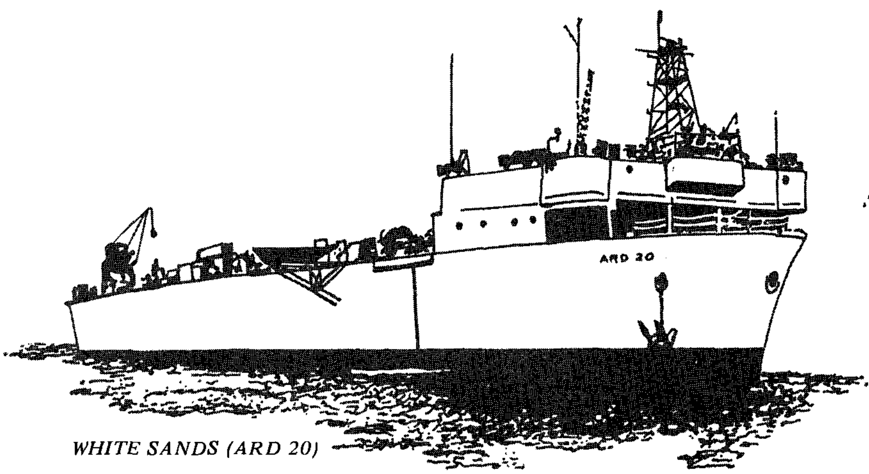
A floating drydock, WHITE SANDS (ARD 20) was modified extensively for use with the TRIESTE, and along with the fleet tug, APACHE (ATF 67), formed an Integral Operating Unit which performed all support functions for the bathyscaph. A prototype deep submergence rescue vehicle (DSRV-I) is operational with the group and DSRV-II is expected to join the group in the near future along with the new Deep Submergence Vehicles TURTLE and SEACLIFF, thus completing the group's highly specialized fleet.



USS DOLPHIN (AGSS 555)

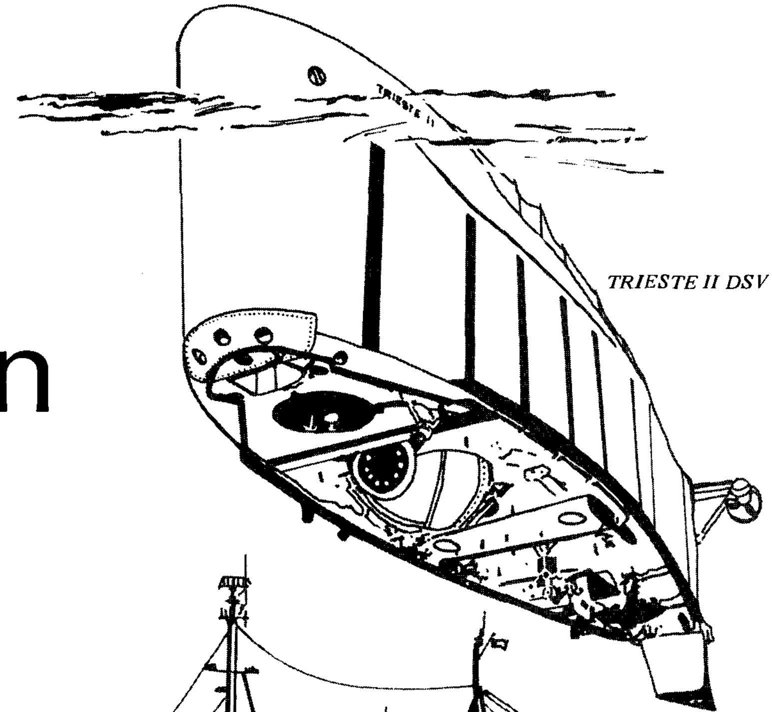


DSRV - 1



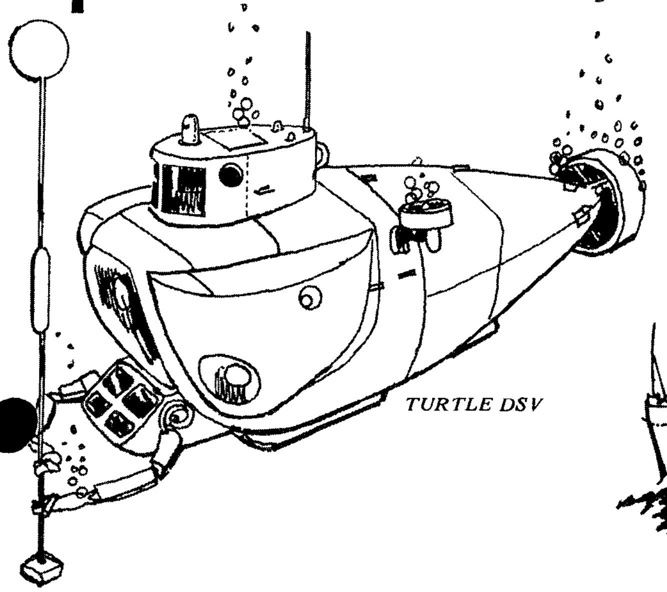
WHITE SANDS (ARD 20)

# navy's center for deep ocean operations

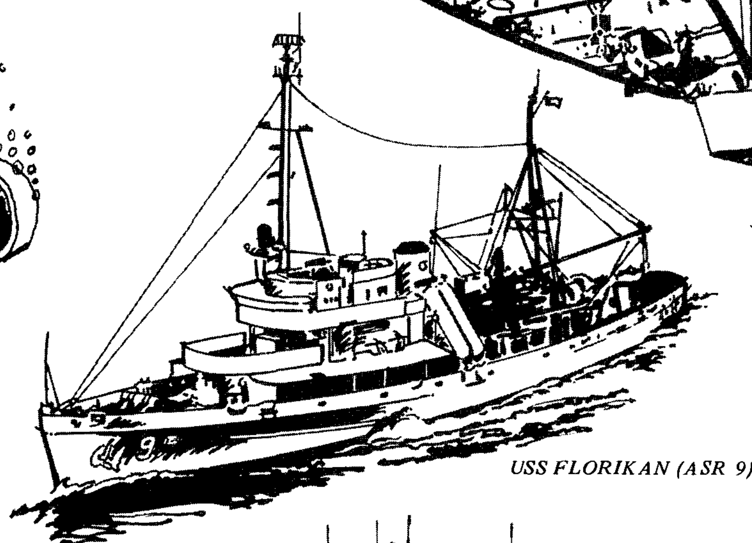




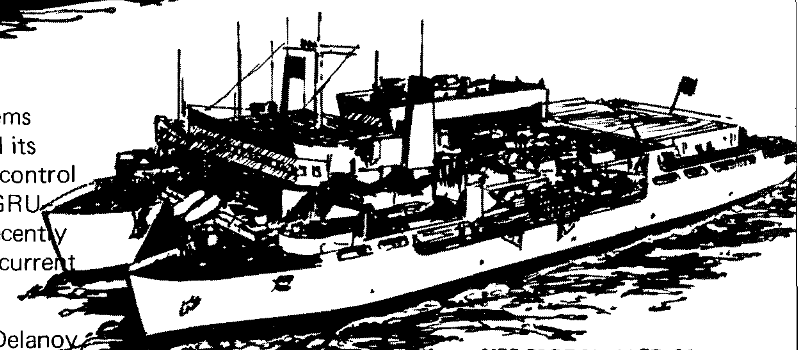
*TRIESTE II DSV*



*TURTLE DSV*



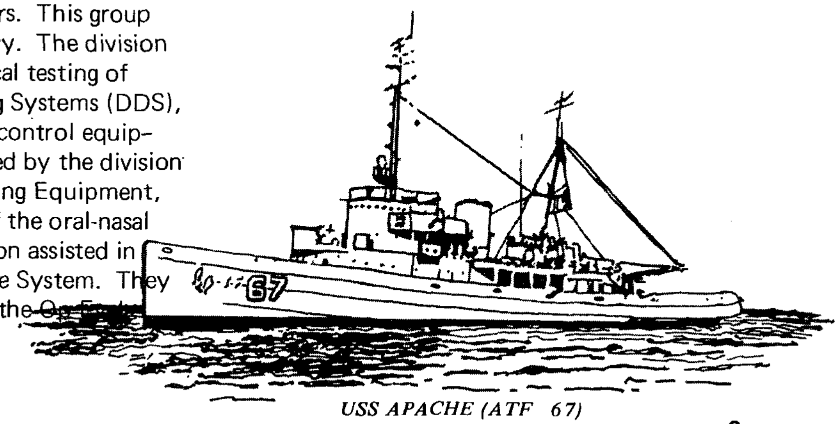
*USS FLORIKAN (ASR 9)*



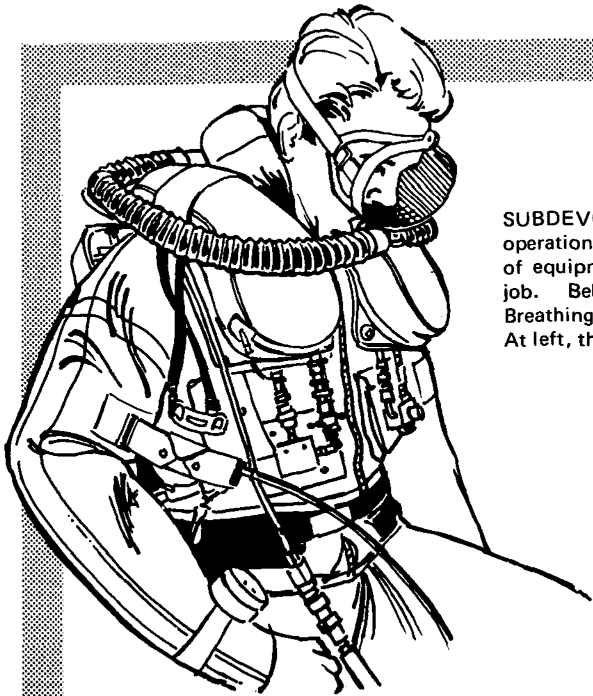
*USS PIGEON (ASR 21)*

With the disestablishment of the Deep Submergence Systems Project Technical Office as an independent command, and its absorption as a unit under operational and administrative control of CAPT R. H. Gautier, former Commander of SUBDEVGRU One, the group's Diving Systems Division was formed. Recently relieving CAPT Gautier was CAPT Sam Packer who is the current commander.

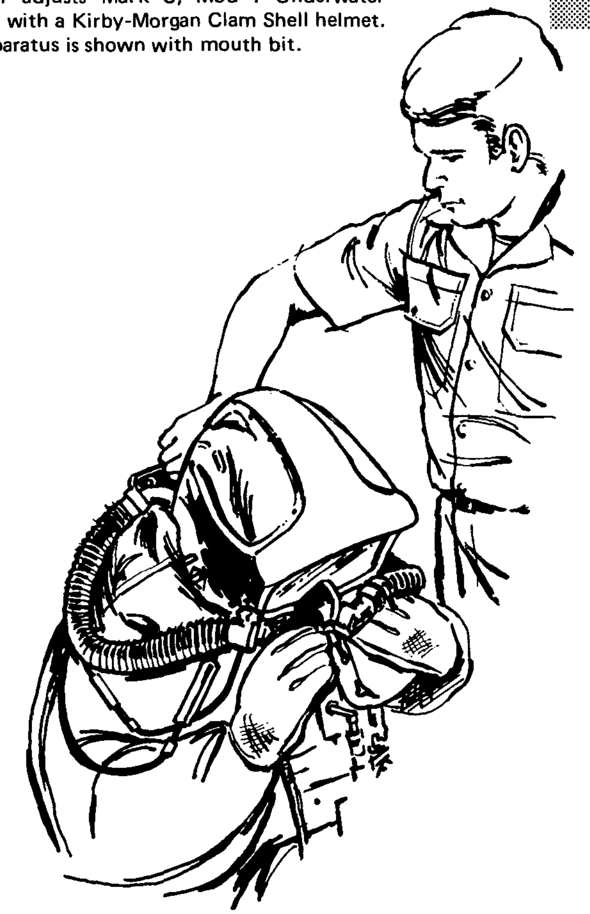
The Diving Systems Division, commanded by CDR B. L. Delanoy, consists of 13 Diving Officers, 7 Diving Medical Officers, and 59 Saturation Divers, four of whom are Master Divers. This group forms the largest fleet diving unit in the U.S. Navy. The division is actively engaged in the operational and technical testing of advanced Diver Equipment Systems, Deep Diving Systems (DDS), and selected diving hardware and environmental control equipment. Among the equipment now being evaluated by the division is the MK 2 Deep Dive System, MK 8 Mod 1 Diving Equipment, MK 11 Diving Equipment and various versions of the oral-nasal mask/helmet designs. The Diving Systems Division assisted in the operational evaluation of the MK 1 Deep Dive System. They provided 50 percent of the manpower needed in the



*USS APACHE (ATF 67)*



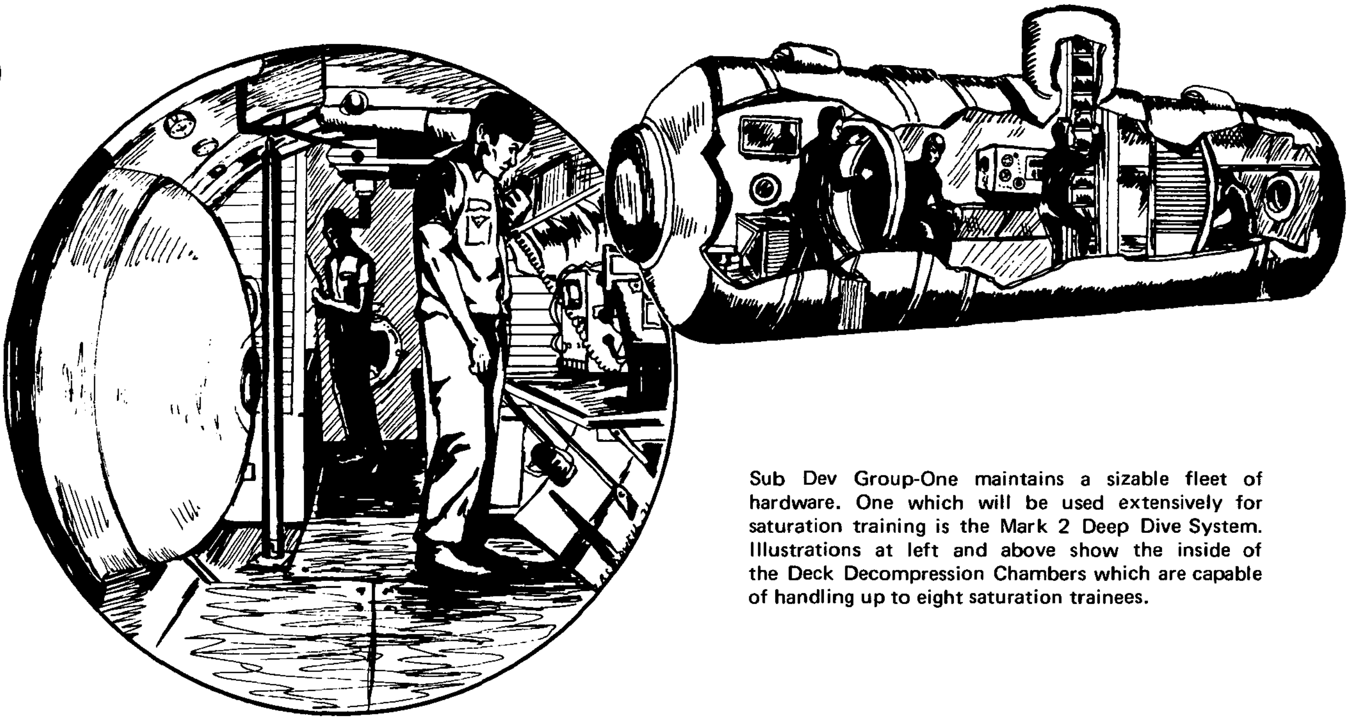
SUBDEVGRU-One divers are involved in a variety of diving operations. Illustrations at left and below depict two types of equipment which could be employed to do a particular job. Below, tender adjusts Mark 8, Mod 1 Underwater Breathing Apparatus with a Kirby-Morgan Clam Shell helmet. At left, the same apparatus is shown with mouth bit.



All divers reporting to SUBDEVGRU–One for duty with the Diving Systems Division undergo thorough physical and psychological screening prior to their enrollment in Diving Equipment training. The training consists of a four-week course of instruction in advanced mixed-gas theoretical aspects and advanced diving medicine and phychology. In addition, the divers receive instruction in the maintenance, operation and handling of hot water suits, umbilicals, diver communications and diver sonar search techniques. The final phase of diver training takes place at sea for repetitive diving and qualification through wet training in the MK 8 MOD 1 Underwater Breathing Apparatus. The men of the SUB DEVGRU are in peak physical condition at all times. According to CDR Delanoy, "We maintain a rigid physical fitness program with daily calisthenics and frequent 1,000 yard swims."

Upon completion of this advanced instruction, the diver is then assigned to one of the five Deep Diving Teams now activated. Of the five teams, one is permanently positioned in San Diego as a Training Team and Emergency Reaction Group that is on standby for two-ocean deployment to augment Fleet units as necessary. Divers serving within the other four teams are exposed to extensive travel and challenging diving assignments all over the world.

Fleet divers who are looking for a change of pace from conventional diving, and the opportunity to participate in the challenging new era of deep sea diving, should indicate SUBDEVGRU–One as a duty preference in preparation for their next assignment. Diving duty with the group is now classified as "Neutral Time" for rotation purposes with a normal rotation of two years. It is, however, anticipated that the tour designation will be altered in the near future to "Arduous Sea Duty," thereby allowing the diver to remain with the Group for an extended tour, if he so desired.



Sub Dev Group-One maintains a sizable fleet of hardware. One which will be used extensively for saturation training is the Mark 2 Deep Dive System. Illustrations at left and above show the inside of the Deck Decompression Chambers which are capable of handling up to eight saturation trainees.

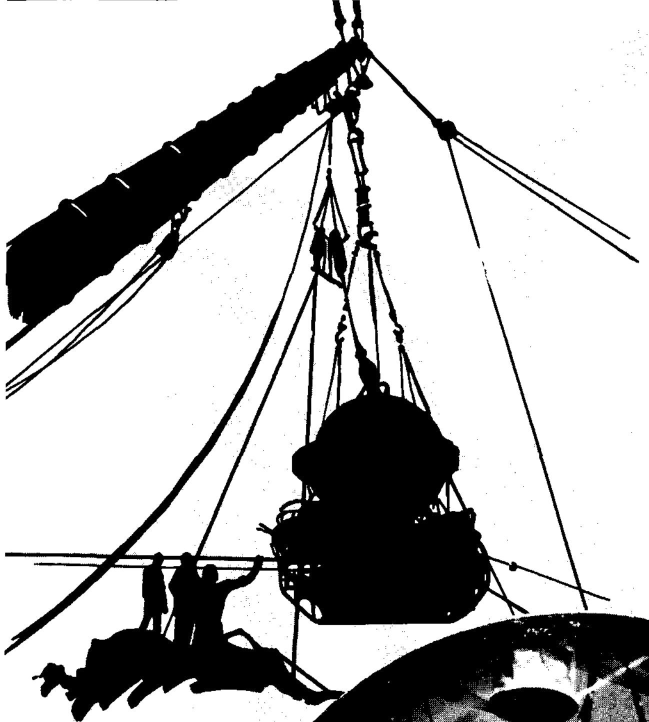
## DELANOY ONLY DIVER DEEP SELECTED FOR CDR

In his 25th year of service to his country, LCDR Billie L. Delanoy will take his place as the only Navy diver to be deep selected for the rank of commander.

The promotion, due in June (some two years early), comes to one of Navy diving's most colorful personalities. Currently serving as the head of the Diving Systems Division with the Submarine Development Group-One in San Diego, a position he has held for some ten months, Delanoy was formerly the Commanding Officer of USS GREENLET (ASR-10).

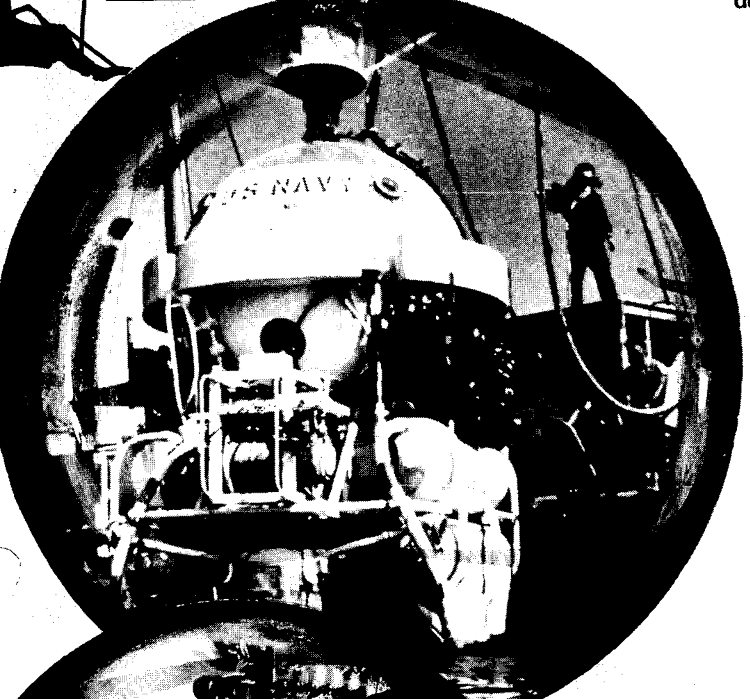
Already a holder of a variety of decorations, including two awards of the Bronze Star with "V" for valor, the Commander-Select's most recent award was the Meritorious Service Medal for "his exceptional qualities of leadership" while serving in his post aboard the GREENLET.

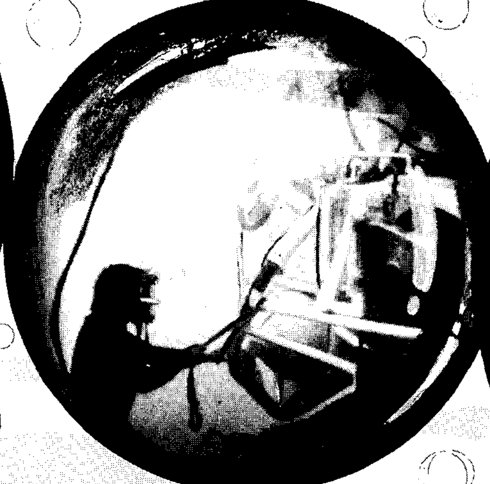
Commander-Select, B. L. Delanoy



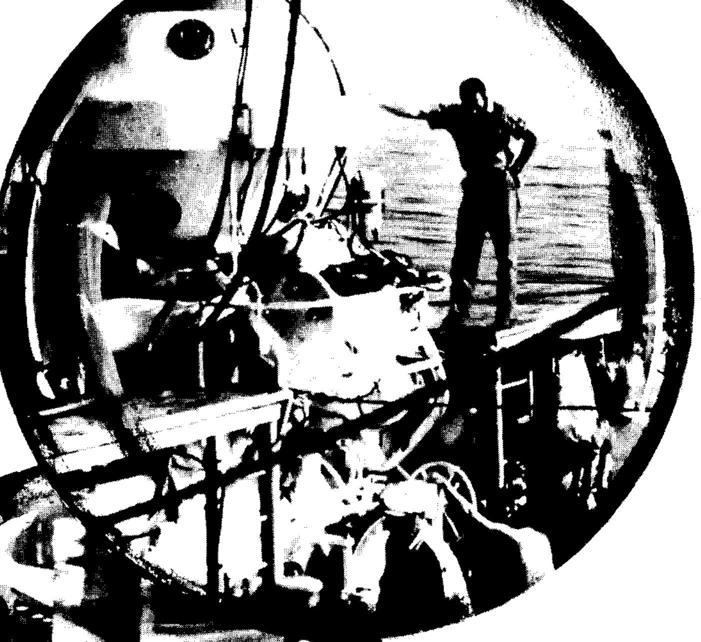
# MARK I DDS

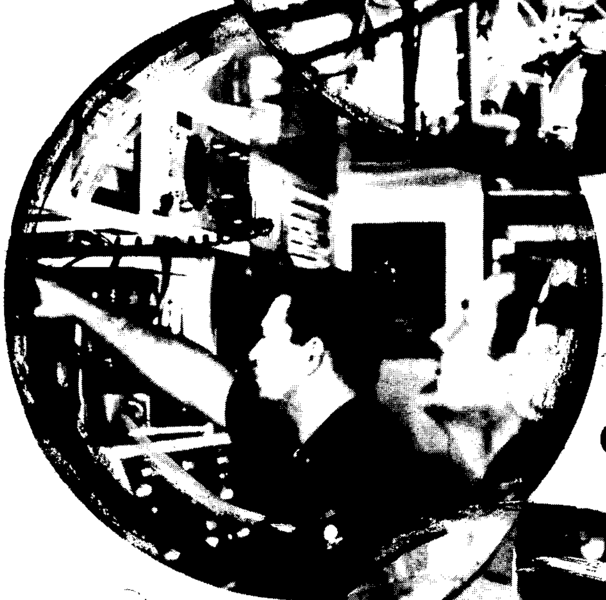
The U. S. Navy more than tripled its depth capabilit
depth of 850 feet. This outstanding achievement for th
as we devote our center spread to a picture story of tha
From left: Mark I PTC prepares for another day
Into the water...Personnel Transfer Capsule con
GEAR, attached to the ship's winch system. In its norma
winch, on the Strength-Power-Communication Ca
desired depth, two divers leave the capsule through a h
inside to monitor their activities on the bottom.
During a shallow test dive, a Navy diver equ
and Mark 11 Mod 0 Aquanaut Equipment System
Capsule and goes to the bottom. He is attache
him with breathing gases and hot water that ci
suit he wears beneath his wet suit.
Diver secures gear on PTC after subme
All part of the job. . .bubbles and more bu
from the PTC.
Picture-taking time on a shallow dive.
PTC provides external lighting to aid in dive
On the bottom, divers uses PT
Topside crew keeps careful watch over in
Closed-circuit t.v. cameras watch divers at all tim
Prior to a dive, the Personnel Trans
mated to the Entry Lock. Flanking the lock are two
live between underseas operations. They enter the ca
connecting the chambers, lock, and capsule.





# Dives 850′





y when the Mark I Deep Dive System reached an ocean
e Mark I and her crew is recognized by FACEPLATE
t accomplishment. Ed.
of tests as it is silhouetted against the Pacific sky.
aining three divers is swung over the side of the USNS
mode, the capsule can be lowered by its own
ble protruding from the top of the capsule. At the
tch beneath the unit. One man stays

ipped with Kirby-Morgan KMB Band Mask
(AES) leaves the Personnel Transfer
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ubbles—diver makes his share on a routine dive

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psule through a series of hatches

Presiding at a news conference for the San Francisco area press, CAPT E.B. Mitchell, Director of Diving, Salvage and Ocean Engineering, explains how the Mark 1 DDS operates. Also on hand for questions were, (from left), CWO Jack Barnes, Chief Bob Merriman, Chief Joe Bates, the on-scene commander, LCDR James McDermott, CAPT Mitchell, and LCDR Lawrence Bussey, Officer in Charge.

**850' Dive cont'd.**

Upon completion of the Mark I Deep Dive System's first diving operation, the men involved were honored by the U.S. Navy for their "outstanding performance and courage" during the dive.

Presiding at the presentation ceremony in San Diego was RADM M. H. Rindskopf, Deep Submergence Systems Program Coordinator, who further congratulated the men and officers on their success.

Honored with the Legion of Merit for his leadership during the operations was the commander of the at-sea operational evaluation, LCDR James J. McDermott.

The recipients of the Meritorious Service Medal were crewmembers who actually spent time in the water at 850 feet. They performed such tasks as drilling holes in steel plate, sawing, working with pipe-wrenches, and attaching lines to gear. They include Chief Warrant Officer Earl D. Barnes, Senior Chief Petty Officer Robert K. Merriman, Chief Joseph E. Langdon, Chief George W. Powell, Chief Tyrone K. Goacher, Chief Larry F. Pulliam, Petty Officer Samuel E. Huss, and Petty Officer Raymond J. Auen. Petty Officer Robert A. Vendetto, also a recipient of the Meritorious Service Medal was included in the ceremony for a dive made earlier at the Experimental Diving Unit.

Further decorations were awarded to the support personnel. Officer in Charge of the Mark I, LCDR Lawrence T. Bussey, received the Navy Commendation Medal, as did LTJG Douglas D. Smith, Chief Warrant Officer Russell D. McIntire, Master Chief James L. Tolley, Chief Ronald G. Miller, Chief Joe J. Bates, Petty Officer Edward Krupenski, Petty Officer Irwin C. Rudin, Petty Officer Frank Atkinson, Petty Officer Allen M. Storie, and Petty Officer Richey J. Steckel.

The personnel from the Mark I who combined efforts with men from the Submarine Development Group-One received the Meritorious Unit Commendation.

After a busy schedule of award presentations, news conferences, and congratulations on their successful mission, the Mark I crew takes time out for a photo. From left are, (front row), Chief Joe Bates, CWO Jack Barnes, Chief Larry Pulliam, and Chief Tyrone Goacher; second row, Chief Joe Langdon, Chief George Powell, Chief Bob Merriman, and Petty Officer Sam Huss. Bates, Pulliam, Goacher, Langdon and Merriman are permanently assigned to the Mark I. Barnes, Powell, and Huss are stationed with the Submarine Development Group-One in San Diego.

**LCDR Edward Flynn**, a medical officer currently stationed at the Experimental Diving Unit, Washington, D.C., is a man deeply involved in diving, its problems and progress. He is currently involved in research concerning cold water diving.

Dr. Flynn joined the Navy in 1967 following graduation from the University of Pennsylvania Medical School. Prior to reporting to the Unit, he served a year of internship at the U.S. Naval Hospital, Bethesda, Md., and spent six months in the School of Submarine Medicine at the Submarine Base, Groton, Conn. FACEPLATE recently talked with LCDR Flynn about his experiences and ideas about diving.

It's all routine for Dr. Flynn. In above photos (clockwise), his duties at the Experimental Diving Unit, Washington, D.C., involve animal experimentation (Tom James, EDU Equipment Specialist is at right); discussing the integrated electronics helium voice unscrambler with colleague, Dr. Bill Spaur; listening to heartbeat of Chief Jimmie Jorren; inserting a polyethylene canula in diver Troy Brown's brachial artery for measurement of arterial blood gases prior to a dive; and a routine ear examination for EN1 Allan Lyons.

ED FLYNN M.D., TALKS

# about diving and medicine

**FACEPLATE:** *How did you first develop an interest in diving medicine?*

**Dr. Flynn:** I first became interested in diving medicine in college. Hannes Keller had just completed a series of very deep dives and the question of nitrogen narcosis being caused by an increase in nitrogen partial pressure or by carbon dioxide retention was being debated. Keller advocated the carbon dioxide theory while American diving physiologists favored the nitrogen theory. We decided to try to resolve the problem by subjecting mice to two mixtures of nitrogen and oxygen at progressively increasing pressures. We reasoned that, if nitrogen were the cause of the depth narcosis, the mice would lapse into unconsciousness at a lower pressure with the gas mixture of higher nitrogen content. If carbon dioxide retention secondary to an increased partial pressure of oxygen at depth were the cause, the mice would succumb at a lower pressure with the gas mixture of higher oxygen content. The experiment eventually proved to be a failure, since the mice were unaffected by either mixture at the maximum depth our chamber achieved. It did, however, kindle my interest in diving medicine to the point that I decided to enter diving as a career.

During the four years of medical school at the University of Pennsylvania I continued to work with mice under pressure. These studies were directed to the problems of decompression with multiple inert gas mixtures. The results indicated a considerable decompression advantage over single inert gas mixtures.

**FACEPLATE:** *What would you consider diving's major problems to be overcome in the next few years?*

**Dr. Flynn:** From a medical standpoint, I think the two problems we know the least about are High Pressure Nervous Syndrone and the compression joint pains. The syndrone is characterized by nausea, dizziness, and tremulousness during compression. Its cause is unknown. Generally, it first appears between 400 and 600 feet and becomes progressively worse with increased depth or increased compression rate. Perhaps the most worrisome aspect is the abnormal electroencephalogram which accompanies the symptoms.

Compression joint pains generally begin at 250 to 300 feet and become progressively worse with increasing depth. Usually the shoulders, elbows, wrists, and thumbs are affected. In one case, the breastbone was involved, making it difficult for the diver to breathe. Again the cause is unknown.

I think the problem of respiratory heat loss under pressure is also an extremely important one. As we approach depths of 1000 feet and beyond, the respiratory heat loss during exercise may actually exceed the total heat production of the body. In this situation, body temperature must fall. Inhalation of cold gas under pressure also causes airway constriction and increased mucus production, both of which increase the resistance to breathing. A heat exchanger to warm the inhaled gas will therefore be necessary in diving to these depths. An engineering model was used on a recent 1100 foot dive at Taylor Diving and Salvage Co., Inc. in New Orleans, La. The heater was successful in maintaining satisfactory breathing gas temperature, but additional work will be required to produce a practical model for diving.

**FACEPLATE:** *How deep do you think divers will eventually go?*

**Dr. Flynn:** I don't believe we will go much deeper than 2000 feet. Beyond that depth, small submersibles in which the occupants remain at surface pressure will be used.

**FACEPLATE:** *Can you give some specific reasons for your prediction?*

**Dr. Flynn:** If the problem of the High Pressure Nervous Syndrone can be overcome, I think the limiting factor will be the increased work of breathing at that depth. Breathing a 99% helium/1% oxygen mixture at 2000 feet is roughly equivalent to breathing air at a depth of 270 feet. The gas is thick and it requires more effort to move it in and out of the lungs. Significant carbon dioxide retention indicating inadequate ventilation of the lungs has already been observed in exercising divers at 1000 feet.

Helium narcosis may also become a problem. At 1000 feet no significant narcotic effects of helium are apparent. Theoretical projections to a depth of 2000 feet, however, indicate that helium will cause a degree of narcosis equivalent to breathing air at a depth of 230 feet.

A third problem concerns the diffusion of oxygen from the lungs into the blood. As gas density increases, oxygen molecules cannot diffuse as rapidly in the gas spaces of the lungs because of the obstruction created by adjacent molecules. The result is a lower concentration of oxygen in arterial blood. This appears not to be a problem at 1000 feet, but could become significant by 2000 feet. The French recently completed a 1700 foot dive. Unfortunately, the scientific results of this dive have not yet been published. When they are, we may find much of it will be applicable to the work we have been doing here.

**FACEPLATE:** *Do you think the use of other gas mixtures might allow men to dive deeper than 2000 feet?*

**Dr. Flynn:** Substitution of hydrogen for helium would reduce the work of breathing at these great depths. It should also offer less impediment to the diffusion of oxygen. However, there is some evidence that hydrogen is more narcotic than helium. In addition, hydrogen/oxygen mixtures can become explosive if the oxygen content is not carefully controlled.

**FACEPLATE:** *Are there any long term medical problems associated with diving?*

**Dr. Flynn:** In a recent study, we found that 85% of our divers suffered from some form of hearing loss. This may be related to the high noise levels in pressure chambers and diving helmets, or, in some cases, to decompression sickness.

A second problem is aseptic bone necrosis. In this disease a small area of bone dies, presumably due to a bubble or blood clot obstructing the blood supply to that region during decompression. If the area is close to the joint line, the joint may collapse under stress and lead to crippling arthritis. The incidence of this disease appears to be extremely low in ordinary diving, but may be more significant in saturation diving. Part of the problem in understanding aseptic bone necrosis is the fact that changes on long bone X-Rays may not appear for up to five years following a dive. We now routinely X-Ray all subjects prior to saturation dives and obtain yearly follow up X-Rays thereafter.

**FACEPLATE:** *What is the practical application of the medical studies conducted at the Experimental Diving Unit?*

**Dr. Flynn:** We recently completed two open sea saturation dives to a depth of 850 feet in California using the Mark I Deep Dive System. These are among the deepest, if not the deepest, successful open sea dives accomplished to date. The gas mixtures, compression profile, cold gas breathing limits, and decompression procedures used on these dives were largely the result of work done here at EDU.

**FACEPLATE:** *Why did you choose a military career to pursue your interest in diving?*

**Dr. Flynn:** I think the primary reason for joining the Navy rather than doing research in a university setting is the opportunity to participate in open sea diving operations. By doing so, I developed a greater appreciation for the practical problems of 'at sea diving', and can guide my experimental work accordingly.

# SUBDEVGRU-One Hosts Salvage Officers Conference

News of the new ATS, cold-water diving, Submarine Salvage operations, and various recovery efforts were subjects discussed as part of the recent annual Salvage Officers Conference hosted by the Submarine Development Group-One in San Diego, California.

The day-long affair, in which some 57 officers from duty stations as distant as England, Pearl Harbor and the Canal Zone, featured speakers involved in current operations concerning salvage and deep water diving.

The roster of speakers read like a "Who's Who" in Navy diving and salvage. The agenda was geared to bring fellow diving officers up-to-date on techniques, programs and projects in each of their respective areas. Beginning with remarks by CAPT E.B. Mitchell, Director of Diving, Salvage, and Ocean Engineering, the conference offered the opportunity for an exchange of ideas in a learning atmosphere.

The new ATS as a three mode ship was discussed during the first session by CDR John B. Orem, of the Naval Ships Engineering Center, recently returned from an inspection survey of the new ship in England. CDR Orem described the new ship as having the capability for normal salvage, modification for the Mark I diving system and submarine salvage. He described the ship's handling, maneuverability and towing capabilities as excellent and the shop areas and stowage as superior. CDR Orem mentioned only two drawbacks, the mooring capability and arrangement of deck machinery. He called the flexibility of the ship its outstanding feature.

The success of the Mark I Deep Dive System and the effectiveness of the Mark 10 Underwater Breathing Apparatus were outlined by LCDR W.I. Milwee, assistant Supervisor of Diving. LCDR Milwee explained the design of the oxygen control system of the Mark 10, describing it as the "heart of the apparatus." During the initial test a saturation dive of over 1,000 feet was reached, the deepest wet dive ever made in this country in cold water, according to LCDR Milwee. The operating time of the Mark 10 canister was found to be 11 hours in warm water and 45 minutes to 1 hour in cold water. LCDR Milwee outlined the need to redesign the canister for cold water diving.

The Royal Navy exchange officer to the Director of Diving, LCDR Pat Dowland, spoke on the necessity of providing supplementary heat for cold water diving. He discussed the requirements of missions involving deep ocean salvage and repair including surface body temperature, inspired gas temperature, maintenance of carbon dioxide solvent temperature and PTC temperature. LCDR Dowland explained that the system is devised to solve these problems and improve the effectiveness of each. He stated that within six months the fleet would have effective, up-to-date, shallow water heating hardware and that within two years, the Navy would be capable of saturation dives to 850 feet anywhere in the world, with effective, but primitive, equipment. Advanced heating systems for the next generation of divers are on their way, he concluded.

The Commanding Officer of the School of Diving and Salvage, LCDR Walt O'Shell, discussed the quality and quantity of Navy divers. The school he commands maintains a 17-week course for first and second class divers and he outlined the problems in obtaining qualified personnel and the need for a diver certification program. He also discussed the need to validate the present diving billet structure, in an effort to better determine where divers are actually needed. LCDR O'Shell explained that increased enrollment and stepped-up recruiting would be used to realize the Navy's goal of 640 first class and 1,000 second class divers in the next year.

Salvage operations in the Pacific, particularly in Vietnam, were described by LCDR Allan Ovrum, Pacific fleet salvage officer. He explained that most of their operations were in-country, associated with Vietnam and were of two types, HCU-1 working on harbor clearance throughout the Mekong Delta, and off-shore salvage. At present, there is a backlog of 25 craft waiting for salvage. He also discussed the phase-out of the HCU-1 program and the necessity for stretching their assets when this occurs. LCDR Ovrum outlined the future of Pacific salvage operations and the need for reprogramming with the war's slow-down.

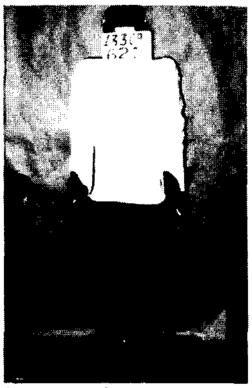
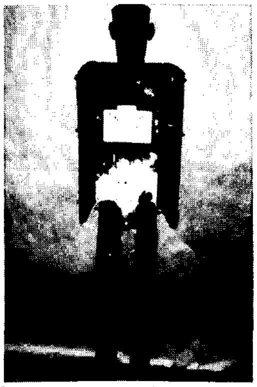
Atlantic fleet operations were presented by LCDR J.J. Coleman, Atlantic fleet salvage officer, who gave an overview of operations on the Atlantic side, including SERVLANT'S capability of submarine salvage. He discussed the possibility of utilizing the ATS and the Mark I combined, and he described the problems connected with oil slicks, from the viewpoint of salvaging the fuel. LCDR Coleman introduced LCDR Karl Keay, also attached to SERVLANT, who described the salvage of the REUBEN JAMES, which the Navy had used for weapons tests as a classic example of salvage operations.

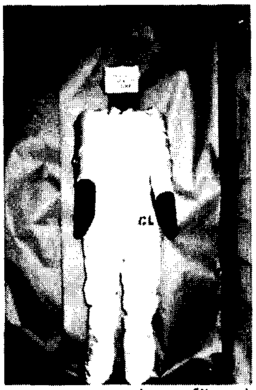
LTJG James W. Walker summarized the functions of the Supervisor of Salvage (operations section) which include major salvage operations and pollution control. SUPSALV also procures salvage and related services outsided the Navy and is responsible for the development and improvement of salvage equipment, methods and procedures as well. LT Walker described recent operations, two of which concerned major oil spills. He also explained the use of the Navy Murphy-boom as the backbone of the plan to combat oil pollution. He said that the experience gained through the clean-up of the oil spills would enable SUPSALV to draw conclusions on which to base future planning.

"Pollution Cure - the Coast Guard's Viewpoint," was the subject of LT Frank Mullins who outlined the Coast Guard's task of providing on-scene Commanders to coordinate Federal, state and local efforts in the clean-up of an oil spill. He described the different types of spills and, depending on their magnitude, explained that the present state of the art is inadequate for oil spill containment or clean-up. He discussed the problems of prevention and containment, and described the various methods of clean-up, the research being done and attempts to enforce pollution legislation.

The recovery of an F6 airplane, lost in the deep ocean for 26 years, was graphically detailed by CAPT Robert Gautier of SUBDEVGRU-one. The plane was recovered from a depth of 3,360 feet, using the Deep Quest Submersible and the lift capability of the WHITE SANDS. The F6 was the second largest item ever recovered from the deep ocean, the largest being the ALVIN, recovered at 5,800 feet. CAPT Gautier described the mechanics of the operation and the well-preserved condition of the plane when it was brought to the surface. He also emphasized the fine quality of the sonar equipment, which led them directly to the aircraft. He commented that it was so precise that the outline of the fuselage could be seen on the sonar.

Recovery of the NASA Solar Eclipse Package was presented by Harold Smith, project engineer and Herb Reed, coordinator. Mr. Smith described the equipment contained in the CURV, the Cable Controlled Underwater Research Vehicle, which was used in the recovery of the solar eclipse package. He explained that the primary problem in locating recovery items was finding the right spot. He outlined their station-keeping technique and the method used to pinpoint the target. The main problems they encountered were the size of the package and the need for quick location, because the information contained in the package might deteriorate with time.



Before and after. . .two photos at left show test results on cotton fabric. Photos at right demonstrate same tests on beta fiberglass.

# Clothing Undergoes Flammability Tests

by L.J. Milner
**Office of the Director of Diving, Salvage and Ocean Engineering**

Though fire is not usually regarded as one of the greatest hazards of diving, a recompression chamber or hyperbaric chamber where oxygen partial pressure is far above that experienced on the surface represents an environment where the fire danger is great. Chambers are particularly dangerous because of the rapid spread of the fire in the high oxygen partial pressure atmosphere. A "fire in the chamber" usually means instant death for the divers.

Since a fatal fire at the Experimental Diving Unit, Washington, D.C., in 1965, an effort has been underway in the diving world to reduce fire hazards in chambers and to extinguish fires once they have started. When three astronauts lost their lives in the Apollo fire, increased attention from Government and industry was focused on the problem to insure the development of fire preventive equipment and materials safe to use in high oxygen environments.

While all hyperbaric operations using elevated oxygen partial pressures have an increased fire danger, two conditions likely to be encountered during routine diving operations are especially dangerous: operation on compressed air at 165 fsw, and a mixture of 25 percent oxygen and 75 percent nitrogen at 60 fsw. This latter condition can occur during oxygen breathing in the chamber, if it is not ventilated in accordance with table 1-32 of the Diving Manual.

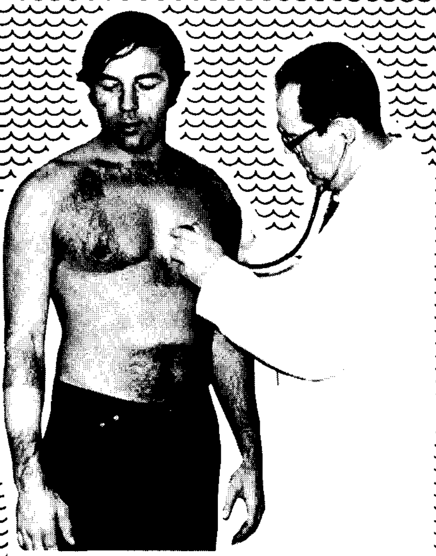
To reduce the danger of fires in all recompression chamber operations, the guidance given in article 1.6.18 of the Diving Manual should be carefully followed. Ventilation rates calculated should be considered a minimum requirement. Particular attention should be paid to ventilating the chamber when oxygen breathing is being used, whether an oxygen elimination system is used or not.

To improve fire safety in chambers, to better protect the divers, and to remove one of the fire sources, the Director of Diving has sponsored a program to test materials used in chambers. The materials are used in blankets, towels, clothing and the like. In testing these materials, comfort and wearability, as well as fire resistance have been considered. Many materials, particularly some of those developed by NASA programs are prohibitively expensive or are not yet available in useful quantities.

Development work increased gathering all available information on fire resistant materials, developing test parameters, and testing all materials under conditions found in recompression chambers. In the testing, an old single-lock chamber with special instrumentation and photographic coverage was used. Ocean Systems Inc. carried out the experiments on a variety of materials. Typical of materials found suitable for future testing were teflon coated beta fiberglass and brown and white teflon. These materials sustained little or no combustion when ignition was attempted under test conditions.

Selected materials were made up into test garments by the Navy Clothing and Textile Research Unit at Natick, Massachusetts. Fire resistance tests were made with the sample garments, and later comfort tests were conducted during January and February at the EDU.

When the results of these tests have been correlated, a material will be selected that best combines comfort, wearability, and fire resistance. This material will be made up into garments, blankets, and towels and issued to the Fleet, greatly improving the safety of the divers.



# MARK 10 MOD 3 CHECKS OUT in COLD WATER TESTS

In late November 1970, the Mark 10 Mod 3 Closed Circuit Mixed Gas Underwater Breathing Apparatus was tested in a deep chamber dive in 26° F. water.

The dive was the second phase of the evaluation of the Mark 10 Mod 3 which began with the 1000-foot saturation dive at the Experimental Diving Unit, as reported in the Fall 1970 FACEPLATE.

The cold water dive was held in the new hyperbaric facility of Taylor Diving and Salvage Company, one of the most modern in the world, in Belle Chasse, Louisiana. The five commercial divers employed by Taylor for the dive were John Violette, Joe Stubbs, Bob Grantz, Clark "Shorty" Long, and William Robinson. Violette, Stubbs, and Grantz are former Navy first class divers; Long is an ex-diving corpsman, and Robinson a former SEAL team member.

The diving supervisors, Lou Crisler, Fred Collins, Fred Coggeshell and George Morrissey, Taylor's General Manager, are all retired Navy Master Divers now working for the company. Other ex-Navy divers directly involved with the dive included CAPT Bob Workman, Ken Wallace, Bob McArdle, and Charlie Duff. Chief Petty Officer Fred Aichele and Petty Officer Thomas Guzicki from the EDU maintained the equipment outside the chamber and remained at Taylor throughout the dive. LCDR W. I. Milwee, Assistant Supervisor of Diving, was the senior coordinator with Taylor.

After a series of workup and training dives at 100, 200, and 300 feet, the divers began the saturation on 18 November with compression to 200 feet. The five divers were compressed in 200-foot increments to 1000 feet. A full day was spent at each depth. Compression occurred at the rate of 40 feet per hour throughout. There were no problems with helium tremors or other physiological phenomena, other than "creaky" joints at the greater depths.

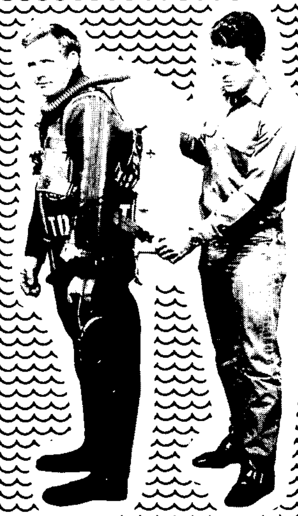
In addition to the Mark 10 Mod 3 equipment, the divers used the Kirby-Morgan M-11 helmet. This is similar to the KMB-8 Band Mask, except that it is designed for use with a rebreather, and the Diving Unlimited open circuit hot water suit. Because the cold gas tests conducted at EDU showed that respiratory heat loss could be dangerous at great depths in cold water, a hot-water-to-gas-heat exchanger was provided to heat the divers' breathing gas. Instrumentation was provided not only for measuring oxygen and carbon dioxide content of the inspired gas, but for body temperature, gas temperature and respiration rate. Attempts to take electrocardiograms were not successful because the electrodes shorted out because of the high salt content of the water which was necessary to achieve the low temperatures.

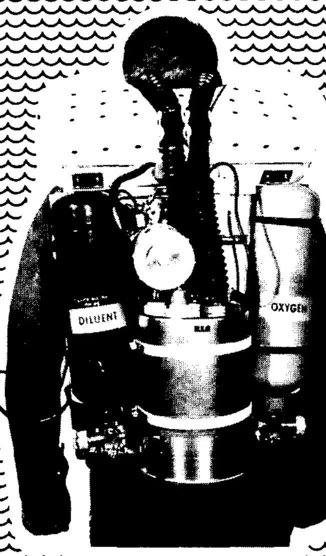
At each depth dives were made with the divers lifting weights and swimming on a trapeze weighted to simulate an 0.8 knot current. The dives, which continued until inspired carbon dioxide reached 0.5 percent surface equivalent, lasted from 38 minutes to four hours. Important information was obtained concerning the oxygen sensors, the oxygen control system and the carbon dioxide removal system performance in the Mark 10 Mod 3.

On 23 November, after the divers had reached 1000 feet and completed one swim at this depth, an excursion was made to 1100 feet. Compression for this phase was very slow with the divers taking 14 minutes to travel the additional 100 feet. The divers remained at 1100 feet for 28 minutes and returned slowly to their saturation depth of 1000 feet, with no complications occurring. Upon completion of the swims at 1000 feet, decompression was begun using standard saturation decompression techniques. Decompression was essentially uneventful except for a slight pain-only knee bend experienced by Robinson at 406 feet with a recurrence at 433 feet after recompression. Treatment was successful and no additional difficulty was experienced; decompression was slowed for the remainder of the dive.

Swimming was continued during decompression with a relatively light schedule of swims against the trapeze for periods of two hours. Swims had to be discontinued before the 600-foot level was reached because of various skin lesions, and throat and ear infections experienced by all the divers.

According to Milwee, "In all aspects, we considered the dive highly successful. The performance of the Mark 10 Mod 3 Underwater Breathing Apparatus showed that this apparatus can be used in the most extreme conditions at deep depths. Changes which must be made before the operational evaluation later this year were pointed out." The information acquired and the techniques used in this deep, cold dive point the way to greater diver capability.






# letters to the editor

Gentlemen:

There are no Deep Dive Systems, Saturation Dives, fancy equipment or new gadgets that would make diving easier for the guy out here in the fleet. However, we do hang in there with the old MK V deep diving gear and just plain SCUBA of yesteryear.

The only jobs that come to an ATF diver these days are the bottom inspections, searching for lost articles in shallow water, and occasionally, a fouled propeller clearing job. However, we are not to blame. There is a shortage of divers in the Navy today; more so, than in previous years. Naturally, then, the squeeze really hits ATF's, since our allowance is so small.

Be that as it may, here are a few divers that are "Ready, Willing, and Able":

Robert W. Kubko, EN2 (DV), USN, Michael E. Simmons, IC3 (DV), USN, John W. Nance, SN (DV), USN, and Hugh S. Kimball, LTJG, USNR. Kimball will soon be transferred to the USS COHOES as XO.

Sincerely,

J. M. Martinez
Commanding Officer
USS TAKELMA ATF-113

Gentlemen:

Through some error, the name of the best (in our opinion) Master was omitted from the subject listing in your Winter, 1970 issue. He is GMGC (DVM) John D. Garlick, a veteran of almost 20 years Naval service and a DVM since 1966. Chief Garlick is presently serving on USS HOIST (ARS-40).

Chief Garlick is not only the top Master on active duty but is also tops in recruiting divers for training. In the past six months, he has "sold" the diving program to seven fine young men, some of whom have just completed school and some who have school quotas in the near future. In these days when retention is so vital, his efforts have resulted in the six year re-enlistment of an outstanding young GMG2 for first class diving school, as well as several extensions of enlistment for other personnel who will attend diving class.

Chief Garlick, through outstanding professional performance and inspirational leadership, has provided the motivation to make the HOIST's diving gang and equipment first class in all respects. In our opinion, his name should have rightfully appeared at the top of the list.

Sincerely,

M. L. Christensen
Commanding Officer
USS HOIST

**Editor's Note: Our apologies to Chief Garlick. We hope that publishing this letter from his CO will help to make up for our error.**

Gentlemen:

I noted with interest the wetsuit pictured on page nine of your Winter '70 issue. This wetsuit, developed by NAVEODFAC, is almost identical to that marketed by M & E Marine Supply Co. of Camden, New Jersey, and called the "Zip-on" suit. This unit purchased a number of these suits to fill our MOB swimmer and boat crew allowance in January of 1970. After a five month Arctic deployment, we have found that these suits fulfill our divers' needs very well (we have 3/16" international orange, lined both sides). We have worn these suits in water at 29° F. for periods up to 40 minutes without exceptional discomfort, but at depths less than 50 feet.

These suits have proven themselves in this unit, since they have been used by our divers, swimmers, boat crews, and helo ice observers. They afford greater durability (lined both sides) and comfort than ordinary suits.

M & E supplied these suits in three colors, orange, blue, and black, and two thicknesses, 3/16" and 1/4". The suit consists of jacket and pants. Hood, boots and gloves must be purchased separately.

Although I am sure the Navy could top us, we probably hold the Coast Guard record for the northernmost dive, having dived at 82°10'N 73° 30'E in the Arctic Ocean on 14 August 1970. SOUTHWIND set a record of northernmost penetration by a U.S. surface vessel under its own power on 15 August 1970 to 83° 01'N in the Arctic Ocean above Russia.

Yours truly,

Michael S. Macie, USCG
Diving Officer
USCGC SOUTHWIND (WAGB-280)

Gentlemen:

It may be of interest to your readers to know the names of the divers pictured on your Summer 1970 cover.

The diver is BM1 (DV), now BMC Juan Ramos of HCU-1. The nearest sailor is BM2 (DV), now BM1 Godfrey of the USS COUCAL (ASR-8). The second sailor is BMI (DV) Smith of the USS COUCAL (ASR-8). All are previous shipmates on the USS GREENLET (ASR-10). The photo was taken in the Gulf of Tonkin, Vietnam, in November of 1969.

Sincerely,

Frank E. Eissing, Jr.
Master Chief Damage Controlman
Master Diver

# the Old Master says...

Did I ever tell you the story about how I lost a diving buddy who was workin' on the sea suctions of a ship? His name was Smitty; we had known each other for years. Smitty was workin' on a routine divin' job with his partner. They were wearin' SCUBA gear and performin' routine cleanin' on the ship's sea chests.

Prior to the dive, Smitty and his partner understood that all the machinery in the engine room was ordered secured. When they had permission to dive, Smitty's partner descended first and headed to the nearest sea suction and cleaned it within a few minutes.

Smitty then proceeded to the next sea chest when he was suddenly and voilently sucked up and jammed against the strainer bars. Before his partner could get to him, Smitty lost his mouth piece and mask in the terrific suction. His partner tried to break him free but also lost his mask in the tremendous pressure.

The partner managed to break free, hit the surface and reported what happened to the first P.O. in the vicinity. The P.O. dashed to the engine room and secured the main circulation pumps. But by this time, the damage had been done. Smitty fell to the bottom when the suction had been cut off and drowned.

Now, there's a lesson to be learned here. I'm tellin' you this story because I don't want Smitty's loss of life to have been in vain.

Thoroughly plan the job – any job for that matter -- and I mean plan from A to Z, nothin' overlooked.

Make up a detailed check-off list in close liaison with a responsible ship's officer, namely, the Chief Engineer. It's your neck – so, deal with the responsible people. The check-off list should look like this —

1. Prior to givin' permission for divers to enter the water:

   a. Insure all pumps affectin' sea suctions and overboard discharges within 25 feet of the work are secured and tagged.

   b. Insure shafts, rudders and underwater radiation equipment, particularly sonars, are all secured and tagged.

   c. Insure the word is passed on the ship's IM that "Divers are in the water workin' on the ship" and that the word is repeated every 10 or 20 minutes.

   d. Insure an appropriate flag sign is hoisted that "Divers are in the water."

   e. Insure a standby diver on the scene.

2. While divers are in the water:

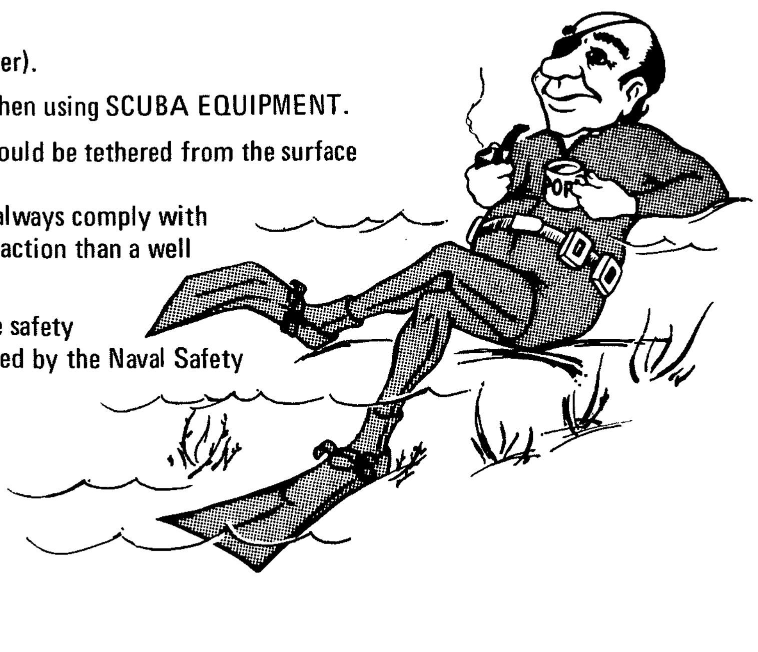
   a. Maintain close surface supervision (ship and diver).

   b. Insure a minimum of two divers in the water when using SCUBA EQUIPMENT.

   c. Divers using LIGHT WEIGHT EQUIPMENT should be tethered from the surface when practicable.

That just about completes the check-off list. You must always comply with safe divin' practices. Nothin' could provide greater satisfaction than a well planned and well executed divin' operation.

While the above listing is a good example, an official dive safety check-off list for divers around ships has been promulgated by the Naval Safety Center and should be used in all such diving operations.

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