FACEPLATE

The Official Magazine for the Divers and Salvors of the United States Navy

Focus on Training

NDSTC
BUD/S
EOD School

Winter 1983
Volume 14, No. 4

FACEPLATE

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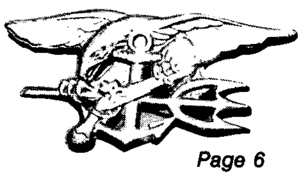

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SOUNDINGS

LCDR Alan M. Nibbs

USS BEAUFORT (ATS-2) Change of Command

LCDR Alan M. Nibbs, Jr., USN, assumed command of the USS BEAUFORT (ATS-2) on 23 September 1983. He relieved CDR F. Bruce Fisher.

Before taking command of the BEAUFORT, LCDR Nibbs was the Officer in Charge of the Naval School Deep Diving Systems on the DVT ELK RIVER (IX-501). During his tour on the ELK RIVER, its MK 2 MOD 0 Deep Dive System achieved certification, the student output of the school was increased by 80 percent and open-ocean saturation dives were reinstituted as part of the curriculum.

From 1977 to 1980, LCDR Nibbs was the Operational Test Director with the Deputy Commander Operational Test and Evaluation Force, Pacific. He completed testing on various underwater systems and became qualified as a saturation diving officer. In 1974, LCDR Nibbs completed the six-month training program at the Naval School of Diving and Salvage and in December became the Engineering Officer on the USS PIGEON (AST-21). During his tour PIGEON was involved with certification of the MK 2 MOD 1 Deep Dive Systems and the operational evaluation of the Navy's Deep Submergence Rescue Vehicles.

LCDR Nibbs also served as First Lieutenant and as ASW Officer on the USS MULLINNIX (DD-994).

LCDR Nibbs has been recognized on several occasions for his service in the Navy. His decorations include the Meritorious Unit Commendation, the Vietnam Service Medal, the Vietnam Campaign Medal, the Combat Action Ribbon and the Battle Efficiency Ribbon.

CDR Fisher departs BEAUFORT for assignment at OPNAV in Washington, D.C. During his tour as Commanding Officer, he oversaw completion of a 13-month overhaul and a six-week deployment to EASTPAC, which included towing the 36,000-ton USS ASHTABULA (AO-51) 2,000 miles from Pearl Harbor to San Francisco. CDR Fisher also led BEAUFORT through an eventual six-month WESTPAC deployment which included the salvage of two vessels from the Republic at Korea's Navy. BEAUFORT was awarded her second Meritorious Unit Commendation for this effort.

LCDR John Paul Speer

USS BRUNSWICK (ATS-3) Change of Command

LCDR John Paul Speer on 11 July 1983 relieved CDR John R. Drucker as Commanding Officer of USS BRUNSWICK (ATS-3), homeported in Pearl Harbor, Hawaii.

Before taking command of BRUNSWICK, LCDR Speer served as Executive Officer aboard USS CONSERVER (ARS-39) and as Commanding Officer of USS BOLSTER (ARS-38). From 1976 to 1979, he worked at the Naval Ocean System Center Laboratory in Kaneohe, Hawaii. He participated in the Marine Mammals Program and served as Operations Director for the Remote Unmanned Work System (RUWS).

LCDR Speer completed Diving and Salvage Training in February

1974 and was immediately assigned the position of Supply and Diving and Salvage Officer of the USS RECLAIMER (ARS-42). He later became Executive Officer onboard the same ship.

LCDR Speer's first tour as an officer was onboard USS NAVASOTA (AO-106). During this tour he became qualified as a Surface Warfare Officer.

LCDR Speer's record is highlighted by the numerous awards he has received, among them the Navy Achievement Medal, Good Conduct Medal, National Defense Service Medal, Vietnam Service Ribbon, Vietnam Campaign Medal and Sea Service Deployment Ribbon.

CDR Drucker has been assigned as Commander Service Squadron FIVE. Noteworthy of his tour onboard Brunswick was the Salvage of the Military Sealift Command Vessel, USNS CHAUVENET (T-AGS-29) off the Philippine Coast (FACEPLATE Winter 1982).

West Coast Naval Reserve Units Seek to Fill Diver Billets

The Naval Reserve is currently looking for more than 100 persons to fill diver billets. Reserve divers will be trained alongside active duty personnel, in order to increase the Navy's pool of well trained divers.

Individuals holding one of the following enlisted ratings are eligible for training: BM, BU, CE, DM, GMG, EA, EM EN, EO, ET, HM, HT, IC, MM, PH, MR, SK, STS, SW, TM, UT, SN, and FN. No prior diving experience is necessary. Applicants will be screened by the diver training unit for placement in one of two other reserve units which need divers. Screening includes a Navy diving physical examination, a hyperbaric pressure and oxygen tolerance test, and an interview with a diving officer or master diver. Minimum physical qualifications include the ability to: run a mile in eight and one-half minutes, swim 300 yards in eight and one-half minutes, do 30 push-ups in two minutes, and do 30 sit-ups in two minutes.

Once accepted, successful applicants will have the opportunity to be trained in a four-week scuba course and/or a 12-week second class diver course at the Naval Amphibious Base in Coronado. Both of these are active duty programs which have set aside openings for Naval Reservists. While awaiting courses to begin, trainees will receive physical conditioning and limited technical instruction.

Individuals already in the Naval Reserve should be approved by their Commanding Officers; those who do not belong to the Reserve may be assigned to another unit until they are approved for training. Persons with less than 22 months remaining in their enlistment contracts are encouraged to extend their enlistment periods.

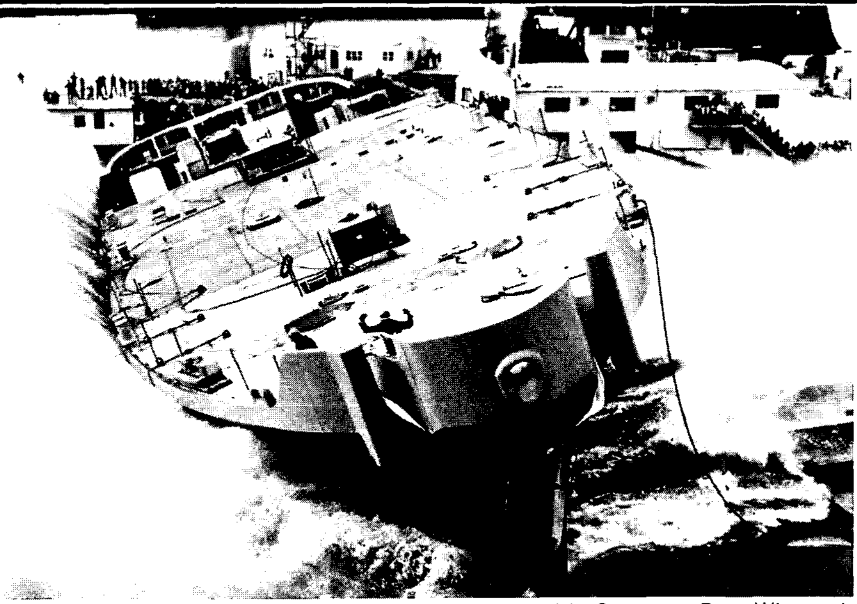
Interested persons should call the Naval Reserve Training Department in San Diego at (619) 225-5114 for more information. Currently drilling reservists may also call the Officer in Charge of the new diver training unit, CDR Larry Sand, at (619) 576-1322.

Members of the USS PIGEON dive team. Back: HT1 Ralph Bonnin, EM1 Gary Stanton. Front: QMC Ted Griggs, HT1 Neil West, HT1 Scott Nace.

USS PIGEON (ASR-21) Conducts Saturation Dive

A five-man dive team from the USS PIGEON (ASR-21) recently completed a 16-day saturation dive to 850 feet in support of certification of the ship's MK2 Mod 1 Deep Dive System.

The system, designed to support a saturation dive team to 850 feet, includes two decompression chambers, four independent life support systems and two personnel transfer capsules. PIGEON is also equipped with an extensive surface supplied diving system outfitted to support conventional surface supported diving to depths of 300 feet on mixed gas using the U.S.Navy Open Bell, Divers Mask, MK 1 MOD's 0 and MK 12 systems. PIGEON is homeported in San Diego, California.



The SAFEGUARD (ARS-50) being launched in Sturgeon Bay, Wisconsin.

Safeguard (ARS-50) Launched

The SAFEGUARD, lead ship of the new ARS-50 class (see FACEPLATE Winter 1982), was launched 12 November 1983 at Peterson Builders Incorporated in Sturgeon Bay, Wisconsin.

The SAFEGUARD is 255 feet in length with a 51-foot beam, 15.5-foot draft, displacement of 2,880 tons and sustained speed of 14 knots. Its power is provided by four Caterpiller D-399 engines driving two controllable, reversable pitch propellers in KORT nozzles through reduction gears. The propulsion plant allows for economical operation on two engines and a maximum bollard pull of 131,000 pounds on the engines. The bow thruster provides maneuverability at low speeds and dynamic positioning capability during salvage and rescue operations. The electric plant consists of three 750 kw generators, also powered by CAT D-399 engines.

SAFEGUARD will carry a crew of approximately 90 to accomplish her missions, which include towing, offship firefighting, rescue and assistance, heavy lift and air diving operations. She is fitted with a double drum automatic towing machine and an air diving system, including recompression chamber. SAFEGUARD carries approximately 175 tons of salvage equipment and materials.

The 12 November launching was sponsored by Mrs. Thomas J. Kilcline. Speakers at the event were Vice Admiral Thomas Kilcline, USN Retired; and Rear Admiral George W. Davis, Jr., USN, NAVSEA, SEA 91. The SAFEGUARD is the first of four ships of a new class of salvage ships under contract to PBI and is scheduled for delivery to the Navy in early 1985. The remaining three ships will be delivered by early 1986.

USS PRESERVER (ARS-8) Change of Command

LCDR John Devlin relieved LCDR Bill Bassett as Commanding Officer of USS PRESERVER (ARS-8) in ceremonies held 23 September, 1983. With the arrival of LCDR Devlin, the number of divers onboard PRESERVER rose to 13.

LCDR Devlin was graduated from the Navy Diving and Salvage Training Center on 24 June 1983. He served as Weapons Officer on the USS SOUTH CAROLINA (CGN-37) and the USS BARNEY (DDG-6). He received a graduate degree in Physics from the Naval Post Graduate School in 1978, and in 1972, he graduated from the Naval Academy with a degree in Oceanography.

LCDR John Devlin

LCDR Devlin has been recognized several times for his service in the Navy. He has received the Navy Commendation Medal with a Gold Star and the Navy Achievement Medal.

LCDR Bassett will be assigned as the Seamanship and Navigation Department Head at the Naval Amphibious School, Little Creek.

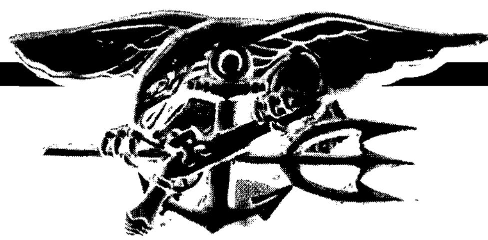
Retraction

In the Fall 1983 issue of FACEPLATE, the Kerie-Cable ultrathermic underwater cutting cable was reported as approved for Navy use. Although successfully used on the ENTERPRISE propeller change under the auspices of OOC in May 1983, the Kerie-Cable had not undergone testing at the Navy Experimental Diving Unit and approval for Navy use was premature. Consequently, approval of the Kerie-Cable for Navy use will depend upon the results of NEDU testing which is scheduled for the spring of 1984.

BUD/S:

Combat Swimmers

photos by LT Michael Wood



The SEAL insignia

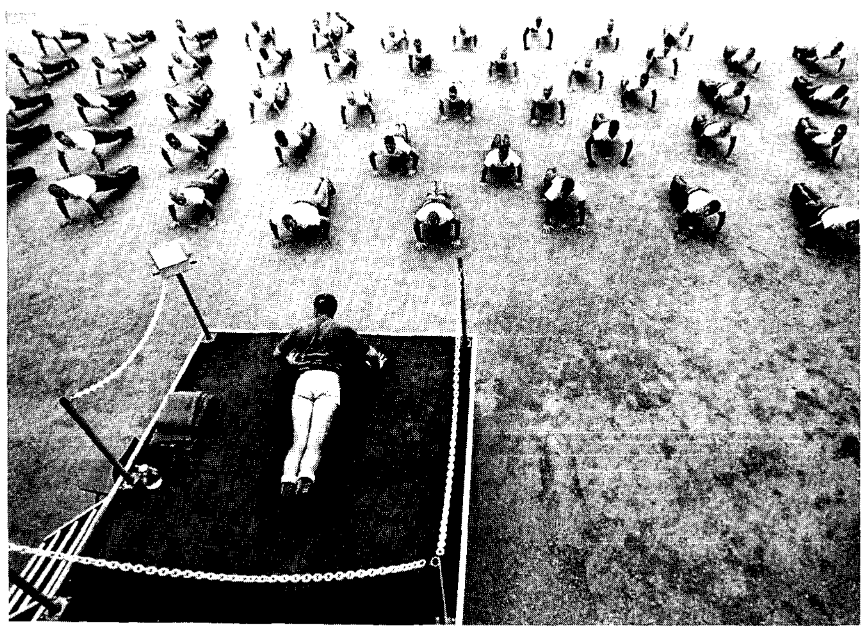
By CDR Tom Steffens
Director, BUD/S Training

The Basic Underwater Demolition/SEAL (BUD/S) training course prepares a select group of men for the physical, mental and technical rigors of being Navy combat swimmers. Sea Air Land (SEAL) Teams are a trained cadre of naval personnel within Naval Special Warfare who carry out clandestine combat missions. Small units of highly trained SEALS support conventional amphibious and fleet operations worldwide. The BUD/S program at the Naval Amphibious School in Coronado, California provides a 23-week course of specialized training at the core of this technical specialty.

BUD/S students hit the beach

Preparation for a practice exercise

Martial arts are part of physical training



Instructor leads outdoor calisthenics

BUD/S training differs from other Navy diver training programs in that it emphasizes physical and mental requirements demanded by the nature of SEAL work. Diving skills are taught as a secondary area of expertise. The mission of a BUD/S graduate could require him to swim 2,000 yards submerged using heavy fins and carrying combat equipment. The 50 percent attrition rate from the BUD/S course —which has remained relatively constant in the 30 years of the program's existence—is testimony to the fact that only the best can make the grade.

BUD/S training is intended to be the toughest military training in the world. LCDR McCleskey, Assistant Director of the Program, said: "The missions of the graduates require that they be able to consistently perform at over 100 percent of their potential. Someone who performs at 90 percent could be detrimental to the reliability or safety of his operational unit." The training combines classroom and physical fitness work into a day which is 14 hours long or more. The class work is technical and requires students to quickly assimilate a broad range of information from medical disease associated with diving to all diving tables. Obviously this is difficult to digest and retain when the instruction follows a four-mile timed run, the obstacle course, limpeteer techniques or another P.T. session.

Because the physical regimen is such a major component of BUD/S training, candidates are sought who have competitive, athletic backgrounds and who are highly motivated, disciplined and self-controlled.

SEAL programs are available to recruits upon completion of RTC. Naval personnel who are 30 or younger in pay grades E1 - E6 may volunteer for BUD/S training.

Phase I: Physical Endurance

After a two-week indoctrination in which students begin a program of long-distance running and swimming, they enter Phase I of training. Phase I concentrates on developing the students' mental and physical abilities. Physical conditioning includes progressive distance swimming and running, practice on the obstacle course and rigorous calisthenics designed to develop stomach, upper body and ankle strength. Instructors push students to the limits of their physical and mental ability to determine and expand their limits of physical and mental endurance under stress.

"The basis of the physical fitness component of BUD/S training is endurance and reliability—physical and mental," LCDR McCleskey said. "The curriculum is designed to give the student enough confidence and presence of mind to keep treading water or find an alternative plan when he is waiting to be picked up by a submarine and realizes the rendezvous has been missed." If that is a slight exaggeration, McCleskey continued, "it is accurate to say that our units routinely operate unsupported in hostile environments that require discipline, stamina, strength and total self-reliance."

During Phase I students also learn to use basic SEAL equipment, to conduct reconnaissance and to administer emergency combat medical care.

The culmination of this seven-week phase of training is "hell week," during which students are subjected to strenuous physical tests under adverse and stressful conditions. Hell week exercises find students assigned to five to seven man boat crews, similar to the type of unit to which they will be assigned. Students' ability to function as part of a team is one of the key qualities that hell week is designed to test.

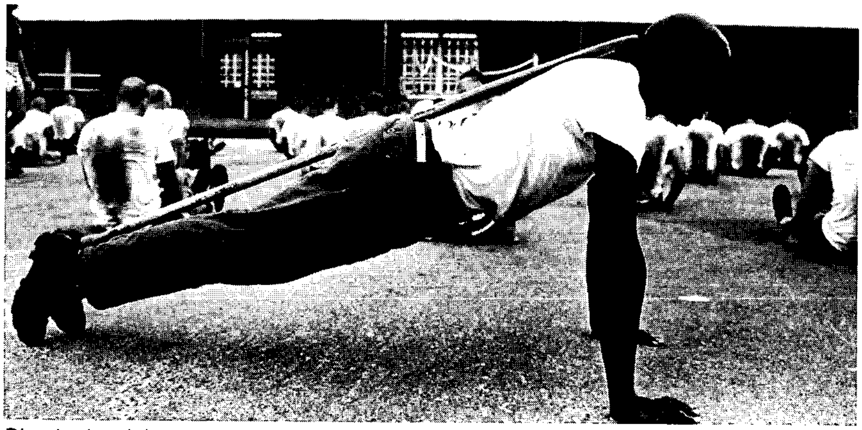
This exercise tests the physical, emotional and mental abilities of the candidate. The week demands self-discipline and control and motivation required to develop the reliability demanded of these combat troops. Hell week combines distasteful and adverse situations to determine if a candidate has the

Students master in-water skills

Training for the rigors of being a SEAL

Ocean-side calisthenics

Students prepare for at-sea training



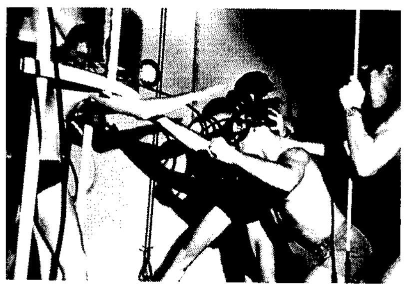
Physical training

Preparing for a practice launch

Students practice tactical exercises

In-water training

Physical training



Training in the BUD/S tower

Physical training

tenacity required for survival. The BUD/S refrain—it pays to be a winner—is indicative of the SEAL attitude that reliability and safety are essential—this is not a suicide squad.

"Hell week demands the self-discipline, control and motivation that is needed for reliable combat troops," LCDR McCleskey explained. "Reliability and safety are essential to survival. Graduates of BUD/S training all possess what the public now calls the 'right stuff.' "

Phase II: Diver Training

As emphasis on physical training continues, Phase II prepares students to become combat divers. They are trained in open, semi-closed and closed circuit SCUBA gear. As well as becoming experts with the gear, trainees study diving physics, diving tables and treatment of diving-related medical disorders.

During the eight weeks of Phase II divers perform an average of two dives per day and one night dive per week. Most are shallow water dives of 15 to 20 feet, concentrating on compass accuracy and combat swimmer techniques.

The BUD/S program conducts many training dives in its 46-foot tower. Trainees practice their skills in the clear water of the tower and are later re-tested in the open sea. Skills such as using a roving bell, signalling, buoyant ascents and various aspects of submarine lock in/lock out are practiced.

The primary operational SCUBA taught in the BUD/S diving component is the Draeger (LAR-5) closed-circuit oxygen rig. The Draeger is well-suited for long-distance clandestine swimming—it is highly mobile, requires minimal set-up and maintenance and, of course, generates no bubbles.

Phase III: Land Operations

The eight weeks of Phase III are devoted to land warfare—small-unit tactics, patrolling, ambush techniques, river and stream crossings, rappelling, individual and crew-served infantry weapons and military explosives and booby traps.

This phase includes 20 days on San Clemente Island using live fire with demolition and weapons. Phase III concludes with a three-day field exercise which simulates a combat scenario.

The purpose of the exercise is to develop planning and problem solving skills; to test the ability of the candidate to coordinate other services needed to accomplish the mission successfully; to enable the candidate to develop and execute a tactical plan and to incorporate information which is provided throughout the exercise.

Leadership

Almost all instructors at BUD/S are SEALS. Most are ranked E-6 or above. Their experience and leadership are an integral part of the BUD/S program. Each instructor undergoes approximately six months of training.

"Our instructors must be sure that all BUD/S graduates will be fully acclimated to a water environment so that they can conduct their missions without worrying about the water. It must be second nature to them," LCDR McCleskey said.

"While a relationship between the students and instructors might be thought of as adversarial, they are actually developing the potential of the candidate to the maximum, in a method which tests the students' limits daily." LCDR McCleskey continued. "If a student decides to withdraw or fails, the instructors become supportive counselors."

The instructors lead by example and demand the most of the students. However, it is the rigors of the course itself that screen out those not suited for the SEAL team.

Preparation of a SEAL instructor takes about six months. The instructors receive four-week instructor training at the Navy Training Center and two weeks of Leadership, Management, Education Training (LMET). Their indoctrination program covers one week in each of the three phases of BUD/S training and always involves supporting a hell week and a field exercise.

A new instructor spends a class cycle watching the instructor he'll relieve. Because of this process it takes about three months from reporting in before the instructor stands at the podium.

On leaving, instructors return to a SEAL unit, probably more specialized and certainly more educated than before, because of their two years of presenting material and answering questions. Although instructors can repeat a tour at BUD/S, usually they do only one tour.

Graduates

Graduates of BUD/S are assigned to three weeks of basic parachute training at the Army Airborne School in Ft. Benning, Georgia and then serve the remainder of their first enlistment at a SEAL team.

The Naval Amphibious School also offers advanced training. SEALS can return for in-depth training in diving supervision, diving equipment and maintenance, corpsman special operations technician, lock in/lock out and free swimming ascent.

There are new billets in the SEAL community, so BUD/S graduates can volunteer for a variety of operational units. These specialized careers go to the rank of Captain. Enlisted personnel rotate every five years and officers every two.

BUD/S graduates generally keep a relatively low profile in public; however, in the Navy community, they are highly respected. For SEALS the Navy slogan that, "It's not just a job, it's an adventure," is much more than just a public relations slogan.

EOD School

SAFETY &

A student in the Underwater Ordnance Division suits up for MK 6 training.

By LCDR Mike Duignan
Training Officer

The Navy Explosive Ordnance Disposal (EOD) School trains officers and enlisted personnel from all four of the U.S. armed services in a highly technical and specialized field—the recovery, identification, rendering safe and disposal of explosive devices. Located on 550 acres at the Naval Ordnance Station in Indian Head, Maryland, the four-service school is managed by the Navy and includes a special curriculum for Navy EOD divers.

The surface curriculum—for Army, Marine Corps and Air Force students—lasts approximately 20 weeks. It includes instruction in the basics of EOD work and specialized training in ground ordnance, air ordnance, improvised explosive devices and nuclear ordnance. Navy students also go through diver training at the Naval Diving and Salvage Training Center (NDSTC) in Panama City, Florida. Then at Indian Head they receive approximately 11 weeks' training in underwater ordnance. The entire program for Navy EOD students lasts almost a year.

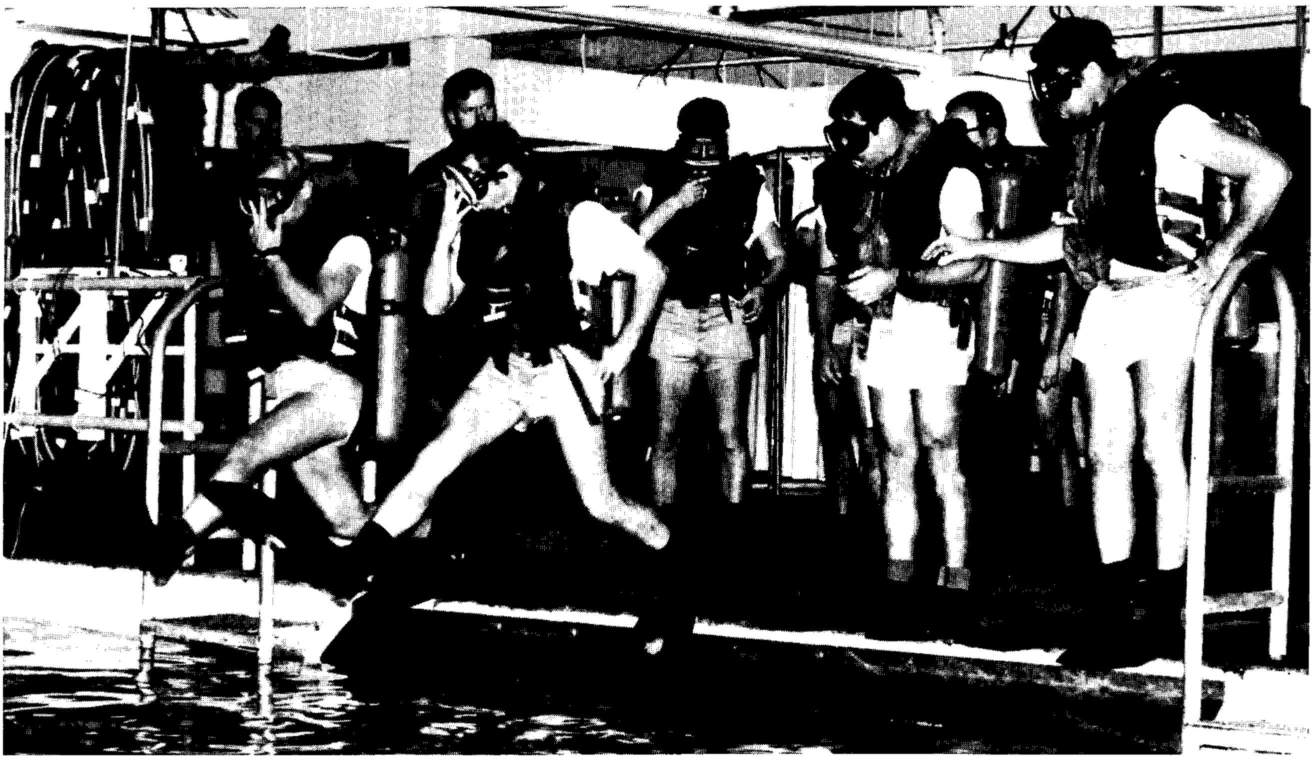
At all levels of EOD training, safety and precision are emphasized. The work is highly technical and must be performed accurately to ensure the safety of the individual involved. For that reason, the school enforces high standards in the classroom and in field exercises.

Underwater Problems

Instruction in each division includes hands-on problems, in which the students are given scenarios requiring them to identify and render safe an explosive de-

Emphasizes

PRECISION



Students participate in MK 6 training exercises.

photos by PH2 Dave Marsh

vice. These problems are the heart of EOD training, combining knowledge gained in the classroom with the tension and speed of real EOD work. In all but the Underwater Ordnance Division, students work on inert training devices; but in the underwater division, each device is rigged with a half-pound block of TNT that explodes about 25 feet away if the student makes a mistake that would have caused live ordnance to detonate.

"It might be the dead of winter, but before you get through one of those underwater problems, you've been concentrating so hard that you're down to your skivvy shirt," MNCM (DV) Perry, a senior instructor at the school, said.

"The Underwater Ordnance Division has the most unique practice area in the school," LCDR C.D. Bernier, the underwater section head, said, adding that the special features of working with underwater ordnance necessitate a specially-designed training program.

"Diving in itself is hazardous," LCDR Bernier said. "Because most underwater ordnance function acoustically or magnetically, they are quite sensitive and a bit more risky than ground or air ordnance. It's bad enough on the surface, but underwater it really gets your adrenalin pumping."

Diver Training

Before arriving at the EOD School, Navy students learn SCUBA, MK 1 and MK 12 at NDSTC, in Second Class Diver Training for enlisted personnel and the Salvage Officer class for officers. As part of the Underwater Ordnance Division at the EOD

School, students also learn the MK 6 semi-closed circuit SCUBA rig.

The MK 6 operates on mixed gas. Because it only lets out exhaust at every third or fourth breath, it is considered semi-tactical. (It cannot be considered fully tactical because it releases trace bubbles.) The MK 6 has a low acoustical and low magnetic signature, making it well-suited for underwater ordnance disposal. "The school is anticipating a switch in the spring of 1984 to the new MK 16, a non-acoustic, non-magnetic, fully-closed circuit rig." Bernier said. (For full description of the MK 16 see FACEPLATE Summer 1983.)

MK 6 training takes place in the EOD School's 24-foot-deep training pool. The pool has a crane at one end which is used to stage weapons for practice work. As in any diver training program, EOD divers must become comfortable enough with the rig to be able to operate it under high-pressure working situations. MK 6 training includes classroom instruction in the theory of the rig, decompression tables and procedures and maintenance and upkeep. Students also learn to split and mix the gas for use with the MK 6. Practical orientation to the MK 6 takes place through a variety of exercises in the EOD School's 24-foot-deep training pool and qualifying dives are made in the pressure complex. A Medical Officer is always on station during MK 6 training.

Diver discipline is an important aspect of EOD diver training. When trying to locate an ordnance device underwater, the divers' moves must be slow and deliberate rather than quick and jerky, so that they do not bump into live ordnance accidentally. This can be especially difficult when visibility is low; and, in fact, low visibility frequently causes EOD units to rethink the advisability of diving. Divers must also be careful not to set off devices that are acoustically or magnetically detonated—there are limits on how closely they can approach ordnance with sonar or underwater ordnance locators.

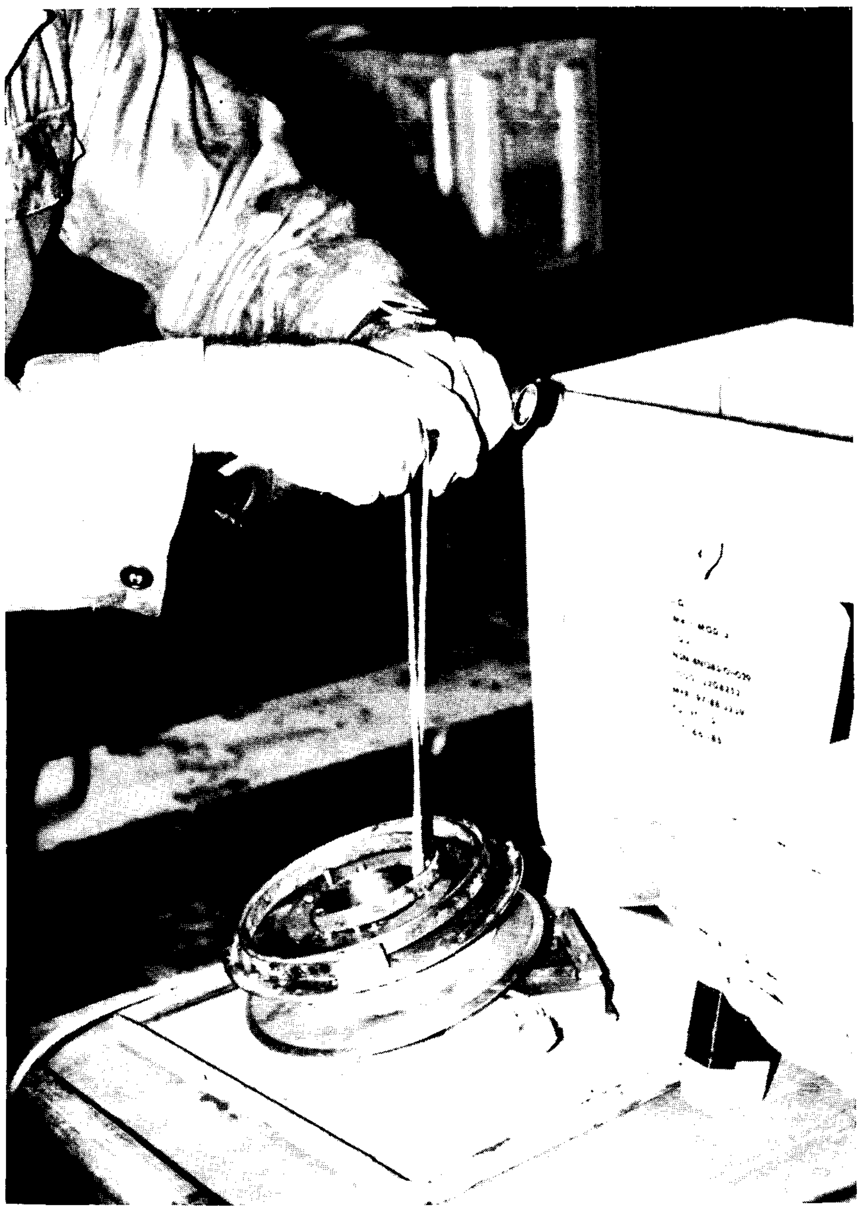
Practice Exercises

In EOD applications, diving is chiefly a means of locating and transporting an item. Most EOD work is within the depth limits of SCUBA (130 feet) or the MK 6 (170 feet). Because of the physical rigors of diving, the Underwater Ordnance Division is the only one which includes regular physical training. In the other divisions, physical training is voluntary.

Once divers have been trained in the MK 6, they begin practice exercises in the Patuxent River. The river is salted with explosive devices. Students working in teams must first search for and locate the ordnance. As in any practice exercise, they identify as much as possible about the device from a short-range reconnaissance, such as the shape, position, any identifying markings or numbers, *etc.* They then return to the surface, identify the device in their manuals and establish the proper render safe procedure (RSP). Once this has been accomplished, they return underwater and do whatever is necessary to render safe and dispose of the ordnance.

"These diving scenarios operate just like a regular situation," LCDR Bernier said. "They'll keep working

A timed practical exercise in the Core Division



until 2 a.m., if need be."

There are a limited number of options that can be performed on an ordnance underwater. In most cases, ordnance are brought on shore before they are rendered safe—beaching is therefore a major aspect of this segment of training. Ordnance are brought to the surface by lift bags.

"The trick is that someone has to attach the balloon to the device without bumping it and setting it off," LCDR Bernier said. Both the balloon and the bridle that is used to attach it are non-magnetic. Once the balloon is attached it is operated remotely by electric controls, which pump in air that causes the balloon to rise, bringing the device up with it. RSP and disposal can then be carried out.

"The skills we teach in the Underwater Ordnance Division are basic," LCDR Bernier said, "but they all apply in real live situations."

Surface Curriculum

Before entering the Underwater Ordnance Division, Navy students must successfully complete the EOD School's *surface curriculum*, in which they are grouped with their counterparts from the Army, Air Force and Marine Corps. Training begins with two weeks at the Redstone Arsenal in Alabama where, under the direction of the Army, students learn chemical and biological weapons.

The first phase of training at the EOD School is the Core Division, where students learn the basics of explosives and explosive effects, applied physical principles, electricity, batteries and mechanical tools. They also learn to use the publications. These voluminous documents are the foundation of air, ground and underwater EOD work. They contain complete information on the design, function, hazardous components, RSPs and disposal of explosive ordnance. Learning how to identify devices and look up information in the publications is as vital a skill as learning the basic safety procedures, which are also taught in the Core Division.

"In the practical exercises in this division students practice their mechanical skills and learn to use them in a crisis," SGT Ronald Gerber, a Core instructor, said. "There's no cookbook. There are 17 safety factors. They have to decide which ones apply. If they decide wrong they could theoretically injure their teammates or hamper operations."

Most attrition from the EOD School (the overall rate is 21 percent) occurs among trainees in the Core Division.

In the Demolition Training Division, students practice at the Stump Neck Range, 13 miles from the school. During this phase they have their first hands-on exposure to live explosives.

"Explosives are just another tool

MK 6 training continues.

for us," Master Chief Perry said, noting that they are often used to pry an ordnance from the ground. In this division students also learn to operate hyper-velocity tools. These tools can perform functions such as removing a fuse from a bomb almost instantaneously.

The Ground Ordnance Division, the next phase of training, instructs students in approximately 300 types of ordnance, including mines, rockets, mortars, booby traps and hand grenades. Approximately 60 percent of the time is spent in the practical area working on problems.

"Go/No Go" Training

In this division, as in the core and air divisions, students are evaluated on a "go/no go" basis. For each problem a student may be required to solve, there will be a list of procedures that must be performed correctly. Each student is allowed only a small number of mistakes—no go's—on each problem. Certain procedures are red-lined, meaning the student fails the entire problem if that procedure is skipped or carried out incorrectly.

"The go/no go system gives us an objective measure of each student's progress," SSG John Haldeman, a Ground Division instructor, said. "We can help the students right up to the point where we feel they can't make it."

Students must pass problems in land mines, grenades, projectiles and rockets, as well as a written test and an I.D. test.

"The I.D. test is the hardest because we have so many types of ordnance," SSG Haldeman said. "They have to identify what type of ordnance, the type of fuse, whether it's armed or unarmed, what country it's from and the necessary safety precautions."

In the Air Ordnance Division, the devices are more complex than any the students have encountered so far and students must also learn how the ordnance are stored and fired from aircrafts.

"For some of these guys, the only

An instructor supervises training.

aircraft they've ever seen is the one that took them to basic training," CAPT Anthony Massino, Officer in Charge of the division, said. Aircraft used in the practice area of this division include Navy fighters, an Army helicopter and a B-52 bomb bay, among others.

Instruction in this division is divided into five sections—egress systems, gun systems, guided missiles, bomb and bomb fuses and dispensers and payloads. U.S. and Soviet devices are emphasized but students are trained to deal with ordnance from all over the world. The problems are timed for approximately 90 minutes, just as in the Ground Ordnance Division, despite the fact that air ordnance are more complex. "Once they get here, they're a little bit more professional because they've been exposed to the same routine several times," CAPT Massino said.

Real Life Perspective

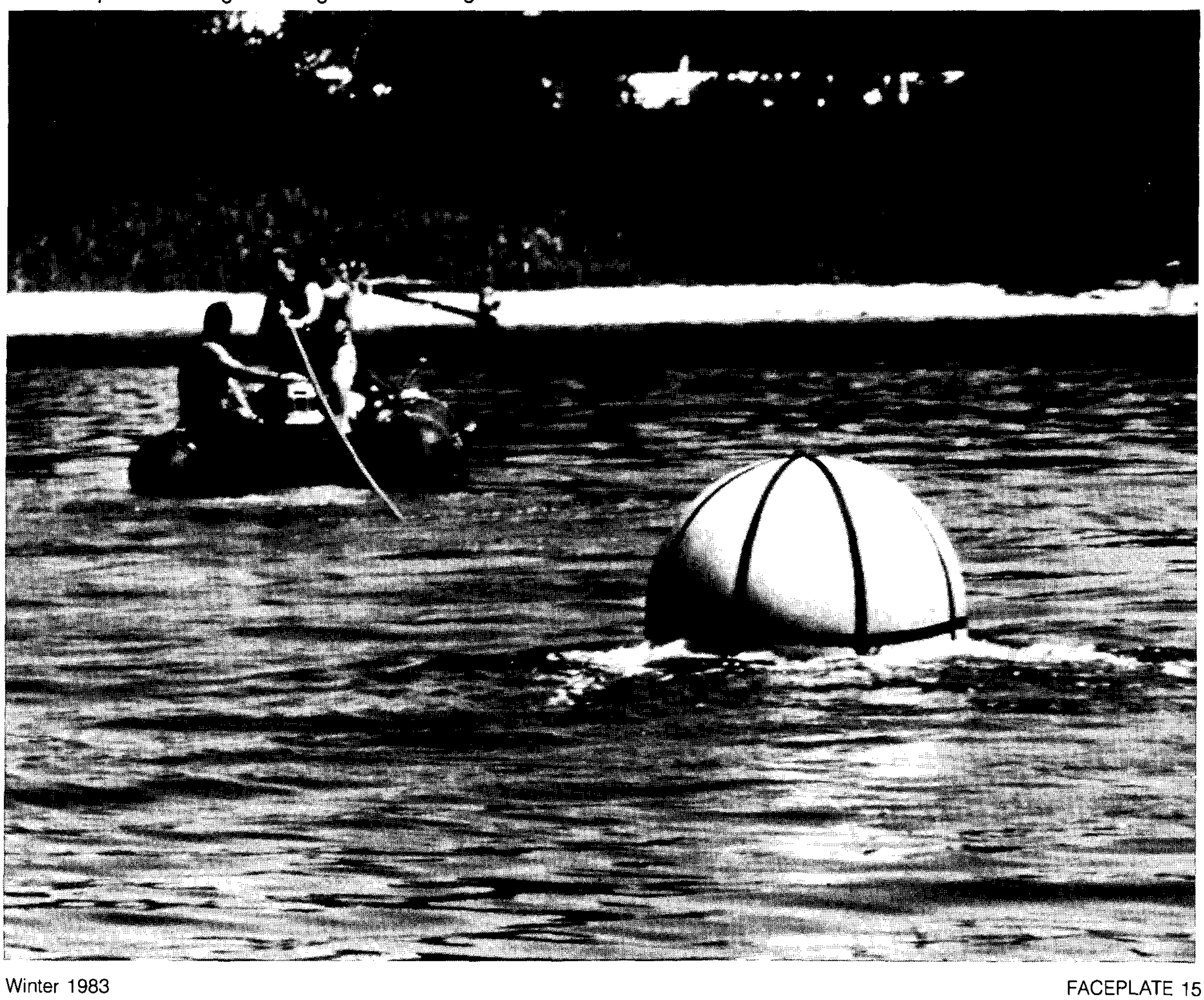
The Surface EOD training program also includes divisions in improvised explosive devices and nuclear devices.

The rigorous testing at the EOD School insures that students will not make dangerous mistakes once they are out working in the field. "If a student misses something in a test it's not just a point off," CAPT Massino said. "They'll get slapped in the face with it in the real world working with live ordnance. We instill that perspective in them—careless or inaccurate work could cause them or their teammates to be killed."

In addition to the 2,000-plus American students who are trained at the EOD School each year, approximately 150 students from 51 foreign countries are trained each year in specially-designed courses. The school trains students from any country to which the United States has sold ordnance. The fall of 1983 class included students from Jordan, Israel, Egypt, the Philippines, South Korea, Japan and Jamaica. The EOD School also sends Mobile Training Teams to countries that request them.

The divisions of the EOD School work together to provide complete training to a wide range of students in a highly technical and often dangerous field. By fulfilling its mission, the school makes an important contribution not only to the Navy, but to all the U.S. military forces.

Students practice using the lifting balloon during an Underwater Ordnance Division exercise.



NDSTC

Revises Curriculum to Improve Fleet Diver Training

By BMCM (MDV) Richard Radecki
Naval Diving and Salvage Training Center

The Navy Diving and Salvage Training Center (NDSTC) is the heart of the Navy's diver training program. At NDSTC's Panama City facility, students in courses from Second Class Diver to Master Diver Qualification learn the latest diving skills and techniques and how to operate Navy-approved diving equipment. NDSTC's curriculum, which has undergone substantial revision over the past year, emphasizes at all levels the importance of supervision and planning, at-sea experience and the basics of diver physics and medicine.

"We've honed in on the heart of the subject matter, to produce better-prepared divers, with increased water time, knowledge of certification requirements and increased technical knowledge of the MK 1 and MK 12," CDR Bruce Banks, Commanding Officer of NDSTC, said.

The revisions in NDSTC's curriculum are designed to give the divers all the skills they'll need to perform their work professionally, NDSTC's Curriculum Instructional Standards Officer LT Kent Skudin, explained. "We tell the divers in their first week of training that present state-of-the-art diving technology is complex. Today's diver is more than just an underwater mechanic," he said.

NDSTC's mission is to train selected officers and enlisted personnel in diving, ship salvage and submarine rescue. To fulfill this mission, it offers 11 courses, ranging in length from one to 18 weeks. Since it opened in 1980, NDSTC has graduated approximately 1,800 divers, including students from the other U.S. military services, selected civilians from the Defense Department and foreign allied nationals as well as Navy divers.

All students must fulfill the Navy's high expectations in all aspects of the coursework—the rigorous physical requirements, the classroom time devoted to diving theory and hands-on mastery of the diving systems. Although the curriculum is demanding, spirit at NDSTC is high as students learn not only the skills, but the team approach that is necessary for their work as Navy divers.

"The team spirit here is outstanding," LT(JG) Susan Cowan, a student class leader in the Basic Diving Officer course, said. "As a working diver, you have to trust and depend on everyone in your dive team and they begin building that spirit here."

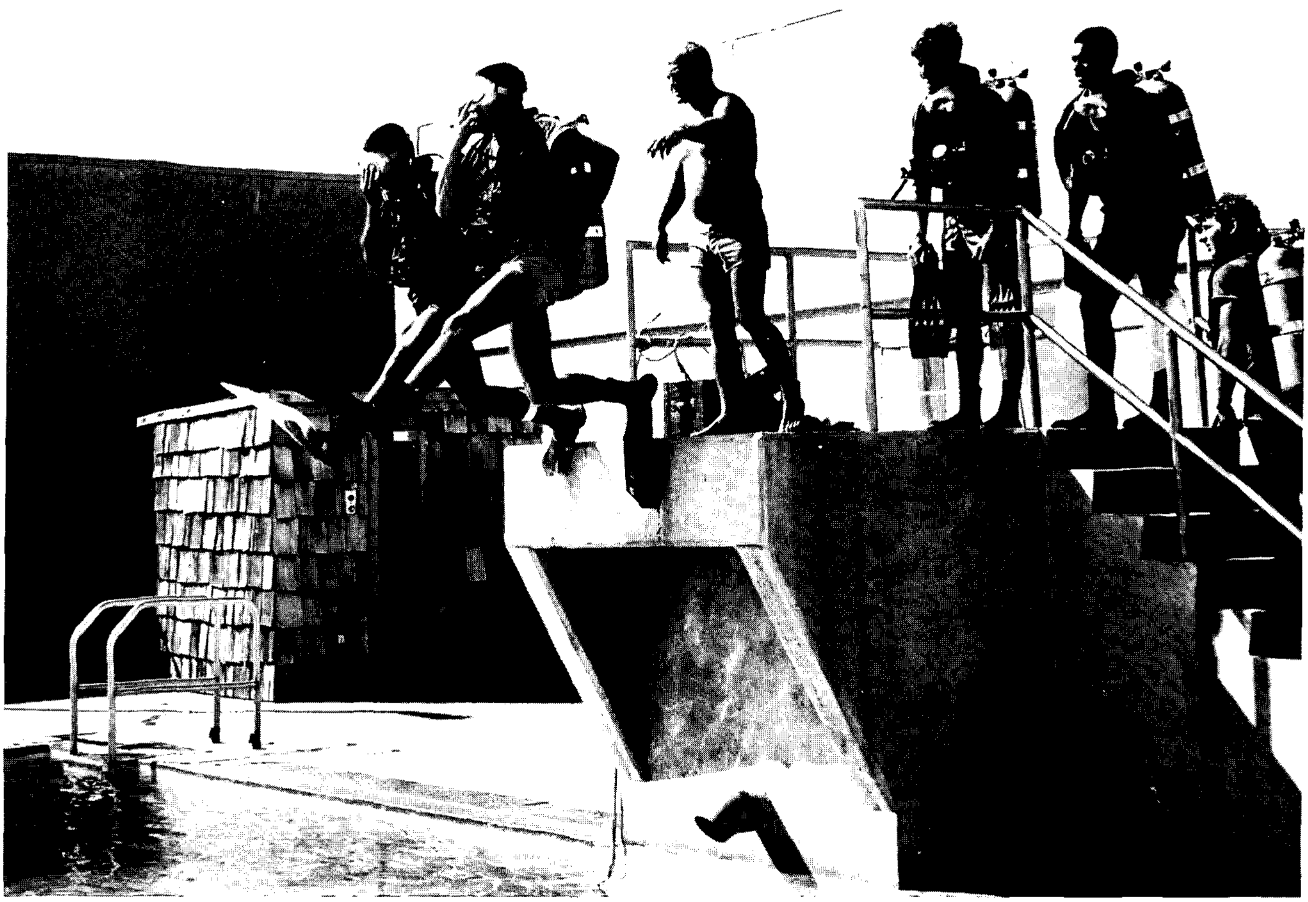
The Basics

According to LT Skudin, the first building blocks at any level of diver training are the basics of diver physics and medicine. These subjects are taught in the classroom during the first weeks of training—this learning is further reinforced by testing the students every week on their knowledge of the basics.

"The first weeks of training are not a time to learn the theory and

Students give the O.K. signal before SCUBA problem-solving begins.

photos by AT3 Jim Olson



Students enter the water for a session of SCUBA problem-solving.

then forget it—it's a make you or break you time," LT Skudin said. "If you don't understand the basics, you don't understand diving."

"Because of the increased emphasis on the basics, night study for all students has become the norm at NDSTC. In the past, students would attend night sessions *after* they failed a test. Now they know they'll have to pass a test on this material during each week of their training," LT Skudin said. In addition, the care and concern shown by instructors—the fact that they're willing to spend their time helping students—motivates the students to work harder.

SGT Stephen Heimbach, a member of the U.S. Army staff at NDSTC, said in the Second Class Diver physics class he is presently teaching, the team of instructors identifies students who are having trouble and tells them to come in for night study. "We're available at any time," SGT Heimbach said. "If a student wants help or needs help, he gets it."

In addition to increased emphasis on the basics, the NDSTC curriculum has been restructured to target the specific classroom audiences. NDSTC previously offered "generic" courses—physics, medicine, *etc.,* LT Skudin explained. However, students at different levels of training have different needs. For example, SCUBA students used to learn surface decompression as part of their diving physics instruction. Since the Navy Diving Manual prohibits them from conducting surface decompression, it has been eliminated from their physics curriculum. Second Class Diver physics has been made more mathematical and stringent with respect to air calculations and other practical applications. Changes such as these have been made in all modules of the NDSTC curriculum and each revised module has been renumbered as a separate document.

At-Sea and In-Water Training

NDSTC has increased the amount of time spent at sea in almost every level of diver training. SCUBA students used to take their qualifying dives in "pots"—NDSTC's pressure vessel assemblies (PVAs) and the fleet was reporting that the graduates were not familiar with the open-sea environment. In response to that input, NDSTC in April instituted open sea qualifying dives for its SCUBA students. "Anyone can breathe gas under pressure in a pot," LT Skudin said. "However, working safely and effectively in an open sea environment is the hard part."

Three days of diving operations at sea and at-sea qualifying dives were added to the Second Class diver curriculum in June. Three days at sea using the MK 12 have also been added to the Basic Diving Officers course, with emphasis on supervision. Previously, most dives in these courses were made in PVAs or off NDSTC's pier in 30 feet of water in Alligator Bayou. In addition to the at-sea training, seven days of in-water time have been added to the Second Class Diver curriculum.

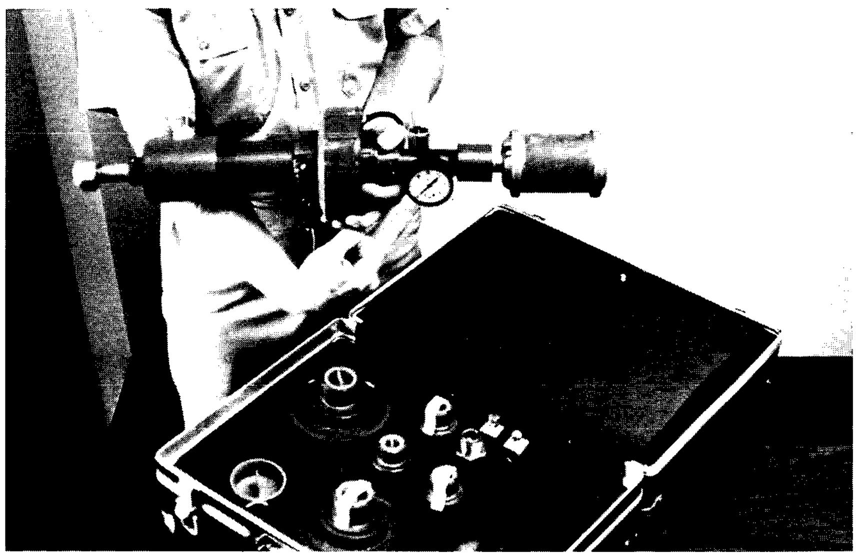
Second Class Diver Training is in many respects the core of the Navy's diver training program. In this 12-week course, the Navy trains enlisted personnel in diving systems from SCUBA to surface-supported air diving in the lightweight MK 1 to deep-sea air diving in the MK 12. Divers not only learn to operate these systems, but also the underwater skills they'll need to perform ship husbandry, salvage and a variety of other diving operations. In-water time is a crucial component of this curriculum.

Divers at all levels of training work on a variety of projects from the five open diving bays on Alligator Bayou. Projects include replacing a gasket on a four-bolt flange, which simulates underwater work on pipelines; practicing search methods, such as circle and jack stay searches; and underwater hull surveys. In performing the hull surveys, divers enter the water from the stern of one of NDSTC's two diving support craft moored in the bay and progress underwater to the bow, noting dents, scratches, marine growth, *etc.* along the ship's hull. Instructors will often place a magnet or other object on the hull to test divers' ability to locate foreign objects. Projects such as these allow divers to practice simultaneously their skills in using the diving equipment and in underwater ship husbandry.

These projects are conducted with SCUBA, MK 1 and MK 12; and at each level, students must demonstrate their ability to complete the underwater work within a specified amount of time.

"It's fine to train a diver to dive," HM1 Craig Johnson, an instructor of the Second Class Diver course, said. "But if they can't learn to recognize problems on a ship's hull, then their effectiveness in the water is quite limited."

A student prepares for a practice dive in one of NDSTC's indoor facilities.



The air sampling kit—now a part of all major diving courses.

SCUBA

Students and instructors generally agree that SCUBA is the most difficult system to learn. It is the first system taught to inexperienced divers—while they are learning to operate a SCUBA rig they are also learning to breathe, move and work underwater.

"SCUBA is definitely the hardest," LT Cowan of the Basic Diving Officers class said. "When we start training we're used to the land. It takes time to get used to the water. Once you're comfortable underwater, once you have confidence in the equipment, then you can concentrate on the other aspects of diving."

Problem solving is the most difficult part of SCUBA training. In this phase of instruction, students wearing SCUBA gear swim circles in NDSTC's 12-foot deep outdoor diver training facility. As they swim, instructors simulate in-water problems, by taking off the students' masks, removing their mouthpieces, *etc.* The students must do whatever is necessary—re-adjust the equipment, buddy breathe with their partners—to resolve the problem.

To insure students' safety during training, several instructors swim with them in the tank, watching for dangerous situations or signs of trouble. An alarm system runs throughout NDSTC and a stretcher and a recompression chamber are nearby for use if needed. Each set of SCUBA gear is carefully checked after each class.

"This is the most dangerous part of the curriculum and the hardest mentally on the instructor," HTCS Ron McLaughlin said. "Students have to learn to handle emergency situations on the bottom, because if an emergency happened at 130 feet, the diver would die before he could get to the surface if proper action was not taken."

Medical Training

A basic part of the curriculum for all Navy divers is learning to cope with pressure-related health problems. Although diving officers and Master Divers have a greater responsibility for insuring the health and safety of their diving teams, Second Class Divers must also be prepared to handle medical emergencies. Special units in diving medicine have been added to the classroom portions of several NDSTC courses.

One week of advanced medicine has been added to the Master Diver/Diving Officers program. The First Class Diver curriculum has incorporated recompression chamber supervisor training including surface decompression with air and oxygen and recognition and treatment of casualties.

LT Rick Odland, one of the two Diving Medical Officers at NDSTC, said a key factor in medical training is teaching students to recognize decompression sickness, the most common diving-related injury. The symptoms of decompression sickness—pain in the joints, nausea, dizziness—mimic those of other diseases. If a diver is suffering from decompression sickness, he or she may need to be treated in a recompression chamber.

NDSTC is well equipped, LT Odland said, not only for training, but for treating sickness or injuries as they occur. The school has six recompression chambers and the medical facilities include a laboratory and an emergency operating room. Students are instructed to report any symptoms immediately to their diving supervisors. "Accidents here are minor because we're able to get to them right away," LT Odland said. Most treatments are for minor complaints such as ear barotrauma ("ear squeeze").

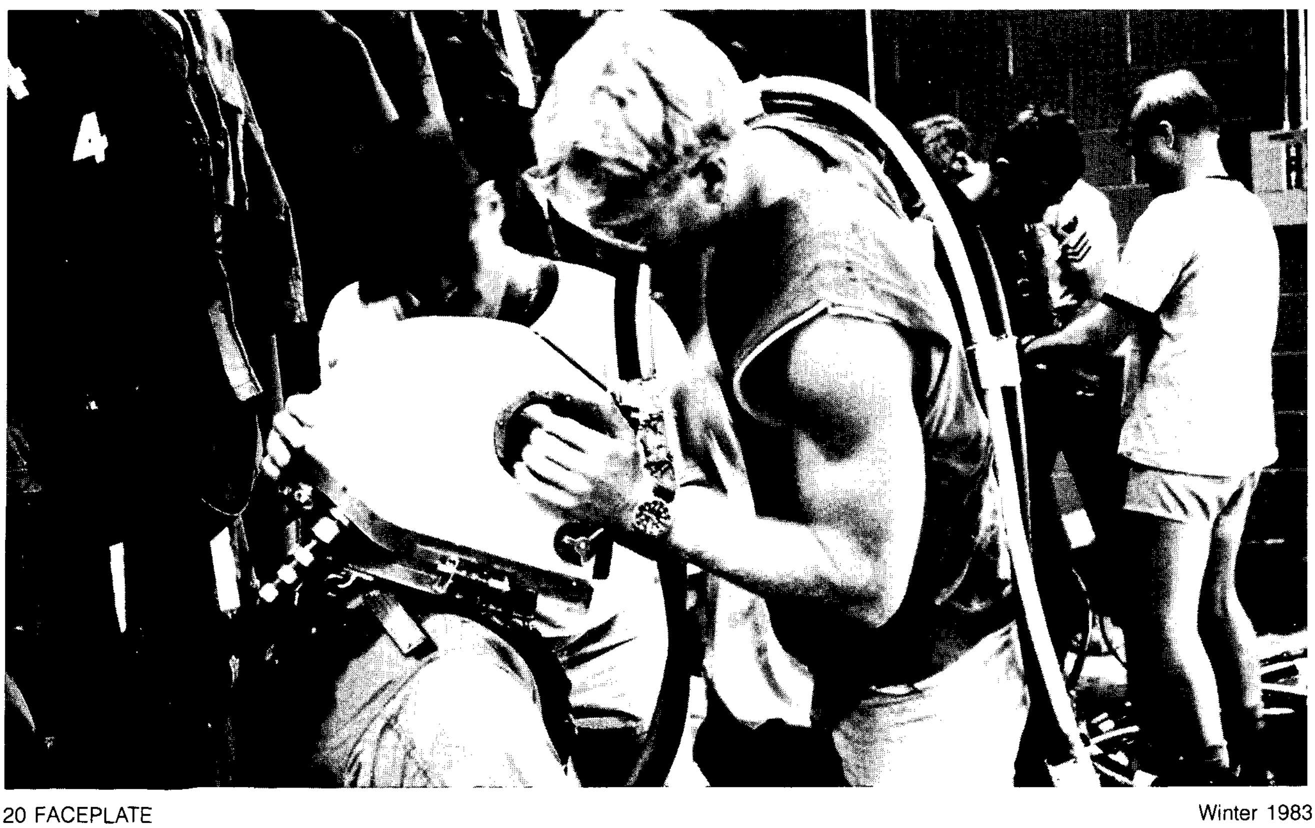
In addition to the diving medicine incorporated into the major diving course, special classes are offered in Medical Department Diving Officer, Medical Deep-Sea Diving Technician and Recognition and Treatment of Diving Casualties.

Diving Administration

Another major aspect of the revisions that have been made to the NDSTC curriculum is the increased attention given to the administrative requirements of diving, including quality assurance and diving systems certification.

"Certification was a stumbling block for Fleet divers," explained QMC Robert Roane Smith, an instructor who developed the certification curriculum. "When divers go out to the Fleet they have a diving system to maintain. All repairs and modifications must be made in accordance with Navy manuals. We teach them where to begin searching in the manuals for the requirements for making repairs."

MK12 training exercises.



"Satisfying requirements for documentation is crucial," QMC Smith added. "If a ship does not document that repairs were made according to Navy specifications, they will not be able to use the diving system until the repair is re-done and/or documented properly."

The certification instruction given in First Class Diver and Diving Officer Training familiarizes students with two documents—the Certification Manual for Deep Submergence Systems and the Type Commander Quality Assurance Manual. "The purpose of the three-and-a-half-day program," QMC Smith said, "is to make students aware that the standards exist, not to teach them specifically how the standards should be met."

A half-day of instruction in air sampling was added to all the major diving courses in April. In fleet, divers are required to submit air samples from their diving systems every six months. "Most divers did not know how to use the air sampling kit," QMC Smith said. "By adding air sampling to the NDSTC curriculum, Fleet divers will know how to assemble the components of the kit, connect it to the diving system, take the sample and return it to the lab." Because there are a limited number of kits available, this procedure must be completed within three days—efficient use of the kit in the fleet is essential to the air sampling program.

Leadership

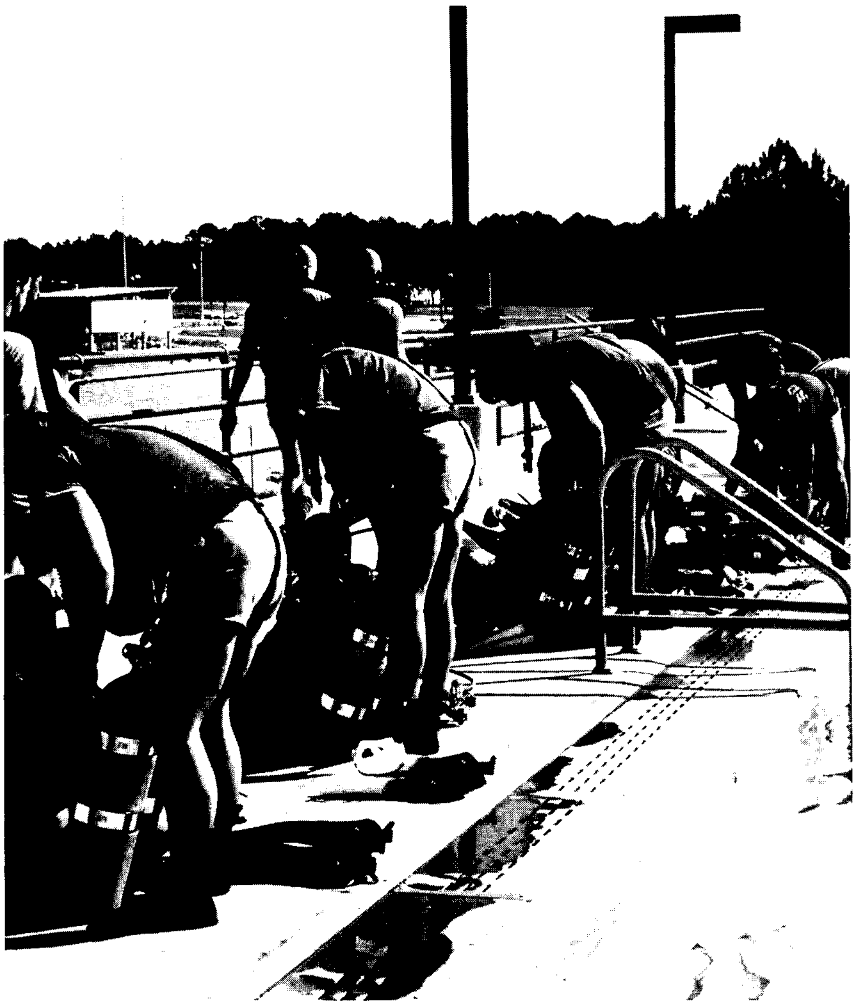
In addition to giving its students a solid foundation in diving theory, skills and equipment, NDSTC gives advanced students training and hands-on experience meeting the challenges of leadership.

"Leadership takes personal sensitivity, technical background and commitment," CDR Banks said. "We teach by example, by evaluating the quality of the student's performance throughout his or her stay here and by a subjective guess of each student's ability to lead. We judge performance, attitude and stick-to-itiveness."

Students as well as instructors are aware of the special qualities it takes to be an effective leader—that in addition to learning how to operate equipment, they must learn to evaluate situations, make decisions and, on occasion, respond to emergencies quickly.

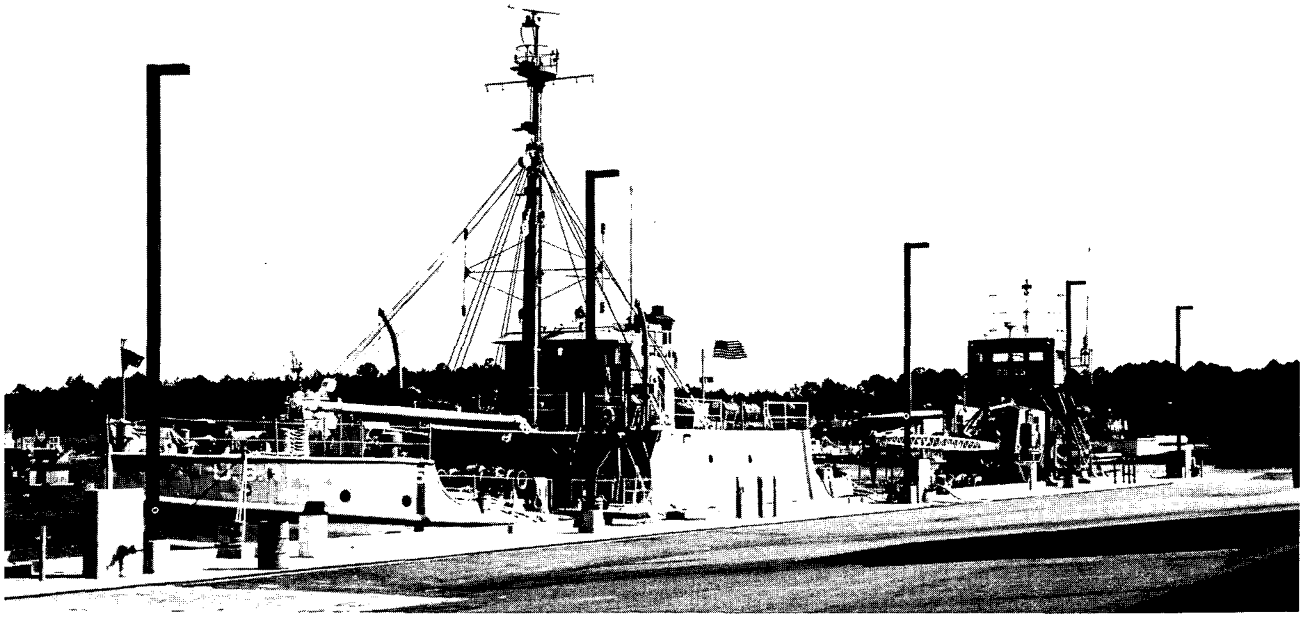
In LT(JG) Cowan's Basic Diving Officer Class, this means increased emphasis on learning to supervise a dive, run the consoles that control a diving system and handle medical or other emergencies. Much of this training takes place from the Center's open diving bays on Alligator Bayou. For at-sea training, students take one of NDSTC's two Yard Diving Tenders (YDTs) 12-15 miles out into the Gulf of Mexico and perform dives in 100-120 feet of salt water.

"They take the fleet environment and put it into a school environment," LT(JG) Cowan said. "We're no longer in the classroom, we're out there learning to react in a hands-on environment. They'll even throw simulated casualties at us to see how we react. This type of training is especially important for officers, because we're the ones who'll be responsible for running the dives correctly. NDSTC makes effective divers out of people with minimal or no prior diving experience."

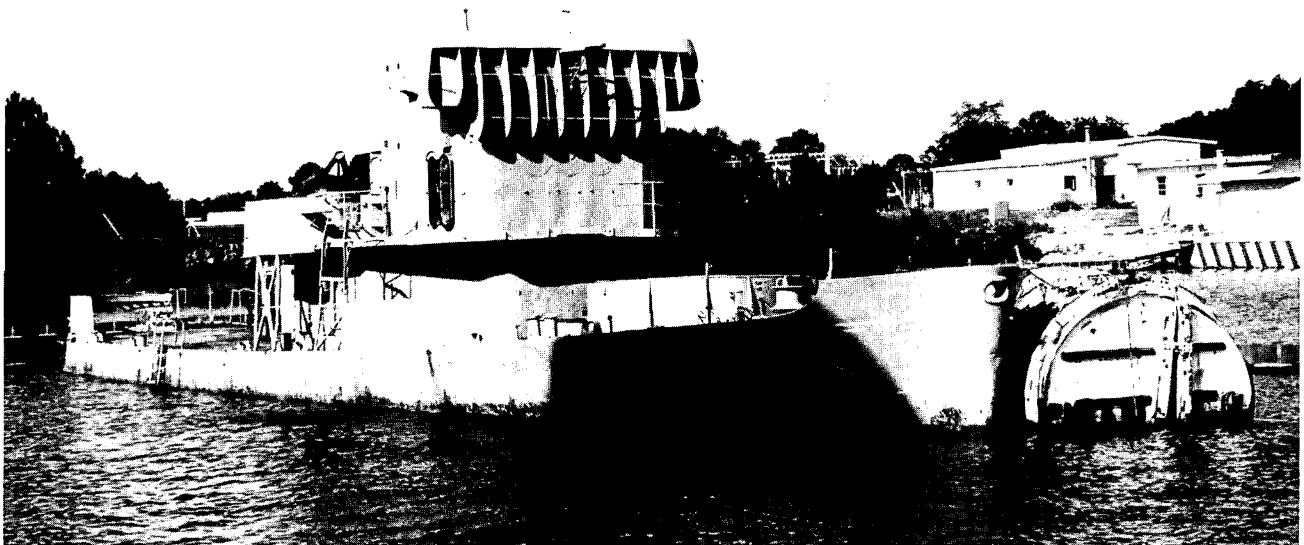


Suiting up for SCUBA exercises at NDSTC's 12-foot deep outdoor training facility.

The YDTs, although considerably smaller than fleet diving vessels, are equipped with standard fleet recompression chambers that can be used for treatments to 165 feet. The consoles and controls are also similar to what graduates will find in the Fleet. Before operating the controls, students are required to prepare accurate drawings of the system. As a safety measure, instructors monitor the students continuously while the controls are being operated.



These YDTs are used in a variety of training exercises.



The "hulk"—used by students in salvage projects—moored in Alligator Bayou.

Moving Toward the Future

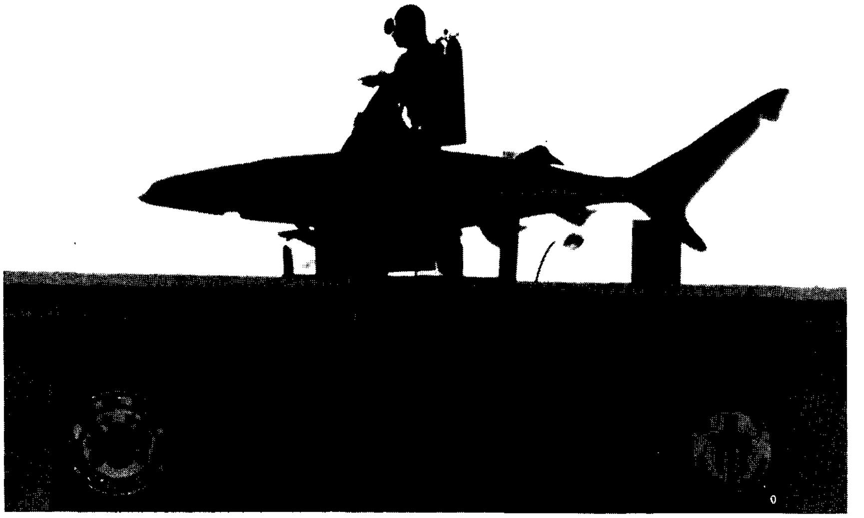
The Salvage Diving Officer curriculum is now bringing its students into the computer age, with the addition of hand operated calculators to the coursework. Students learn to program hand operated calculators to perform buoyancy and stability calculations needed in salvage projects. This training is incorporated into their final exam—a salvage situation summary. In this exam, students use their calculators and Navy towing and salvage manuals to figure out on paper how to rig, salvage and tow a stricken vessel.

NDSTC plans to continue updating and revising its curriculum to meet the changing demands of Navy diving and salvage. A curriculum feedback system, implemented in December 1982, has so far generated approximately 275 suggestions from students and instructors. Almost all have resulted in changes to the curriculum.

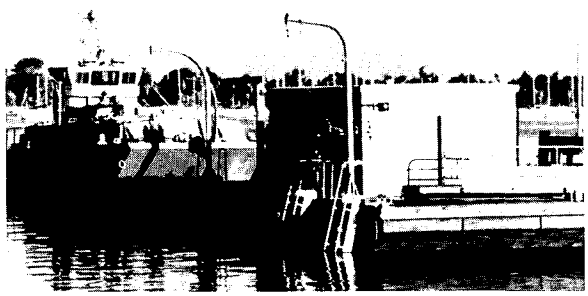
In the near future, students will be learning to operate portable recompression chambers. NDSTC has also requested 14 new audio-visual productions on all aspects of diver training. Training in the automatic towing machine, to be used with the new ARS-50, will also be added.

"The spirit and the quality of instruction provided at NDSTC are great," CDR Banks said. "We're providing the U.S. Navy the best-trained Navy divers in the world."

Coronado Dive School Keeps Pace with Innovations



The school building and "shark."



LCM-8 Second Class Divers diving boat with the diving barge in front.

photos by LT James H. Cosper II

By Ensign Roger Kitson
Naval Amphibious School, Coronado

NDSTC is not the only facility that offers basic diver training. Providing the Navy with top quality divers is also the mission of the Diver Second Class Training Department (DSTD) of the Naval Amphibious School, Coronado. As at NDSTC, many changes have occurred at DSTD during the past five years. Sophistication in diving equipment, technical advancements in naval ship hull design, water tool design improvements and metallurgical innovations have mandated changes in curriculum and pointed out the need for modern facilities.

Located in a modern, 50,000 square foot complex, DSTD's facility possesses two training tanks (each over 10,000 gallons), an LCM 6 SCUBA boat, an LCM 8 surface support boat certified to 190 feet with a recompression chamber and three Boston Whaler safety boats. Additionally, the department has a 25,000 square foot waterfront/pier complex project barge with a certified LP air system.

Innovations and improvements in diving equipment and techniques used in today's diving Navy are a continuing impetus for changes in curriculum. As at NDSTC, the old MK V SSDS has been deleted from training and the MK 12 SSDS has been added. Improvements in underwater welding and cutting equipment and techniques have also prompted curriculum changes such as cutting with MAPP gas, use of austenitic welding rods and underwater ultra-sonic testing equipment.

Greater emphasis is now being placed on the academic portion of the courses. Previously, there were no formal written testing methods. Now, the students are both tested and given a comprehensive reenforcement exam on a weekly basis. Satisfactory completion of a final written exam is a prerequisite for graduation. Grading standards provide the student with several opportunities to evaluate his or her progress to learn the material. Students must also attain a designated physical performance level before they are allowed to graduate.

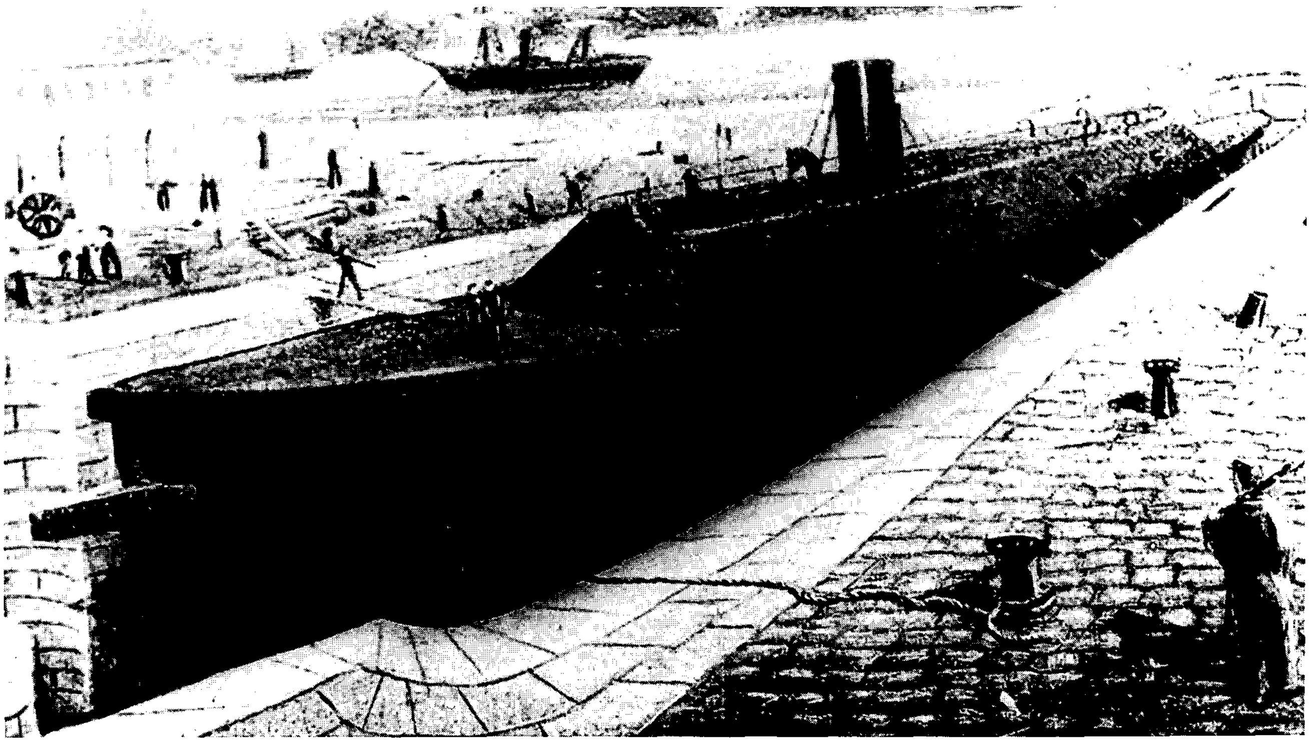
The department not only trains divers for the Navy diving community, but for all services, and also conducts the reserve phase training program. For example, DSTD trains the U.S. Air Force Manned Space Flight Engineers, qualifying them in SCUBA at 40 feet in preparation for simulated space walks in the external craft simulator located at Long Beach, California. They are also familiarized with the MK 12 SSDS because it is similar to the NASA space suit.

Major advancements in diving medicine are occurring more frequently and the curriculum is updated to reflect these changes. Recompression chamber operations have been added to familiarize the students with chamber operations and how to monitor persons with decompression sickness.

DSTD is in the process of instituting several new course topics including the portable recompression chamber, the new generation of underwater hydraulic tools and an underwater ship husbandry package course for divers going to Intermediate Maintenance Activities and to a Mobile Diving and Salvage Unit. Many new topics have already been implemented, especially in the area of practical training. These include tower training (free and buoyant ascent), surf entries, more complete maintenance procedures for SCUBA, the open diving bell and personal records. Night dives and underwater hull inspections have been added to increase students' practical experience.

The Diver Second Class Training Department helps provide the world's best divers, a task that is achieved through perseverance and hard work by the staff and the students.

Search for the VIRGINIA RAM



The CSS VIRGINIA with the ram.

By LT R.E. Nisley
Mobile Diving and Salvage Unit TWO

Divers from Mobile Diving and Salvage Unit (MDSU) TWO recently completed an underwater survey of the Civil War era ship USS CUMBERLAND, which was sunk by the Confederate ship CSS VIRGINIA in the Spring of 1862 in the James River near Newport News, Virginia. The objective of the survey was to determine the feasibility of finding and raising VIRGINIA's 1,800 pound cast-iron ram. The confrontation between VIRGINIA and CUMBERLAND—which was won by VIRGINIA's use of this powerful ram—and the ram itself are historically important because they signified the superiority of the iron warship over her wooden predecessor.

The Confederates had reconfigured (and renamed) the VIRGINIA from the iron clad USS MERRIMACK, which had been scuttled by retreating Union forces early in the war. In addition to the ram at her bow, VIRGINIA had been equipped with an iron-covered casement sloping 40° positioned on her main deck, along with heavier armaments.

On the morning of 8 March 1862, the newly refitted CSS VIRGINIA steamed slowly from her berth at the stone drydock at the Gosport Naval Shipyard, Norfolk toward the Union fleet at anchor in the James River. Flag Officer Franklin Buchanan was in command of the ship's new crew, which included workmen who were completing repairs. VIRGINIA's mission was to confront and sink the CUMBERLAND, which was the Union's most heavily gunned warship.

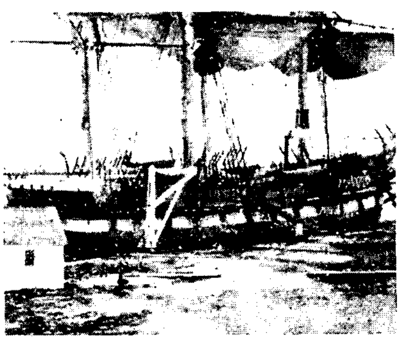
Steaming at five knots with thick black smoke billowing from her single smokestack and sunlight glistening from the grease smeared (to deflect cannon shot) on her sides, VIRGINIA struck a formidable appearance that morning. Although VIRGINIA was visible for miles as she approached the Union blockade, the ships in the vicinity were unable to maneuver into position for battle, because there was not sufficient wind for their sails.

VIRGINIA fired first upon the USS CONGRESS, which lay to her anchor near the CUMBERLAND. She then turned toward her target and rammed CUMMBERLAND on the starboard bow below the forechannel, simultaneously firing a bow cannon. CUMBERLAND fired volley after volley at VIRGINIA in a fruitless attempt to discourage the attack. Mortally wounded as a result of the ramming, CUMBERLAND lurched and began to sink as VIRGINIA backed down to free herself. In this process, the ram broke from its foundation on VIRGINIA's bow. CUMBERLAND quickly settled to the bottom of the James River with over 120 men trapped below on her gundecks.

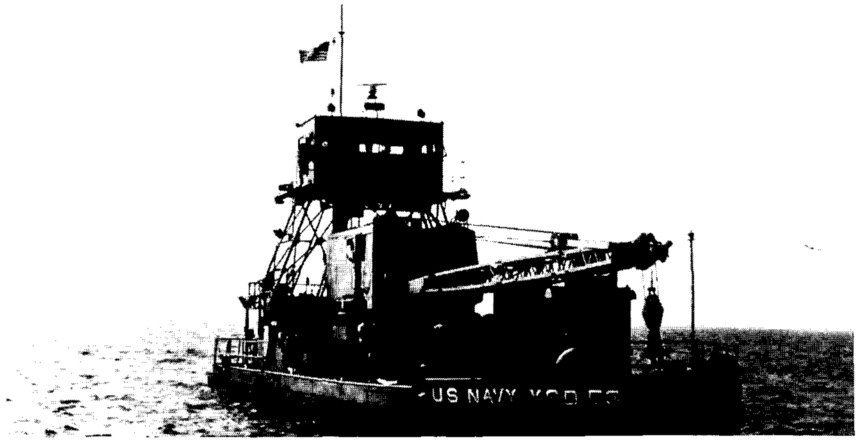
CUMBERLAND, to this day a grave for the men who defended her, remains the property of the U.S. Navy. Historical information on the ship has been maintained by Hampton Roads Naval Museum. Mike Curtain, curator of the museum, assisted the MDSU TWO survey team as they reviewed the history of the battle and developed preliminary determinations of the expected outcomes of their survey.

The survey team was composed of men and women from MDSU TWO, Reserve MDSU Detachments 101 from Portsmouth, New Hampshire and 304 from Philadelphia, Pennsylvania. Reservists attached to these units were also assigned to the search. The YSD-53, a converted sea plane derrick with a Fly Away Diving System (FADS) onboard, provided surface-supplied diving capability. The MK 1 and MK 12 surface supplied diving systems and a 35 foot work boat (WB) with a hand held fathometer were also deployed to the survey site.

Three principal goals were established before the survey began. The first—to locate the exact position of the CUMBERLAND. After the battle, CUMBERLAND's masts and rigging had been cleared to



The USS CUMBERLAND



The YSD-53 underway to search for the VIRGINIA ram.

allow unimpeded navigation of the river. Her site on the river bottom, however, was not positively marked. The second goal was to determine CUMBERLAND's disposition on the bottom—how and in which direction the ship was resting. Finally, the team would survey the CUMBERLAND's hulk for the ram, focusing their search on the starboard bow, where the vessel had reportedly been rammed. In planning and during the survey operation, every effort was made to maintain the structural integrity of the wreck and not to disturb its general condition.

Attempts to survey the CUMBERLAND were made in April and July. Both attempts were impeded by heavy commercial traffic in the waterway near the dive site, a river current of more than two knots and a complete lack of visibility on the bottom.

As a result of both surveys, the exact position of CUMBERLAND was determined near the western end of Pier "C," Newport News Marine Terminal, Newport News, Virginia. The vessel was found in 80 feet of water with the bow headed downstream and had a starboard list of approximately 30°. The wreck was covered with sediment. The deck was exposed and strewn with debris such as timber, river sludge, pilings and even oyster tongs. Her port side rose four feet above the river bottom amidships, tapering to the mudline forward. The starboard bow was well below the mudline.

The divers located an apparent access to the gundeck near what appeared to be the remnant of the deckhouse. In the process of the survey, three artifacts were recovered by the divers. They were later turned over to the museum representatives for proper handling and preservation. These items were a compass housing, a brass fuse touch hole cover that was engraved with the date 1858 and a brass plate that had apparently sustained battle damage.

Thirty dives were conducted in the two attempts and two of the original goals of the survey were accomplished. CUMBERLAND was accurately located after years of uncertainty and its orientation on the river bottom was determined. Unfortunately, the silting that has occurred during the 121 years since the battle prevented the divers from locating the ram. Any further endeavor to find the ram must involve removing the mud from the area of the starboard bow. It was estimated from the CUMBERLAND dimensions that the ram may lie as deep as 20 feet below the mudline.

Whether or not the ram is eventually located and salvaged, the significance of the ram and the memory of the CUMBERLAND, VIRGINIA and the crews who fought and died in that battle over a century ago shall always stand as testimony to their place in the history of naval warfare.

Historical information taken from Edward Miller's "Bound for Hampton Roads," *Civil War Times Illustrated*, Vo. XX, No. 4, July 1981.

NEDU Tests MK14 CCSDS during Deep Dive 1982

By LCDR Michael D. Curley
Navy Experimental Diving Unit

A 29-day, 1000 feet seawater (fsw) helium-oxygen saturation dive was completed by divers from the Navy Experimental Diving Unit (NEDU) as part of Deep Dive 1982. The dive took place in NEDU's Ocean Simulation Facility (OSF), one of the largest hyperbaric facilities in the world. The seven-man dive team worked approximately three months on the project.

The primary purpose of Deep Dive 1982 was to continue testing the life support capability of the MK 14 Closed Circuit Saturation Diving System (CCSDS). Secondary goals were to conduct graded exercise testing of the Superlite 17B open-circuit demand hard hat; to evaluate a semi-closed circuit emergency breathing apparatus for use in personnel transfer capsules with contaminated atmospheres; and to investigate the effectiveness of using a nitrogen-filled dry suit to keep a diver warm in a 0°C helium-filled chamber.

The Deep Dive team assembled at NEDU on 7 September 1982, ten weeks before the anticipated start of the dive. After a week of classroom studies, the team spent four weeks in a thorough training program on the MK 14 CCSDS in NEDU's 55,000 gallon test pool. Pool training was followed by two weeks of work in the OSF, during which each dive team member completed one graded exercise on a bicycle ergometer each day. The ergometers measure divers' cardiovascular output while they exercise at various pressures. In the two weeks immediately preceding Deep Dive 1982, divers completed four days each of 30 and 60 fsw workup dives.

On 16 November 1982, the seven U.S. Navy divers entered the OSF complex and were pressurized to 214 fsw. Twelve days were spent using the MK 14 CCSDS in upward and downward excursions from various saturation depths. All MK 14 CCSDS evaluations were conducted in the OSF's 55,000 gallon wet chamber filled with water and chilled to 35°F.

On the 13th day of the dive the complex was brought to 1,000 fsw, where the dive team remained for four days. While at 1,000 fsw, the divers participated in a dry thermal study investigating use of a Passive Diver Thermal Protection System (PDTPS). The system is designed to keep a diver warm at 1,000 fsw when the PDTPS dry suit outergarment is filled with nitrogen (vice helium). An upward excursion was made to 844 fsw on dive day #17, where the dive team engaged in two days of Superlite 17B and MK 1 Mod S testing. During the decompression phase of the dive, the emergency breathing apparatus was evaluated by members of the dive team at various depths. All studies planned for the dive were successfully carried out by the dive team members with the sustained support of NEDU watchstanding personnel. The results of the specific studies conducted are contained in NEDU reports.

Each saturation dive at NEDU provides a unique opportunity for training new and experienced personnel on the 10 OSF watch stations. During Deep Dive 1982, 19 men and women successfully passed rigorous oral and written watch qualification boards, resulting in an additional 27 watchstanding qualifications on the OSF. The high number of qualifications achieved during Deep Dive 1982 reflects credit on both the recently qualified personnel and the experienced watchstanders, all of whom maintain high levels of proficiency on the OSF system.

Dive team members included: MC(DV) J. Morrow (Team Leader), HMCM(DV) T. Holmes, HTC(DV) R. Pruitt, TM1(DV) R. Novak, HT1(DV) J.Jones, MM1(DV) R. Valentine and GMG2(DV) D. Luther.

Nitrogen-Oxygen Saturation Dive

Thirty-three days after the surfacing of Deep Dive 1982, another NEDU dive team entered the Ocean Simulation Facility to begin a five-and-a-half day nitrogen-oxygen saturation dive at 60 feet seawater (fsw). The purpose of this dive was to continue the validation of a 60 fsw extended air decompression procedure which was developed to expand the Navy's ability to treat decompression sickness and air embolism.

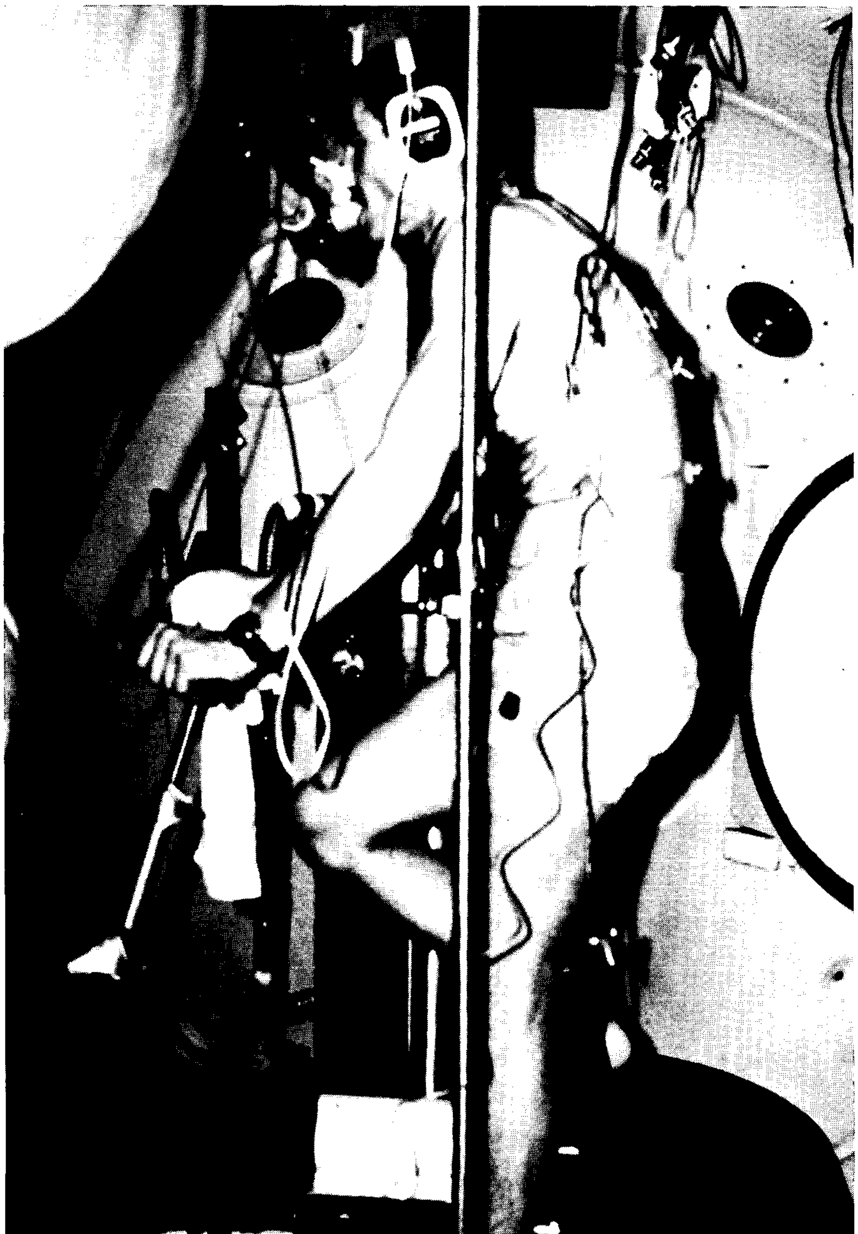
The dive team, dressed in the Passive Diver Thermal Protection System, dove the MK 15 closed circuit UBA in 35°F water to establish CO_2 canister duration at various operational temperatures.

On 17 January 1983, ten Navy divers were compressed to 60 fsw to carry out the MK 15 studies. Diving evolutions were carried out smoothly throughout the dive, and all divers were safely decompressed to the suface with no incidents of decompression sickness. The data gathered from the dive will contribute to the formulation of safe operational diving treatment table guidelines for the Fleet and MK 15 operational parameters.

Dive team members included: EMCS(DV) J. Cole (Team Leader), CDR H. Schwartz, CDR D. Whall, LCDR W. Evans, LCDR F. Butler, LT(N) E. Pahl, HTCM(DV) J. Scott, ETC(DV) P. Pavlow, EN1(DV) K. Lang, and QM2(DV) J. Sorenson.

Naval Hyberbaric Center

Launches Cardiovascular Dive Series in New Chambers



A subject in the dive study pedals a bicycle ergometer.

By Maureen A. Darmody
Editor
Hyperbaric Medicine Program Center
NMRI

Investigators at the Hyperbaric Medicine Program Center (HMPC), Naval Medical Research Institute (NMRI) in Bethesda, Maryland, are in the process of expanding the limited store of research on cardiovascular functions in divers. On 21 December 1982, under the direction of CAPT E.T. Flynn and his associates, Dr. T. Doubt and Mr. D. LeGrys, nine Navy divers completed the first series of dives in one of the new research chambers at the HMPC. The dive series, which started 13 September 1982, was designed to gauge cardiovascular function under pressure.

Cardiac output, or the amount of blood the heart pumps each minute, is one of the major indicators of a diver's level of tolerance to exercise. Until recently though, because investigators lacked a practical means of measuring cardiac output, research in this area had been secondary to studies on pulmonary function in diving. However, a new impedance device is now available that makes it possible to measure cardiac output conveniently and without discomfort to the subject.

The connection between cardiac output and divers' exercise tolerance is an important one. The ability to perform hard physical work is primarily contingent on a good supply of oxygen brought to working muscles through the blood stream. If cardiac output decreases, the flow of blood to the muscles will decrease and with it exercise tolerance. Previous studies have shown that heart rate decreases under increased pressure, especially if the oxygen partial pressure (PO_2) or the density of the gas mixture increases. Researchers do not know whether cardiac output also falls under these conditions or if it is stabilized by a compensatory increase in the volume of blood pumped per beat.

The primary purpose of this study was to measure cardiac output during exercise under both high and

Table 1: Experimental Conditions of Cardiovascular Dive Series

CONDITION	DEPTH (fsw)	INSPIRED GAS MIX
1	0	air
2	75	air
3	75	6.4% O_2, 93.6% N_2
4	150	air
5	150	3.8% O_2, 96.2% N_2

low oxygen pressures. If cardiac output decreases under pressure and is sensitive to the changing PO_2 of the breathing mixture, a mixture could be selected for operational use that would minimize this change and maximize exercise tolerance.

A secondary but equally important purpose of this study was to use the electrocardiogram to gauge the effects of increased pressure on divers. Several unexplained drownings of well-trained, physically fit divers have occurred, which some researchers believe may have been caused by sudden irregularities in their heart beats. Previous experimental observations indicate that this phenomenon does occur under increased pressure. In the current study, changes in the EKG readings of test divers were monitored in great detail by incorporating heavy work tasks and varied inspired oxygen pressures in the experimental design. As with the cardiac output tests, final data analysis should facilitate selection of a breathing mixture that will minimize the occurrence of irregular heart beat during exercises at depth.

The experimental design included three depths and five gas mixtures. It was intended to determine the effects of hyperbaric air and nitrogen-oxygen mixes on EKG, heart rate, cardiac output and heart contractile force (the rate and amount of force per beat with which the heart contracts). Experimental conditions are listed in Table 1.

Nine active divers and three standby personnel participated in the inaugural dive series. Each diver exercised continuously for 20 minutes on a bicycle ergometer at simulated depths of 75 and 150 fsw. At each depth the men breathed either air or a nitrogen-oxygen mixture containing normal surface pressures of oxygen (0.21 ATM). A similar exercise using air at the surface level served as a control.

During the 20-minute period of continuous bicycle exercise, the workload was increased every five minutes, from light to nearly maximal. Divers began the 30-minute test with a 10-minute rest period and advanced to four successive work levels at 75, 100, 150 and 200 watts. At each level, investigators obtained measurements of lung ventilation, oxygen consumption, carbon dioxide production, heart rate, EKG, cardiac output and heart contractile force.

All the heart data were obtained from impedance band electrodes placed around the diver's neck and chest. In addition to monitoring EKG, these electrodes measure the changing electrical resistance in the chest cavity of the heart's alternating contraction and relaxation cycle. This fluctuating resistance provides information about the rate of blood ejection from the heart and the volume of blood that is ejected per beat.

Researchers measured lung ventilation and oxygen consumption by collecting the exhaled breathing gas in a large plastic bag. Its volume was measured in a spirometer and oxygen and carbon dioxide concentrations were determined with instruments located outside the chamber.

CAPT Flynn and associates expect to complete the data analysis for this series of dives in several months. In the meantime, more dives are underway at the HMPC, for studies of maximum work capacity under pressure and the nervous control of the heart beat. Each dive series should contribute to the vitally needed store of knowledge on cardiovascular function in diving.

photos by
JOCS James Jones

Divers stand on the light supports during the concrete pouring operation.

UCT ONE

Divers Do Repairs

AT N.A.S. BERMUDA

By SN Terrie R. Sisco
Naval Air Station, Bermuda

The Seabees of Underwater Construction Team (UCT) ONE have recently been working on an underwater salvage and repair assignment at the Naval Air Station in St. David's, Bermuda.

Under the direction of LCDR Kevin Gross and CE1 (DV) Michael Oliver, the team, which is home-based in Little Creek, Virginia, is repairing runway lights at the Naval Air Station and doing some salvage work at the Navy Annex.

The runway light structures had been worn by age and salt water. Because these lights help guide incoming flights to safe landings, they must function properly at all times to insure smooth operations at the air station.

The UCT ONE divers used a large Navy barge as a diving platform to support this operation. They repaired the light supporters by using a combination of fiberglass and plywood forms which they placed around steel "H" beams that they had driven into the ocean floor. These fabrications provided a form for the concrete that was needed to strengthen the runway light supports.

"The first step in the repair was to scrub rust and marine growth off the light supports," Oliver said. "After we set up the new forms, we pumped in the concrete through a hose which was connected to a concrete pump on the beach." Once the concrete hardened, the forms were moved to Ferry Reach where they will be used in similar procedures on the lights there.

The repair work is expected to add several years of service life to the lights.

At the Naval Annex the divers removed old steel piles from an unused pier and boat house. "We had to cut the steel piles near the bottom using an electric cutting rig that burns through the steel," Oliver said. A crane was then used to remove the rusty pieces of steel from the bottom.

Although the UCT ONE team has been bothered by high winds and rough seas, they expect to meet their deadline for this project, Oliver added.

UCT ONE divers work to build the plywood forms around the runway light platform.

This clean-up operation will make the once-hazardous Annex waterfront more pleasant and safer for boaters and swimmers.

UCT ONE is one of two underwater construction teams. Underwater Construction Team TWO is home-based in Port Hueneme, California. Although both teams are trained to accomplish underwater work, they can carry out work in or out of the water.

The underwater construction teams rely on diving, but perform a mission that differs significantly from that of other Navy diving teams, such as fleet divers SEALS or Explosive Ordnance Disposal Units, LCDR Gross explained.

"Our primary mission is waterfront construction. Diving is just a means of accomplishing that mission," he said.

Some construction divers are trained to use explosives, which present one of the greatest dangers Seabee divers face. However, no explosives were used to accomplish the work at N.A.S. Bermuda.

"When we do construction work, we rarely blast with explosives," Oliver explained, "because there are often safer, more practical methods of getting the job done."

The UCTs support military installations around the world and are constantly looking for motivated Seabees interested in becoming a part of the team. Interested individuals should refer to the Naval Personnel Command Manual, Chapter 14.

NEDU REPORTS

Evaluation of Commercially Available, Wrist-Worn Depth Gauges.

J. R. Middleton, J. F. Tobias, B.E. Webb.
NEDU Report 2-82. AD No. A119834

Abstract:

Twenty-eight models of commercially available diver wrist-worn depth gauges were evaluated by the Navy Experimental Diving Unit. All gauges were tested to determine accuracy, repeatability, watertight integrity, thermal stability, durability, readability and luminescence capability. The depth gauges tested represented a comprehensive survey of the available market. Test results showed the vast majority of the models to have an accuracy of ± 5 feet seawater (fsw). Under some test conditions, this degraded to ± 10 fsw or greater. Two samples of each model were tested. In several cases, gauges marketed by different manufacturers had the same internal mechanism. Given the repeatability, size of the gauges, cost and manufacturing techniques available to the industry at the current time, no operational difference was perceived in performance of any gauge evaluated. Once a calibration check has been performed, all are considered satisfactory for U.S. Navy SCUBA use, with the exception of special explosive ordnance disposal nonmagnetic requirements.

Manned Testing of the Superlite 17B Diving Helmet Compared with the MK 1 Mod S Diver's Mask

H. J. C. Schwartz. NEDU Report 4-83

Abstract:

The Diving Systems International Superlite 17B helmet underwent manned performance testing at a simulated depth of 850 feet of seawater during a helium-oxygen saturation dive in the Ocean Simulation Facility. The Navy MK 1 Mod S Diver's Mask was tested at the same time as a basis of comparison. Four subjects performed a total of 12 graded exercises (50-150 watts) on a submerged bicycle ergometer. Breathing characteristics of both UBAs were satisfactory and capable of supporting heavy exercise at 850 fsw. Maximum end tidal CO_2 in mmHg at 150 watts was 55.2 ± 5.9 in the Superlite 17B in a 45° head-up position, 48.0 ± 9.7 for the Superlite 17B in the 45° head-down position, and 57.5 ± 8.2 for the MK 1 Mod S Diver's Mask in the 45° head-up position. A microphone manufactured by the U.S. Navy was substituted for the Superlite 17B microphone and provided better communication at depth.

Manned Evaluation of MK 15 Closed-Circuit UBA Cannister Duration at 13.4°C and 2°C

F. R. Jaggears, Jr. NEDU Report No. 6-83

Abstract:

The CO_2 absorbent cannister duration of the MK 15 closed-circuit Underwater Breathing Apparatus (UBA) was evaluated during moderate exercise in cold water of 13.4°C and 2°C at 65 fsw. The Passive Diver Thermal Protection System (PDTPS) was worn during the study to evaluate the thermal protection it provides at 65 fsw. Results demonstrate that the safe operational limit of the MK 15 UBA is 117.5 minutes at either 13.4°C or 2°C and the PDTPS provides adequate thermal protection to the diver operating in these temperatures at 65 fsw.

Unmanned Evaluation of the U.S. Navy MK 16 First Article Closed-Circuit UBA

J. R. Middleton. NEDU Report 7-83

Abstract:

In accordance with Naval Sea Systems Command Task No. 78-19, the Navy Experimental Diving Unit (NEDU) conducted unmanned performance testing on two first production article MK 16 underwater breathing apparatus (UBA) in October 1982.

Breathing resistance/breathing work and oxygen (0_2) set-point control studies were conducted in the NEDU Experimental Diving Facility (EDF) on air and helium oxygen (HeO_2) at depths to 300 fsw using a hyperbaric breathing simulator. In addition, carbon dioxide (CO_2) absorbent canister durations were conducted on both air and HeO_2 at depths to 300 fsw in water temperatures ranging from 29 to 90°F.

Results of the unmanned performance testing revealed the breathing resistance/breathing work and CO_2 absorbent cannister durations were slightly improved over the pre-production model tested in January 1980. Initial testing of the MK 16 first article 0_2 set-point control system showed both units to be operating properly and within established limits. However, each UBA 0_2 add system completely failed to calibrate in the latter stages of the evaluation. This failure requires that follow-on testing of the MK 16 O_2 add system be conducted. (Editor's note: Since NEDU Report 7-83, additional satisfactory testing has been completed.)

Evaluation of DIVEX AGA Commercial Mask

J. R. Middleton, W. A. Evans, M. G. Jantzen, R. C. Maulbeck. NEDU Report 9-83

Abstract:

Between September 1982 and January 1983, an open circuit demand full-face mask (FFM) was evaluated in both manned and unmanned modes on air in accordance with NAVSEA Task No. 81-3. The mask, designed for use with open circuit (O/C) SCUBA, is produced by AGA SPIRO of Lindingo, Sweden and modified for the umbilical supplied use by Divers Exchange (DIVEX) of Harvey, Louisiana. The purpose of the task was to provide unmanned performance data and open water operational data to aid in the selection of a new FFM to replace the current U.S. Navy Lightweight Mask (Jack Browne).

Unmanned breathing resistance, respiratory work and umbilical pressure drop studies were conducted using a hyperbaric breathing simulator at depths up to 198 fsw at simulated work rates ranging from light to extreme. The tests were conducted using the two umbilical sizes currently found in the fleet.

In addition, open water manned testing was conducted on board an operational submarine tender where human and operational factor considerations were evaluated.

Results of unmanned testing revealed the DIVEX AGA commercial mask to perform adequately for shallow water diving operations not exceeding 66 fsw with either 3/8 or 1/2 inch inside diameter (ID) umbilicals in both 200 and 300 ft. lengths tested. Breathing resistance and breathing work values were within the performance goals specified at depths up to 60 fsw.

Manned testing showed the AGA mask to be a lightweight, easy to use and maintain underwater breathing apparatus (UBA). The DIVEX AGA commercial mask requires human factors modifications to the purge button, the communications electrical connector, and to a device aiding valsalva and subsequent NEDU testing before it could be considered an adequate replacement for the current USN Jack Browne FFM. In addition, topside over-bottom pressure control is required when using the DIVEX AGA mask which will require operating procedures and possibly equipment that is not used with the Jack Browne mask.

FACEPLATE ANNOUNCES LETTERS TO THE EDITOR

FACEPLATE will be printing letters to the editor beginning in the Spring 1984 issue. We welcome letters on all subjects. All letters should be signed though names will be withheld on request. Letters published in FACEPLATE express the views and opinions of the writer and do not imply endorsement by the Navy.

Address all letters to FACEPLATE, Supervisor of Diving (SEA OOC-3), Naval Sea Systems Command, Washington, D.C. 20362.

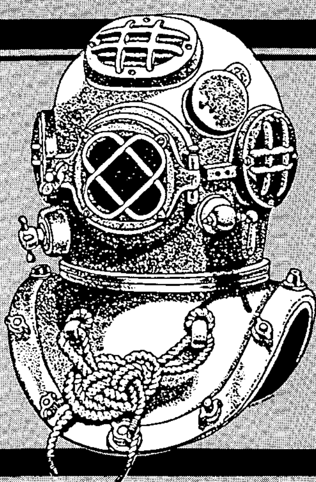
View from the SUPERVISOR OF DIVING

By LCDR Raymond Swanson

I recently returned from a meeting of the International Exchange Program, IEP B-12, conducted at HMS VERNON, Portsmouth, England, last November. Attended by members of the United States, Canadian, Australian and Royal Navy diving communities, the meeting was conducted under the auspices of formal International Exchange Agreements whereby technical information on all phases of diving is exchanged freely and discussed in depth for the benefit of all participants. Normally, I would devote this column to discussing the technical recommendations developed during the proceedings; however, I also want to share with you two common underlying problems that arose continuously throughout the meeting. Although they were not on any formal agenda, nor were they individually discussed, these problems were mentioned subtly during informal talks. The common thread of these issues clearly indicates that professional diving doesn't vary much from one nation to another.

The first issue was diving accidents. Representatives of each Navy reported that equipment failures were almost unheard of and only limited procedural errors occurred. The blame almost universally rested with operator error. Participants at the meeting agreed that careful scrutiny in diver candidate selection and effective diver training at our diving schools, coupled with supervision by well qualified and proven divers in the fleet, are the most important factors to improving our diving safety records and reducing casualties.

The second issue was budget planning and diving equipment acquisition. All divers want the latest and best; however, the budget cycle does not permit sporadic changes of equipment development every time a new piece of commercial equipment enters the market. Trade brochures frequently overstate equipment's performance—only through military test and evaluation can the repetitive performance capability of that



equipment be proven. The U.S. Navy must also consider certification requirements. Many of you feel that headquarters moves slowly in acquiring new equipment, and in some cases that is true, but only the best equipment—that which has been satisfactorily tested and evaluated —reaches the fleet diver or is approved for Navy use.

The Supervisor of Diving is the U.S. Project Officer at International Exchange Program meetings. U.S. participation usually consists of senior personnel from Naval Sea Systems Command, Navy Experimental Diving Unit, Naval Medical Research Institute and various Navy laboratories. An invitation is also extended to the fleet and their attendance is welcome.

The typical Information Exchange Program agenda begins with review of each nation's diving achievements, including operations, R & D and equipment acquisition. The reviews are oriented to R & D. Presentations at the November meeting covered diving medical and treatment table research, closed-circuit SCUBA decompression development and oxygen toxicity, carbon dioxide absorbent and thermal protection studies and diver tools and techniques.

After the presentations, the real work of the meeting begins. Representatives from participating countries, in this case the United States and the United Kingdom, form working groups which examine each country's requirements and determine how we can assist each other by coordinating our efforts. Substantial amounts of information are exchanged in these working groups. At this past meeting three groups covered the broad subject of physiology, communications and general thermal protection and breathing equipment. Some of the specific topics discussed included fiber optic development, diver's gas heating, standards for breathing equipment, defibrulation in chambers and CO_2 build-up in rebreathers.

As you see, the meetings are oriented toward R & D. The exchange of ideas and techniques provides the U.S. with much valuable information. For example, the standardization of unmanned test procedures gives us a baseline of data on much of the breathing equipment tested by the United Kingdom. It also reduces the amount of equipment we must test and allows us to devote more time and money to other areas of interest. This example is but one of many instances where results of the United Kingdom's research can be directly applied to U.S. diving systems or procedures.

The OLD MASTER

By TMCM (MDV) Bill Gholson

Have you ever received long awaited new equipment or repair parts only to find that the material was damaged or deficient? This experience can be frustrating. It can affect your command's ability to perform its mission and even endanger personnel, if the damaged item is installed in your existing equipment.

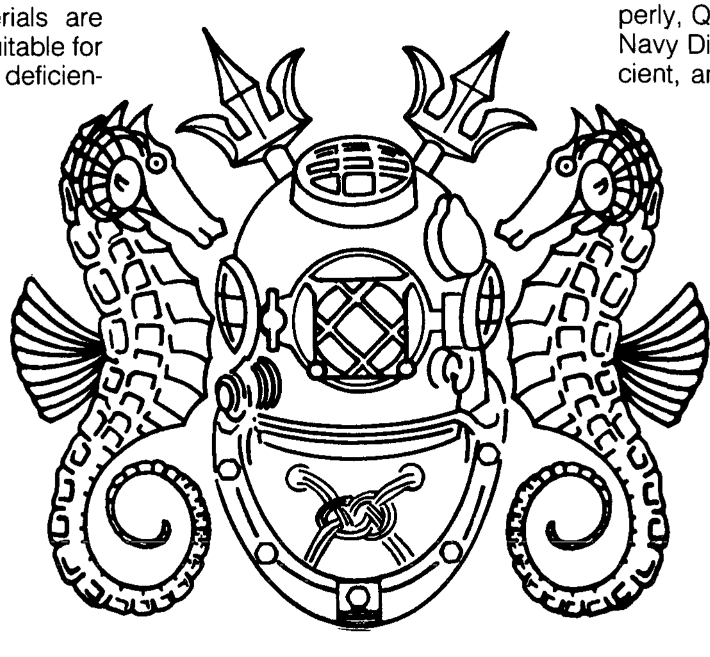
The Naval Supply System has a program for reporting these quality deficient materials—Naval Supply Instruction (NAVSUPINST) 4440.120E. It is important for Navy divers to be familiar with it. Your command's supply officer should have a copy.

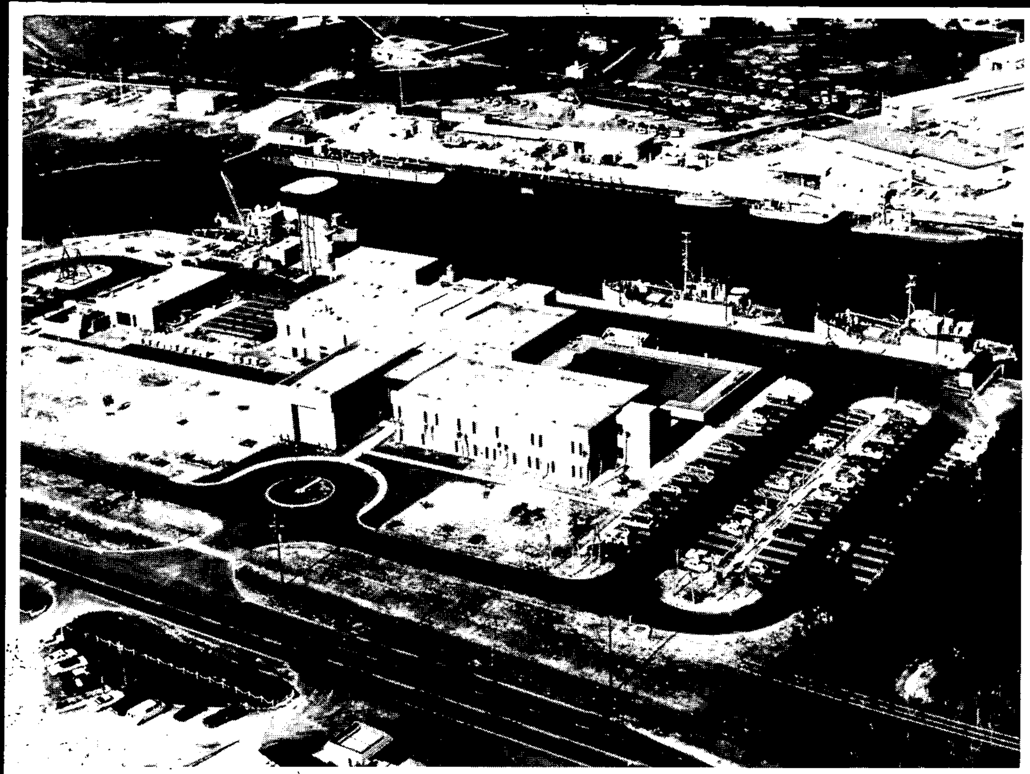
The quality deficient reports, better known as QDRs, normally apply to materials which have been accepted into the supply system; however, in cases of danger to personnel, these procedures may be applied to locally purchased nonstandard materials.

Quality deficient materials are parts or equipment not suitable for their intended use due to deficiency in design, material or procurement. These deficiencies can include chemical, electrical, functional or physical discrepancies that cause nonconformance with contractual or specification requirements. It may also include deficiences attributable to ambiguous, improper, incorrect or omitted contractual requirements, including the procurement document or its referenced documents that describe the technical requirements of the material, for example, the documentation required for level one or O_2 cleaned material.

There are two QDR categories. Category 1 is a product quality deficiency which may cause death, injury or severe occupational illness; cause loss or damage to a weapon system; or directly restrict the combat readiness capabilities of the using organization. When Category 1 is assigned, a QDR message report is required within 24 hours after discovery of the deficiency followed by a completed SF 368. Category 2 is a product quality deficiency which does not meet the criteria set forth for Category 1. When a Category 2 deficiency is identified, a QDR (form SF 368) must be submitted within five working days.

NAVSUPINST 4440.120E uses terms familiar to supply corps personnel and is necessarily complex, but don't let that throw you. Your job at the deckplates level is to recognize the problem and then follow up by notifying responsible individuals within your chain of command and the supply department. A divisional training session with a guest speaker from your supply department may be the easiest way to get up to speed on QDRs. We all need to understand and use the system. If utilized properly, QDRs will make our jobs as Navy Divers more productive, efficient, and above all, more safe.





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