

# Deep Dive

## NAVAL SUPPORT ACTIVITY PANAMA CITY PROVIDES THE EDUCATION, EXPERTISE FOR DIVERS TO LEARN THEIR TRADE

BY EDWARD LUNDQUIST, SPECIAL CORRESPONDENT

From training to testing, Panama City, Fla., is the Navy's center of excellence for diving. Divers for five armed services are trained here. Equipment and procedures are tested here. And new technologies are developed here. That is because there is no other place in the world with people with this combination of experience, education and expertise, as well as the facilities and equipment dedicated to military diving.

The Naval Support Activity Panama City is home to the Naval Diving and Salvage Training Center (NDSTC), Navy Experimental Diving Unit (NEDU), the Naval Surface Warfare Center Panama City Division (NSWC PCD) and the Center for Explosive Ordnance Disposal and Diving (CEODD).

NSWC PCD creates, maintains and modernizes a lot of the products used by divers. NEDU tests and certifies the products for fleet use. NDSTC trains users to use the products created and tested by the other two commands. And CEODD manages the careers for the EOD and diving communities.

### Pool of Talent

"Our mission here is to train the next generation of divers for all the various branches. We have all the services train together under one house — Army, Navy, Air Force, Marine Corps and Coast Guard — not to mention we also provide for inter-agency," said Cmdr. Cameron Chen, NDSTC commanding officer. "We have FBI, state law enforcement, everybody coming here, training together, going through the same courses."

That means the divers are all trained to the same Navy standard.

"Special Operations Command has their own standards, but most Navy divers will end up supporting the vast majority of SOF [Special Operations Forces] diving requirements, so there's a lot of cross-pollination that occurs here," Chen said. "We all work together."

"We have about 1,300 students come through the door here each year," he said.

Chen said NDSTC has a staff of about 240 staff, with 140 serving as instructors and the rest contractors and government civilians. Each service contributes instructors and a share of the overhead.

The school has six recompression chambers, plus one that is deployable, which is most likely the most chambers in use in one place anywhere.

"We have a huge engineering staff to support the systems," Chen said.

The school's chambers are set up for training, but the life support equipment is rooted in the submarine community, and the Navy diving program leverages that equipment and expertise. "Maintaining the necessary level of certification on our systems requires a highly proficient engineering team. That's our biggest reason why all the services want to come and be involved here, because we have all that," Chen said.

According to Chen, the school logs 1 million minutes of dive time a year.

"Twenty percent of all diving across DoD [Department of Defense] happens right here at this schoolhouse. And we do this safely. I don't think we need to be so risk intolerant that we fail to operate in an environment that can help us accomplish our missions.

"The most gratifying part of the job is the graduation ceremonies with the families and seeing how proud our graduates are to join and be a part of this heritage of Navy diving," he said.

Similarly, CEODD provides agile and adaptive training to all services, select countries and government entities; delivering knowledge to satisfy validated training requirements and improve Navy and joint force operational readiness. It also develops and manages the personal,

professional and leadership development programs for all Navy EOD and diver officer and enlisted personnel.

“Our mission is training divers and EOD technicians from all services, using the latest tools, tactics and procedures to provide the rigor, relevancy and realism of training to accomplish their mission,” said Lt. Cmdr. Brent Wadsworth, director of Training.

CEODD and NDSTC also provide diving courses that support other naval requirements to include Seabee divers, undersea medical officers, Army hard hat divers, U.S. Coast Guard divers and foreign military divers. Air Force and U.S. Marine Corps combat diver courses of instruction are co-located at NDSTC and utilize the CEODD/NDSTC support structure to execute their training mission.

CEODD also manages the Naval School of Explosive Ordnance Disposal, located nearby on Eglin Air Force Base, Fla., that provides high-risk, specialized, basic and advanced EOD training to more than 2,200 U.S. and partner nation military and selected U.S. government personnel each year.

Combined, the center has 35 different courses of instruction and a throughput of approximately 1,800 students per year, with an average of 700 students in training at any given time.

## Gear Issue

With a focus on the littoral environment NSWC PCD has four primary mission areas: mine warfare; naval special warfare; diving and life support; amphibious and expeditionary warfare and other missions that occur primarily in the littorals

Dave Junker, a retired Navy saturation diver, is the project manager for EOD and fleet diving systems in service engineering and depot functions at NSWC PCD Diving and Life Support. His team manages the logistics, documentation and conducts repairs and modifications for gear used by military divers, including several rebreather systems. One piece of gear commonly found throughout the fleet is the MK 16, a deep-diving, low-magnetic, electronically controlled,



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Navy Diver 2nd Class Kent Knudson, a command diver at the Navy Experimental Diving Unit, carries wrenches through the Ocean Simulation Facility at Naval Support Activity Panama City, Fla., Jan. 23 prior to making a saturation dive during which he was one of six Sailors who were compressed to a depth of 500 feet.

gas-blending rebreather that uses galvanic oxygen sensors and a computer to introduce pure O<sub>2</sub> into the breathing loop, where it mixes with inert components of the gases, air or helium, while the CO<sub>2</sub> is absorbed.

It's useful for divers who are identifying or disrupting mines because the MK 16 emits no bubbles, doesn't make noise and has virtually no magnetic signature. There are about 300 MK 16 sets in the fleet today.

Junker and his team support other rebreathers, such as the Viper, MK 25 and MK 28. The Viper is a semi-closed loop underwater breathing apparatus (UBA) that injects a constant dosage of a mixed gas nitrogen and oxygen into the breathing loop. Viper is used for surf zone mine countermeasures missions to the lanes for amphibious landings.

The LAR V Draeger MK 25 rebreather is a closed-circuit, chest-mounted SCUBA device that uses 100 percent oxygen. The expelled breath is recycled into the closed circuit where the carbon-dioxide is filtered out. The MK 28 UBA electronically controlled closed-circuit rebreather is used by a Navy special

diving detachment, and is a modified version of the commercially available Megalodon UBA.

## Test Dive

According to NEDU Commanding Officer Cmdr. Jay Young, NEDU provides equipment and procedural testing and evaluation for new and modified Navy diving equipment, and physiological performance research development, test and evaluation, in an effort to better prepare divers and special operations forces to safely execute their missions.

“We have sponsors from around the Navy, including program sponsors and operating forces who send us equipment or procedures to test and evaluate, or task us to do different physiological testing for them. So, a lot of our customers are NAVSEA [Naval Sea Systems Command] program offices, Special Operations Command and the Navy Special Warfare Groups,” he said.

NEDU can create a wide range of test depths, temperatures, salinity and other environmental factors to simulate where the equipment might have to operate. Testing can be done unmanned or with divers.

“We provide independent test and verification for diving and life support systems,” said Chief Warrant Officer 5 Ray Schubert, NEDU operations officer and command diving officer. “We don’t certify. SUPSALV [supervisor of salvage] does that. We test and provide responses to inform the certification process.”

According to Schubert, most of what NEDU does is revalidation of testing of in-service equipment from diving hats and SCUBA regulators to contaminated water dive systems. But it does get involved in some unique and sophisticated testing, most of which is classified.

New or modified gear usually starts with unmanned testing to the requirements. Once NEDU is satisfied that it’s safe for human performance or human use, it is tested in NEDU’s 15-foot test pool.

“A diver can breathe and operate and see how it works compared to other equipment in that controlled environment. We have safety divers, so if something goes wrong we can get the diver up pretty quickly. If there’s a requirement to go deeper, we would use our OSF [Ocean



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A Navy diver trains at the Naval Diving and Salvage Training Center pool in Panama City, Fla. About 1,300 students from all of the military services, as well as the FBI and state law enforcement agencies, receive training at the center each year.

Simulation Facilities] to test equipment to 100 feet, 200 feet, or 300 feet. We can also test in open water,” Young said. “It all depends on what the sponsor wants us to do.”

The OSF is a one-of-a-kind series of compression chambers.

“The people who come here to maintain or operate the OSF will never encounter a recompression system as complex as that. Ever. They don’t exist in our Navy and they don’t exist in the world. When they leave, they have a huge amount of experience and expertise that they would not get had they not come here,” Young said.

NEDU is involved in physiological studies to determine how diver performance is affected in different situations.

“Reduction In Performance is a physiological evaluation where operators would like to know, given a scenario with a diver breathing a certain gas mix — maybe 100 percent oxygen — in the water for a certain period of time before he arrives at the beach, project site or whatever mission the diver is going to conduct, and how that affects energy, strength and stamina over time,” Young said.

## Innovation Hub

Midé Technology of Medford, Mass., came to Panama City to test its new articulated joint design for atmospheric diving suits (ADS) using NSWC's Hydrospace Lab. The new joint operates very differently than existing ring joint technology used in current ADS, allowing ADS divers to move more naturally and the ADS to perform a wider variety of tasks at depth.

According to Midé's Jared Keegan, the company worked with the projects sponsor, the Office of Naval Research (ONR) Undersea Medicine Program, and a technical point of contact to evaluate if the joint could survive and flex properly at depth.

"PCD's test facility is one of the few labs in the world where we could test the joint under the required operational pressures for deep dives. For the effort we designed a custom test arm to fit within PCD's chamber, which was capable of surviving depth pressure, flexing the joint and measuring key performance parameters including joint torque. At PCD we were able to proof the joint and get the data we needed," Keegan said.

Midé has developed the technology as part of the Navy's Small Business Technology Transfer program, which is similar to the Small Business Innovation Research program, but involves the participation of research partner consisting of a university, Federally Funded Research and Development Center or a qualified nonprofit research institution. In this case, Midé is working with the Massachusetts Institute of Technology and industrial partner Phoenix International.

"NSWC PCD is providing subject matter experts to assist ONR and Midé in their research and development of a novel joint design for an atmosphere diving suit. This collaboration stems from our corporate knowledge of hyperbaric life support and legacy one atmosphere suits," said NSWV PCD Project Manager Dr. John Camperman. "We are participating at the request of ONR, including joint tests with Midé researchers in our Hydrospace Laboratory to find new technology that supports undersea human intervention without the decompression constraints that accompany wet divers."

The Hydrospace Laboratory supports all branches of the U.S. military, as well as non-military government activities. It provides an unbiased venue in which to evaluate and measure the functionality and safety of equipment under investigation, both commercial and in development. The lab has the hardware, software and staff to perform hyperbaric equipment tests, precertification and quality assurance tests, gas and liquid flow studies, heat transfer studies, simulated manned testing and hyper/hypobaric environmental simulation with real-time data acquisition, reduction and display.

Paragon Space Development Corp., in Tucson, Ariz., has leveraged its experience in designing and fabricating life support systems and space suits for astronauts to help divers operating in contaminated water. Responding to a Small Business Innovation Research topic from the Navy, Paragon developed a contaminated water dive system that can be used in water contaminated with fuel, chemicals, biological material or other toxic substances.

Dry suit dive systems use silicon seals that can be compromised depending on the chemicals, and breathing exhaust valves can let contamination into the suit.

"We took a standard dive helmet and modified it with our return surface exhaust system. When a diver exhales or releases air from the dry suit, the exhaust goes to the surface where contaminated water can't be introduced to the suit or helmet," said Paragon's Patrick Pasadilla. "We've developed a new suit dump valve connected to our exhaust system, effectively isolating the suit from the environment."

## Mastery of the Seas

Divers learn their trade at Panama City. And they come back when they are ready to prove they have mastered it. For Navy divers, the second-class diver is an operator; the first-class diver is a supervisor; and the master diver is the culmination of achievement for a career diver with operational sea and shore experience, and who has passed a rigorous exam.

"We need to grow an individual over the course of a career to be more proficient in the water space," Chen said. "Just like a pilot needs flight hours, divers need time in the water before they progress to more difficult or dangerous tasks."

NDSTC is responsible for evaluating and certifying master divers, the highest level of proficiency.

"We take about four per class — and we run drill after drill after drill after drill, in all the different areas, in different levels of duress, so that we make sure that they're proficient," Chen said. "There is a curriculum, with some preparatory work and classroom time. But what we want to tease out is that gray area where there's no book answer, or there's conflicting guidance. We train to a level that is beyond what we've taught, and to be able to deal with the unknown.

"They need to make good decisions out there, get the job done, and then explain to us what they did and why. We want to see their math more than the answer. We want them engaged in thinking and not just regurgitating a tech manual," he said. ■

*Edward Lundquist spoke with Navy diving experts at Panama City, Fla.*