



WAVES

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Cover Image:

Courtney Jones

On Nov. 1, 2018, the USS John P. Murtha (LPD 26) recovered the test version of the Orion capsule at sunset in the Pacific Ocean. Photo edited by NASA/Ron Beard, Photo credit: NASA/Tony Gray

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ABOUT NSWC CARDEROCK DIVISION

Naval Surface Warfare Center (NSWC), Carderock Division is the Navy's center of excellence for ships and ship systems. For more than 100 years, Carderock has helped preserve and enhance the nation's presence on and under the seas. Carderock is the full-spectrum research and development, test and evaluation, engineering, and Fleet support organization for the Navy's ships, submarines, military watercraft and unmanned vehicles with insight into new concepts and diverse technologies for the Navy Fleet of the 21st Century. The Division's expertise spans from naval architecture and marine engineering, to electrical and mechanical engineering, to computer engineering and physics.



Carderock Division's unique laboratories,

modeling and simulation facilities, at-sea-assets, and large-scale, land-based engineering and test sites at our headquarters in West Bethesda, Maryland, and seven detachment locations across the country contribute to the full-spectrum nature of our mission. Carderock Division will continue to solve challenging engineering problems to meet future Fleet needs.

MISSION

Carderock's mission is to conduct world-class ship design and engineering that protects our Sailors and Marines and allows them to deliver combat power at sea.

VISION

Our vision is to be the Navy's trusted partner for identifying and providing world-class, cost-effective and innovative technical solutions for advanced ships and ship systems, enabling the warfighter to execute their missions and maintain their technological edge.

CORE EQUITIES

Full-spectrum, life-cycle naval architecture and marine engineering for ship, submarines, boats, craft and unmanned vehicles

- Ship Design and Integration
- Hull Forms and Propulsion Systems
- Structures and Material Systems
- Environmental Quality Systems
- Vulnerability and Survivability Systems
- Signatures and Silencing Systems

CARDEROCK DIVISION LEADERSHIP



CAPTAIN TODD E. HUTCHISON, USN COMMANDING OFFICER

Capt. Todd E. Hutchison became the 39th Commanding Officer of NSWC Carderock Division in July of 2020, in the midst of a pandemic. He came from Guided Missile Frigate (FFG(X)) Program Office at Naval Sea Systems Command in Washington, D.C., where he had most recently served as the Principal Assistant Program Manager for the Test and Evaluation Branch.

After college at Appalachian State University, Capt. Hutchison initially enlisted in the Navy in 1995 and after boot camp, he completed nuclear qualification at Nuclear Prototype Training Unit. During that school, he was accepted for Officer Candidate School and was commissioned in 1997.

As an officer, Capt. Hutchison's background is as a Surface Warfare Officer, culminating in a tour as the Commanding Officer aboard USS MICHAEL MURPHY (DDG 112). This experience has given him a unique perspective of the importance of the work that is done at not only Carderock, but the other Warfare Center Divisions.

LAWRENCE TARASEK, SES TECHNICAL DIRECTOR

Lawrence Tarasek was appointed to the Senior Executive Service in September 2018 and became Technical Director for NSWC Carderock Division. Prior to that, he had served as the Deputy Technical Director for seven years.

Mr. Tarasek started his career in February 1985 in the Signatures Department at Carderock Division performing engineering design work for the SEAWOLF submarine program. This work encompassed design and testing for numerous SEAWOLF silencing components and integration of these components into a balanced ship design. He has extensive experience in every phase of the submarine life cycle and has supported acquisition design and in-service submarine platforms.

In his current position, Mr. Tarasek oversees the research, development, test and evaluation, analysis, systems engineering, design, integration and certification of complex naval warfare systems related to ships and ship systems, combatant craft and Marine Corps vehicles for the Carderock Division.

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Carderock's Hidden Gem for Acoustic Signatures Testing

By Edvin Hernandez, NSWCCD Public Affairs

Home to the world's largest unmanned submarine, Naval Surface Warfare Center, and manpower. Take Cutthroat, the Large Carderock Division's Acoustic Research Detachment (ARD) in Bayview, Idaho, is the Navy's hidden gem for acoustic signatures testing. The detachment, which occupies 25 acres next to Farragut State Park and sits on the shore of Lake Pend Oreille, evaluates the acoustic performance of large-scale submarine and surface ship models.

The lake, according to ARD Site Director Seth Lambrecht, is ideal for testing because of its geographical location and quiet waters.

"The rivers and inlets are all on the North side of the lake, so the entire South end of the lake is an almost laboratory static environment that is 1,100 feet deep," he said. "The flat bottom of the lake and its isothermal condition - 100 feet below the surface - make it ideal for mathematical analysis."

Lambrecht is responsible for ensuring the safety, security and environmental aspects of the detachment in tangent with "The testing done here at ARD has achieving Carderock's mission. He joined the command in 2005, starting at the West Bethesda, Maryland, headquarters, before moving to Idaho where he has worked for the past 12 years.

In 1942, the Pacific Northwest base was used as a World War II training facility. and was eventually transferred into Carderock's possession in the 1960s.

"Once the Navy realized that Lake Pend Oreille was one of the best locations for acoustic testing around the world, they started bringing different test platforms for evaluation," Lambrecht said. "Since then, everything has evolved and continued to grow here."

Testing at ARD requires careful planning Scale Vehicle 2 (LSV 2) and world's largest unmanned submarine, as an example. John Becker, the LSV chief engineer, said it takes about a third of the ARD workforce to prepare, operate and analyze data for a typical LSV 2 underway.

"As the chief engineer, my primary responsibility is to ensure the LSV operates safely and meets Naval Sea Systems Command (NAVSEA) requirement for the LSV program," he said. "LSV 2 is a one-third scale Virginia-class submarine model, which is different from its predecessor – LSV 1 – which was a guarter-scale SeaWolf-class submarine model. When it goes out for testing, it is a full day's work – we start early and end late."

The detachment uses long-range arrays and the Intermediate Scale Measurement Systems (ISMS) to provide unique acoustic test capabilities, including radiated noise and onboard data collection.

contributed to many improvements in submarine systems and features including propulsors, bow area designs, treatments, sonar systems and many others," Test Operations Manager Steve Finley said. "There are four major ranges here on the lake. The oldest one is a buoyant vehicle range, which consists of haul-down that pulls the model down to the bottom of the lake to take on onboard data. The LSV range is similar to a full-scale submarine range; it has two vertical arrays with the LSV running between them for making radiated noise measurements. The ISMS range is the most complex underwater structure in the world. It consists of 158 hydrophones and 36 projectors – all to take target strength measurements as



well as radiated noise measurements and test advance sonar and underwater systems. Finally, the yellow barge, which is in 600 feet of water just one mile from our Bayview site is where calibration and smaller model and UUV testing is done."

The data acquired from these ranges is important to the greater Navy because it offers critical evaluation and analysis of submarine signatures underwater, target strength testing and attributes to keeping the warfighters safe at sea.

"All of the data that is transferred to West Bethesda from model testing here in Bayview is processed and used to answer questions on full-scale submarine platforms," Lambrecht said. "We look to improve them and make them more effective for our fleet."

LSV 2, which is named after the cutthroat trout, follows suit in a local tradition at ARD that names its vessels after local fish species. When a group of students from an elementary school toured the naval base on a field trip, they were given the choice to make the

name permanent. The rest, as they say, is history.

"Our Cutthroat model has similar systems that a full-scale submarine would have," Becker said. "The front part of the vehicle is almost all batteries – there are 1,680 lead acid batteries just for the main motor. West Bethesda personnel." We also have a computer system that contains the autonomous software that allows the LSV 2 to operate on the range. The model is used to predict full-scale acoustic performance for submarines."

Cutthroat is not the only submarine model that is tested at ARD. In August, Carderock employees at the detachment recovered their Pike model, a Columbiaclass submarine model, from the ISMS range after testing and craned it in to one of their shops.

"The Pike model, once deployed on the ISMS range is tested underwater for one to eight weeks at a time," Finley said. "We take nearly continuous data on it through the fiber optic cable and process all range and onboard sensors and transducers. Everything is controlled and

recorded via the 14-mile fiber-optic cable Impact Statement," he said. "We follow in the laboratory, back at the base. Once the testing is completed, the model is pushed back into this Model Engineering Support Facility and configuration changes are made while the data is processed and analyzed, typically by

SeaJet is another model that is docked at the facility and, unlike Cutthroat and Pike, is a surface ship model generally representative of USS Zumwalt (DDG 1000). It is a guarter-scale model that supports radar cross section and underwater electromagnetic testing.

There are some challenges to collecting acoustic data at the base, however. The noise produced by public boat traffic, for example, is one way that data can be contaminated, as well as inclement weather. Lambrecht added that the lake is unpopulated for the most part and said testing is sometimes executed at night for the best conditions.

"All of the acoustic testing on Lake Pend Oreille is guided under the Environmental

that guidance to avoid any natural damage to the environment and native species that inhabit the lake. Every test that is conducted here goes through extensive planning so we can get the best results."

Apart from supporting the Navy, ARD has previously partnered with private industry, academia and U.S. allies for various missions.

"The purpose of this detachment is to bridge the gap between full-scale testing and initial concept design small-scale testing," Lambrecht said. "Our models are large enough to capture all of the relevant structural features of full-scale testing at a significantly cheaper cost. We validate all of the acoustic properties of full-scale fleet designs and ensure that the Navy meets all of its acoustic requirements."

Though ARD is on the opposite side of the country from its West Bethesda headquarters, there is no doubting its importance to Carderock and America's fleet.



Through the Lens of a Carderock **Detachment: Welcome to SEAFAC**

By Edvin Hernandez, NSWCCD Public Affairs

Located on the northern tip of the West Coast, more than 4,000 miles away from its headquarters in West Bethesda, Maryland, is Naval Surface Warfare Center, Carderock Division's Southeast Alaska Acoustic Measurement Facility (SEAFAC). Operating in a remote environment, SEAFAC is the Navy's primary acoustic engineering measurement facility in the Pacific.

The waters in Behm Canal near Ketchikan, Alaska, are an ideal location to conduct acoustic trials, according to SEAFAC Site Director Jennifer Kelso.

"We have an important, dedicated mission to support the Pacific Submarine Force (SUBPAC)," she said. "SEAFAC is an ideal location for recording acoustic measurements because we are located in a glacial fiord that is protected by Prince of Wales Island from open ocean shipping noise. It makes for a pristine acoustic environment."

Although submarines have the capability to submerge and avoid being seen by their adversaries, their signature level is just as important to evade detection.

"There are a number of reasons why you might care about your acoustic signature," Kelso said. "The noise you're putting into the water can make you identifiable. Although all Navy vessels care about the noise they are putting into the water, our submarines have a focused stealth interest in understanding their acoustic signature."

SEAFAC provides the capability to perform research, development. test and evaluation to determine the sources of radiated acoustic noise, to assess vulnerabilities and to develop guieting measures for military ships. In many instances, real-time analysis of the signature allows analysts to identify and provide corrective recommendations before the vessel leaves the facility. By using

dual bottom-mounted acoustic arrays, Carderock personnel can record the signature of a submerged submarine in transit for different speeds and operating conditions. They can test motionless submarines, too, at their permanently moored static measurement site.

Suspension barges with mooring cables are used to hold submarines in position at the testing depth between the measurement arrays. Once in position, the analysts evaluate acoustic signatures of individual ship components and systems. Carderock engineers and scientists provide real-time data analysis to the crew aboard, and adjust as needed.

Submarines, however, are not the only vessels that can be evaluated at SEAFAC. The facility has measured Navy surface ships and even cruise ships, in the past. Because the functions and capabilities of this facility are valuable to the Navy, Kelso

Behm Canal near Ketchikan, Alaska, at the stati site of Naval Surface Warfare Center, Carderock Division's Southeast Alaska Acoustic Measurement Facility in April 2022, The Suspension barges, housing ring equipment, hold submarines in position at the testing depth between the measurement arrays and evaluate acoustic signatures of individual ship ents and systems. (U.S. Navy photo by Edvin Hernandez

and Deputy Site Director Eric Simon have their hands full with coordinating site testing logistics and keeping the public informed of Navy activity in the shared water space of Western Behm Canal.

Kelso, who has been the SEAFAC Site Director for the past six years, said she is required to notify the public when any restrictions will be placed on other vessels operating in the canal. This notice, and radio communication, advises other boats in the area how to safely operate in the canal around SEAFAC operations and in a way that minimizes interference with data collection.

"When a test vessel arrives here, we have to deal with the weather that we have and any surface contacts, including other users in the same water space such as small boats in the area," Kelso said. "Those things will all increase the ambient noise level in the water and effect what we can actually measure."

THE NOISE YOU'RE PUTTING INTO THE WATER CAN MAKE YOU IDENTIFIABLE. ALTHOUGH ALL NAVY VESSELS CARE ABOUT THE NOISE THEY ARE PUTTING INTO THE WATER, OUR SUBMARINES HAVE A FOCUSED STEALTH INTEREST IN UNDERSTANDING THEIR ACOUSTIC SIGNATURE.

> A boat carrying a buoy heads toward one of SEAFAC's suspension barges before conducting an acoustic trial in the Behm Canal near Ketchikan, Alaska, in April 2022. Naval Surface Warfare Center, Carderock Division's Commanding Officer Capt. Todd Hutchison toured the command's SEAFAC detachment, which specializes in acoustic measurements, in April 2022. (U.S. Navy photo by Edvin Hernandez)



Building 1 of Naval Surface Warfare Center, Carderock Division's Southeast Alaska Acoustic Measurement Facility on a sunny day in Back Island, Alaska. SEAFAC is the command's West Coast asset for making high fidelity passive acoustic signature measurements. Building 1 includes guest berthing for 40, mess facilities and operations and analysis spaces. (U.S. Navy photo by Edvin Hernandez)

The Environmental Protection Agency requires federal agencies to conduct thorough planning for any actions that may have an effect on the environment. Simon and Kelso said they have to go through a formal process to show prudent environmental planning before installing new instrumentation in the water or on their shore-side facility on Back Island. This includes any changes to their buildings or infrastructure footprint. The weather, on the other hand, is another factor Kelso and Simon have to plan around.

"Weather can also have a significant effect on our operations from a safety perspective," Kelso said. "Not only do we need a quiet environment, but we need the water conditions to be safe enough to transfer our people on and off the small boats and decks of the submarine. The wind, amount of rain and wave action can make that difficult."

Precipitation is another uncontrollable variable that influences the acoustic data collected. According to Simon, snow is louder than rain and when the thermal layers in the water change, it affects the way sound travels.

affects the way sound travels.Carderock's Commanding Officer Capt. Todd E. Hutchison
recently visited SEAFAC, touring the facility's buildings and
static site in the Behm Canal. Hutchison thanked Kelso and
Simon for their leadership and returned to West Bethesda,
eager for his next visit.

to	At SEAFAC, Kelso's team works around the clock to complete
ect	the mission.

- "We test year-round," she said. "In the winter, we might get higher ambient levels because of weather, but we have far fewer people in the water who we are sharing that space with. Summertime is the opposite. Ambient levels are lower, but we have more contact interference. That's one reason why during trials we are testing for 24-hours, because sometimes our best window will be overnight."
- On a day-to-day basis, she and Simon are working to proactively communicate with visitors in the area and educate the public about SEAFAC. The Navy has been conducting acoustic trials in Ketchikan for more than 30 years, and Kelso continues to ensure the mission is executed smoothly. When a trial is underway,
 Carderock sends their best from their detachments and
- er headquarters to support.

Advanced Manufacturing Prototyping Lab **Opens in Building 9**

By Todd Hurley, NSWC Carderock Division Public Affairs

Envisioned as a successor to the Manufacturing Knowledge and Education those in need. Franke and his team are (MAKE) Lab that was previously in Naval Surface Warfare Center, Carderock Division's building 60, a new makerspace, the Advanced Manufacturing Prototyping (AMP) Lab, has been created in the Model Fabrication Facility at Building 9. An open people don't know about the capabilities house and ribbon cutting event with Carderock's Commanding Officer Capt. Todd E. Hutchison was held on June 23.

Scott Ziv, a mechanical engineer in the Additive Manufacturing Program Office, who has been coordinating the MAKE Lab since 2017, joined forces with Ryan Franke, a technician in the Subtractive and Additive Manufacturing Branch to bring the AMP Lab to Building 9.

"The AMP Lab is the successor to the MAKE Lab, and has similar traits, but with new systems and in a new space," Ziv said. "Scott is in the research side, and I am in Lab, which will be open 24-hours a day. "We want people to know that we are back, we are open and have all these new capabilities and that there is value in rapid it made sense for us to team up and use development for research work."

The MAKE lab was originally created as a space for education, to teach people about 3D printers and how to use them. However, over time, innovation has made them more easily accessible.

"Now that people know how to use 3D printers, and can affordably purchase them, the actual education side isn't as necessary as it has been in the past," Ziv said. "Therefore, the AMP Lab spun up as a kind of rebranding of the MAKE Lab, as less of an education tool, and more of a makerspace where people can go and have become way more accessible, usable access to these systems without having to buy their own and maintain them."

The collaboration meets the needs of everyone involved, as it gives Ziv and the AMP Lab a larger space to be used by also able to show off other capabilities at the location.

"Bringing the AMP Lab to Building 9 was a win-win for us," Franke said. "A lot of at Building 9, where it is located or how to even get in. With bringing the AMP Lab here, we are hoping this opens the door to people realizing what Building 9 can do. After prototyping in the AMP Lab, customers can easily transfer from small scale prototyping to larger scale production within the same facility."

Ziv and Franke joined forces as it made sense to the two of them to use their combined expertise to make this an all-in- Once an individual has completed a one makerspace.

the more physical development side of the making and production of parts, so our expertise and knowledge together," Franke said. "The AMP Lab is an idea space, but we in building 9 can make your idea a reality — we take your concepts and make parts you need for your project, and we are already here, we are in the same building."

Additionally, it became apparent to Ziv that transitioning the MAKE Lab to the AMP Lab made the most sense.

"Most things we've worked with the last couple of years are metals, but in the plastics world, polymer systems have and their material properties have become better," Ziv said. "The reason the additive manufacturing research and development group stood up the MAKE Lab was because we didn't fully

understand the technology at the time, but polymer 3D printing is being used for real things now, both in industry and on ships. Polymer systems are almost not really research anymore."

In preparation for the June 23 open house, Ziv and Franke hosted weekly, hour and a half long trainings, where they went over basic rules and expectations of the space and give users hands-on experience printing parts.

"The MAKE Lab historically had about 400 people trained." Ziv said. "We have about 20 people or so trained for the AMP Lab, and now that we have this new facility we hope to greatly increase that number."

training, they will be given the access codes to Building 9 including the AMP





The additive manufacturing equipment located in the newly created Advanced Manufacturing Prototyping (AMP) Lab are (I-r) two Makerbot Method X Systems, two Prusa MK3S systems, a Stratasys uPrint SE Plus, a Markforged Onyx and Markforged X7, a Vacuum former and a Stratasys F370. Not pictured are a 3D scanner, a small PCB mill and a laser cutter. The AMP Lab, which is located in Carderock's Model Fabrication Facility in Building 9, hosted an open house and ribbon cutting event with Carderock's Commanding Officer Capt. Todd E. Hutchison on June 23. (U.S. Navy Photo by Scott Ziv)

An additively manufactured sign that hangs above the door to the newly created Advanced Manufacturing Prototyping (AMP) Lab, located in Carderock's Model Fabrication Facility in Building 9. (U.S. Navy Photo by Scott Ziv)



Fabrication and Technical Support Division; and Ryan Franke, a technician in Carderock's Subtractive and Additive Manufacturing Branch, cut the ribbon during the grand



Carderock Engineer Supports Stability Tests for Deep Submergence Vehicle

By Edvin Hernandez, NSWCCD Public Affairs

Deep Submergence Vehicle Alvin is craned on the RV Atlantis in St. George's Harbor, Bermuda, in October 2021. (Photo by Ken Kostel, Woods Hole Oceanographic Institution

ATLANTIS WOODS HOLE

Alan Bryden, a general engineer in Naval Surface Warfare Center, Carderock Division's Weight and Stability Branch, assisted an overhaul of the Deep Submergence Vehicle (DSV) Alvin last October. Bryden, Naval Sea Systems Command (NAVSEA) and the Woods Hole Oceanographic Institution (WHOI) supported sea trials of the submersible, which is property of the U.S. Navy, for certification and stability purposes.

The DSV Alvin is a unique vessel that is capable of submerging to thousands of meters underwater. It was launched in 1964 and has been involved with several historic events. For example, in March 1966, it supported recovering a hydrogen bomb lost by the U.S. Air Force off Palomares, Spain, and in September

1968, it recovered a F6F Hellcat lost in training during World War II. The submersible has also been utilized to study black smokers, which are chimneys or underwater volcanos formed from deposits of iron sulfide, around the Galapagos Islands to investigate life forms living from hydrothermal vents. Famously, DSV Alvin was used again in 1986 to survey the wreck of the Royal Mail Ship Titanic, which sank in April 1912. Following this journey, the submersible surveyed the remains of USS Scorpion (SSN-589), which was tragically lost in May 1968.

While the U.S. Navy owns DSV Alvin, it is operated and maintained by WHOI in Massachusetts, and NAVSEA is the certifying authority. When an overhaul of the submersible

the vessel in 2006 and 2013, keeping records of challenges vehicle was needed, Carderock's technical experts were contacted, including those in the Weight and Stability Branch, to engineers encountered along the way, which was something support NAVSEA review and concurrence. Bryden appreciated. "Even though our branch is the expert of ship stability, every "All of the Carderock engineers involved with previous stability ship is unique – particularly the one-of-a-kind DSV Alvin," tests have moved on," he said. "Paul Daly worked the most Bryden said. "The amount of time between these events – every recent 2013 test and he has since retired. Brian Heidt and Harry seven years or so – creates hurdles, particularly with respect to Wellens oversaw the 2006 tests. Fortunately, the branch kept technical continuity." lots of photographs, drawings and notes from the previous evaluation. Particularly useful were the notes kept on the Although this is not Carderock's first time supporting the DSV problems and complications that occurred in the past. That Alvin, it was a first for Bryden and the associated NAVSEA helped us prepare solutions. The WHOI provided a large trove of useful documents, too, mainly of the vehicle's history." team. Carderock had previously executed stability testing for

ATLANTIS

EVEN THOUGH OUR BRANCH IS THE EXPERT OF SHIP STABILITY, EVERY SHIP IS UNIQUE -PARTICULARLY THE ONE-OF-A-KIND DSV ALVIN.

Bryden boarded the Research Vessel Atlantis, DSV Alvin's support ship, on Oct. 14, 2021, and sailed with the WHOI crew from Massachusetts to Bermuda. During their time in Bermuda, he and his NAVSEA teammates worked closely with WHOI engineers on a quiet pier in Saint George's Harbor.

"The pier was protected from the ocean and was well away from the busier areas of Bermuda," he said. "One challenge the crew did encounter was COVID restrictions, which limited our ability to go on shore."

The team began their assignment by checking the life support system of DSV Alvin. After that, they evaluated the main ballast system, the variable ballast system and the trim system.

"When the main ballast tanks are filled with water, the submersible is designed to be close to neutral buoyancy," Bryden said. "At that point, the variable ballast system can be finetuned to get the needed buoyancy just right – adjust for salinity, for personnel weight and to make up for any items brought into the science basket from the ocean floor."



Once all those systems were verified to be functioning properly, the team's attention turned to the stability tests. A pilot and two engineers boarded DSV Alvin and remained inside the vehicle's 7-foot diameter titanium sphere for a long day of work. Bryden said he was looking for the ability of the submersible to resist overturning forces such as wind, waves and unsymmetrical loads, among other things. He was also observing for those forces during submerged maneuvering.

"There were two major stability tests performed," he said. "Like any ship, one test is for surfaced stability. Then the second test, unique to submersibles, is a test for submerged stability. Each process is similar, but the resulting measurements discover two separate parameters. The submerged stability test ensures that the center of gravity of the vehicle is sufficiently lower than the center of buoyancy. The surfaced stability test is similar, ensuring the center of gravity is sufficiently below the surfaced metacenter to provide an acceptable margin of safety."

With the stability tests completed successfully, Carderock's assistance was no longer required on-site and Bryden returned home. Just two weeks later, DSV Alvin made its deepest dive ever. Bryden said the rigorous qualification process is not yet complete, however, with the overhaul, the DSV will be certified to dive 6,500 meters in the summer of 2022 – a 44 percent increase to its previous depth capabilities - and will be able to access 98 percent of the ocean floor.

To learn more about DSV Alvin, visit <u>https://www.history.navy.</u> mil/content/history/museums/nmusn/explore/photography/ underwater-search-and-recovery-equipment/alvin-dsv-2.html, or https://www.whoi.edu/what-we-do/explore/underwatervehicles/hov-alvin/.



WAVES | INNOVATION



Deep Submergence Vehicle Alvin is lifted from the water by a crane on RV Atlantis at St. George's Harbor, Bermuda, on Nov. 1, 2021. Woods Hole Oceanographic Institution employee Bruce Strickrott (far right) supervises the lift. (Photo by Ken Kostel, Woods Hole Oceanographic Institution)

Snakehead Team Delivers First Flooded Nose Section for Unmanned Vehicles

By Benjamin Morley and Courtney Jones, NSWC Carderock Division Public Affairs



On June 25, 2021, the Snakehead Large Displacement Unmanned Undersea Vehicle (LDUUV) team in Naval Surface Warfare Center (NSWC), Carderock Division's Maritime Systems Hydromechanics Branch broke new ground by delivering the first Flooded Nose Section (FNS) to Naval Undersea Warfare Center (NUWC), Newport Division for integration with the Range Hull vehicle.

NUWC Newport is the lead Warfare Center for the LDUUV program, and is in charge of vehicle design, fabrication and testing Naval Sea Systems Command's Unmanned

Maritime Systems. As a collaborative government effort, Carderock assisted NUWC Newport Division by providing subject matter experts to support FNS design, hydrodynamics, structures, battery, materials, corrosion, paint and fabrication oversight.

The endeavor to create the FNS began in 2017 with the LDUUV program, which was itself created to solve issues with unmanned underwater vehicles. Dana Colegrove, an engineer who works in the Maritime Systems Hydrodynamics Branch, is the technical program manager for LDUUV. He leads the Snakehead Program, which has included a massive team of

more than 350 Carderock employees from nearly 40 branches throughout the entire life of the program support.

"We've been working on it through various phases of the acquisition process for several years now," Colegrove said. "We came out of critical design review in June 2019, and then ramped up our internal support along with contractor augmentation to finish open design actions, fabricate and assemble the FNS. Carderock has been working on the program for many years and is now in the testing and evaluation portion at NUWC Newport Division."

The vehicle is made up of several sections, including the FNS, which is an essential element for interfacing with the host launch and recovery hardware. The FNS is the forward-most area of the vehicle, and it has a couple of functions. First, it provides the mechanical interface between the host launch and recovery line. It also provides locations for flooded sensors for acoustic and optical communication, obstacle avoidance, and launch and recovery. Lastly the FNS section provides the mechanical interface and acceleration mitigation to the pressure hull.

Determining the mitigation spring needed was a large collaborative effort within Carderock's Structural Composites Branch, Non-Metallic Materials Research and Engineering Branch and Maritime Systems Hydromechanics Branch. that culminated in actual dynamic testing of the springs in the Department 60 test facilities. Just aft of the FNS is the Forward Variable Buoyancy Section (VBS), followed by an electronics payload, Aft VBS and tail cone sections.

In its mission, the Snakehead Program helped the government understand future requirements for LDUUV-sized vehicles in terms of battery certification, submarine integration and certification and launch and recovery.

"There are a whole host of analytical pieces, hydrodynamic performance, maneuvering characterization and hydrodynamics drag," Colegrove said. "We also have folks working at Carderock in materials structures, fabrication oversight and lithium-ion batteries. Over the years, this program has been very well-funded, and we became a pretty big player in supporting NUWC Newport Division."

The team withstood challenges when creating the FNS, developing and offering newly advanced solutions to design requirements. First, they had to ensure that the intended design could meet the requirements flowed down to the system and could be manufactured with the given integration timeline. Next, they had to coordinate the FNS efforts with the entire vehicle integration timelines and create an effective acquisition strategy to ensure every component was allocated in a way that supported full-system integration. Lastly, there

Flooded Nose Section and the pressure hull. (U.S. Navy photo by Harry Friedman)

was testing and integration. This phase ensured that all the purchased or fabricated components were assembled properly in the system and tests were performed on both hardware and software. That testing at Carderock ensured a system was delivered that met its functional requirements by ensuring those requirements could be verified ahead of time. They surmounted these hurdles with great effort, keen oversight and strong communication, despite the challenges caused by the pandemic and manufacturing delays.

"We had great folks who did mechanical design and interfaced well with the people doing the hydro simulation,"

Colegrove said. "They worked well with the structures folks who were doing a lot of the simulation work for the impact of the nose. They had great communication and reached out to various personnel at Carderock and outside Carderock to make sure they understood all the requirements and were able to get those put together and meet the requirements of our stakeholders by communication and engagement."

For their accomplishments, the Snakehead team was honored as part of



Mechanical engineers in Naval Surface Warfare Center, Carderock Division's Maritime Systems Hydromechanics Branch Rory Thomas (left) and Jason Morin (right) install the impact mount assembly to the structural assembly at Naval Surface Warfare Center. Carderock Division in West Bethesda. Md.. on June 2, 2022. The impact mount assembly provides acceleration mitigation function between the

the 2021 Carderock **Division Honor** Awards, receiving the Vice Adm. Emory S. Land Award for Collaboration Excellence. That award encompassed the entire team at Carderock and celebrated completing major milestones of design and fabrication. The success of the program through the fabrication phase of the effort is directly related to the deep integration of the technical teams on the Snakehead Program, both across multidisciplinary and organizational boundaries. This close

interaction has been highly beneficial to the overall Office of Naval Research to share technical experience, tools and processes in areas that haven't traditionally interacted.

"Everybody on the award was a major contributor," Michael McDonald said, Carderock's Structures and Composites Division Head. "It's a very dynamic environment through which close coordination keeps up with emergent needs. Communication coordination with the team really has been essential to keeping this program moving the way it's been going."

Carderock Collaborates on Tow Body Dynamics Effort

By Todd Hurley, NSWC Carderock Division Public Affairs

Naval Surface Warfare Center, Carderock Division has collaborated with Naval Undersea Warfare Center, Newport Division in Rhode Island on an ongoing tow body dynamics effort known as MOLA.

The purpose of the MOLA is to bring a tow body that can collapse in on itself so a surface vehicle can pick it up out of the water and tow it via a cable. Its name derives from the ocean sunfish, or common mola, one of the two heaviest known bony fish in the world.

"MOLA is the name of a large ocean sunfish, that looks like a swimming billboard," Dr. Jesse Daily said, Newport Division's primary investigator for the MOLA collaboration. "This fish is the inspiration of the project. We knew we wanted to call it MOLA because we wanted that shape of fish but with a towed body."

This is a Naval Innovative Science and Engineering-funded project that Newport Division started in 2020. Soon thereafter they brought in Carderock for the tow body dynamics aspect. The scale model construction and tow body testing portion of the effort takes place at Carderock, while Newport handles the acoustics research and modeling, electronics and the manufacturing.

"We are trying to get to a point where we have a tow body that can tow successfully and collapse upon itself," Daily said. "Right now we are ready to start testing at a scale level to see how the tow body can complete its full evolution — deploy the system, have it expand, then collapse on itself and bring it back on the vessel. A big challenge is how to get it to be able to collapse enough to get it onto a ship."

Jason Morin, a mechanical engineer in Carderock's Maritime Systems Hydromechanics Branch, is in charge of the tow

model testing done at Carderock, after taking over for the recently retired Dr. David Coakley.

"Newport came here because we have done a lot of towing and are known for our expertise," Morin said. "Over the last couple of years with this project, we have provided our expertise on hydrodynamics and have performed analysis. There are a lot of ways this work could be done — we've been exploring the best way possible. Some models have rigid tubes, others have flexible tubes. We are still exploring what would work best, and figuring out how to fabricate what it is made of and how it will function once it is in the water."

Testing at Carderock has consisted of tow body stability, array stability, hydrodynamics in the tow body, tow body stability over speed ranges and how to expand and collapse a tow body.

"We started at square one — figuring out the design routes to see plausible routes," Morin said. "In 2021, we built the big scale model array that we towed

in the carriage three basin. From that work it informed the next steps. From there, Newport started building the full scale flexible tube array, and we did a scale model test here at Carderock to inform them of what to expect when they do a full-scale test."



Four different tests have been conducted at Carderock: one in the circulating water channel and three different scale model tests in the carriage three high-speed basin.

"It's been a lot of fun learning what will and will not work." Daily said. "It seems quite simple, being that it is essentially a bundle of PVC pipes. But, it took us a long time and was a feat of engineering that has not yet been accomplished — it is quite significant that we were able to accomplish what we have. What can kill this project is not being able to get it on and off a vessel, but we've shown that we can get it down into a small enough package to be able to do it."

Morin and Daily are hoping to be concluded with the project later this year, with an overall goal of being picked by the Office of Naval Research (ONR) for further development. "Our goal is to get picked up by ONR or some other entity that would turn this into a program of record and fully develop the

OVER THE LAST COUPLE OF YEARS WITH THIS PROJECT, WE HAVE PROVIDED OUR EXPERTISE ON HYDRODYNAMICS AND HAVE PERFORMED ANALYSIS.

system." Morin said. "We think it will be very beneficial to the warfighter and to the Navy in general."



Carderock Shows Up at Sea Air Space 2022

By NSWC Carderock Division Public Affairs

The annual Sea Air Space Conference and Exposition was held April 3-6, 2022, at the Gaylord National Resort and Convention Center in National Harbor, Maryland. In addition, the Office of Naval Research hosted a STEM Expo on April 2. Naval Surface Warfare Center, Carderock Division participated in the science, technology, engineering and mathematics (STEM) event and the main conference and exposition.

Sea Air Space is the Navy League's Global Maritime Exposition. It brings the U.S. defense industry and military stakeholders together for educational sessions and an exhibit hall floor.

At the STEM Expo, Carderock's STEM Director Charlotte George, along with fellow Carderock volunteers Gary Steele and Jenna Nunes, ran a hands-on demonstration called "Oh, Barnacles!" to illustrate how barnacles can cause unwanted drag on U.S. Navy ships. Using toy boats – one set with pompoms on the bottom and another set without – the children competed in a side-by-side drag test to see which boats move faster through the water.

In the exhibit hall, Carderock's Dr. Thomas Hays, a materials scientist, discussed safe storage and transportation of Lithium-ion (Li-Ion) Batteries using the Carderock-patented Charging-Capable Li-Ion Autonomous Safe Storage Inter-Service Container, also known as CLASSIC. In collaboration with Army

and Air Force partners, Carderock developed and tested the CLASSIC, which is a standard-footprint container that safely transports, stores and charges Li-ion batteries needed to support surface, air and ground energy requirements.

Out on the water, Carderock's Combatant Craft Division showed up with Stiletto, the Navy's Joint Prototyping and Experimentation Maritime (JPEM) platform for innovative technologies. The JPEM program helps discover new joint technologies in the commercial space in days or weeks versus months or years. It fosters commercial innovation by giving small businesses and inventors a deep understanding of military missions. JPEM conducts maritime demonstrations to validate technical feasibility, explore operational value and reduce developmental risk. It is a program designed for industry, government and academic organizations to facilitate maritime technology development, transition and provide responses to operational requirements and capability gaps. Stiletto provides an opportunity to demonstrate in a realistic maritime environment.

One more piece of Carderock made it into the Sea Air Space Exposition. In commemoration of the centennial of the U.S. Navy Aircraft Carrier, Carderock's Curator of Ship Models loaned a model of the USS Enterprise (CVN 65) to the Naval History and Heritage Command to be displayed in their booth.





Visitors leave the Navy's Joint Prototyping and Experimentation Maritime (JPEM) platform Stiletto as it sits pier side on April 6, 2022, in National Harbor, Md., during the annual Sea Air Space Exposition at the Gaylord Nationals Resort. (U.S. Navy photo by Monica McCoy)

Dr. Thomas Hays, a materials scientist at Naval Surface Warfare Center, Carderock Division, discusses safe storage and transportation of Lithium-ion (Li-Ion) Batteries using the Carderockpatented Charging-Capable Li-Ion Autonomous Safe Storage Inter-Service Container, also known as CLASSIC, with Federal News Network Producer, Peter Musurlian on April 5, 2022, at the annual Sea Air Space Exposition at Gaylord National Resort and Convention Center at National Harbor, Md. (U.S. Navy photo by Monica McCoy)



Carderock Utilizes Natural Seawater for Revitalization Effort

By Todd Hurley, NSWC Carderock Division Public Affairs

Over the past three years, Naval Surface Warfare Center, Carderock Division has been working on a revitalization effort that developed new capabilities to perform small and large scale testing of seawater systems, materials and coatings, by utilizing natural seawater at Carderock's South Florida Ocean Measurement Facility (SFOMF) detachment in Fort Lauderdale.

The effort, which is a three-year Naval Innovative Science and Engineering (NISE) 219 Revitalization and Recapitalization (R&R)-sponsored project, is being led by Omar Ramos, an engineer in Carderock's Corrosion and Coatings Engineering Branch.

"SFOMF is located right by Port Everglades, and our position on the equator and conditions created by daily commercial ship traffic provide a perfect combination of replicating the conditions experienced by our fleet," Ramos said.

The primary capability has been the establishment of permits and infrastructure to allow for seawater intake, discharge and exposure through the state of Florida. This not only allows for large-scale testing, but also provides constant and alternate immersion, which helps when exploring the effects or performance of material or coating when it is exposed to seawater.

By doing this, Carderock engineers are able to provide data and recommendations that allow the Navy to increase mission readiness and reduce total ownership costs. They do this by performing rigorous tests that are more indicative of field performance than utilizing artificial seawater, blue water or water that the fleet would never see in operation/homeporting.

"In 2014, I realized the potential here at

the SFOMF location, but the only thing we were using it for was atmospheric exposure, which is a test required for many topside coatings for the Navy," Ramos said. "We were not using the seawater, which was readily available, for 30 years. Utilizing the natural seawater would provide a significant upgrade in testing capabilities that seemed to be a desire from program sponsors. Therefore, my branch head and coworkers, as well as SFOMF leadership, helped me to form a team that increased Carderock's capability by physically putting this vision into action."

Ramos' vision was to revitalize Carderock's corrosion facilities through a multifaceted approach. The approach consists of building a natural seawater complex with multiple different systems that utilizes natural seawater for testing operational performance of sea water systems, materials and coatings. Meanwhile, it focusing on modularity and flexibility, which maximizes the capability by ensuring that it can adapt to the changes of the Navy.

The corrosion facilities at SFOMF consists of four laboratories, one of which is a wet laboratory that allows for seawater to pass through for projects that require equipment that is sensitive to atmospheric conditions. There is also a field for atmospheric testing and a pump control room that allows for the distribution of seawater.

"There are two benefits of being modular — we are located in a hurricane prone area, so everything

we install can be moved into a shelter or anchored down as necessary," Ramos said. "The other benefit is that this seawater testing site is designed to adapt with the changing needs so that we can accommodate different types of testing for seawater components. With this, we can replace equipment, systems and layouts altogether if needed without disrupting the overall function of the seawater facility. Therefore, we can still continuously pump in and pump out seawater regardless of modifications underway."

In its three-year span, Ramos' efforts have led to the ability to store and move up to 10 thousand gallons of seawater at a time, a number that is still growing.

"The capability so far has created a return of investment on new funding upwards of 9:1 over the last two years," Ramos said. "We received our industrial waste water permit in the first year. Multiple programs immediately utilized the capability as we can pump up to 800 gallons of water

THE CAPABILITY SO FAR HAS CREATED A RETURN OF INVESTMENT ON NEW FUNDING UPWARDS OF 9:1 OVER THE LAST TWO YEARS.

per minute, which allows us to do large-scale testing and supply seawater to multiple tests at a time. This is one of the great features of the 219 R&R funding, where Carderock funded the development of a capability out of NISE 219 that no program would have covered individually, however once established. formed a line to utilize the capability."

A vital part of this effort is that the testing can run autonomously, as the facility is fully automated.

"One of the big things here is that our testing can run continuously, without interruption, for any necessary period of time," Ramos said. "Having an automated facility means we can provide seawater autonomously for long periods of time to replicate environments without the need to have an operator on-site 24/7."

The importance of this effort to Carderock is that it allows for large-system testing, rather than only being restricted to laboratory testing. While it is crucial to providing fast and efficient recommendations, laboratory testing doesn't always translate to what one can expect in the field.

"The difference between laboratory and field testing is in the natural environment and test panel complexity," Ramos said. "So, exposure to things like ultraviolet rays, temperature and natural impurities in the water like metallic ions can present a big difference in results to testing. The subtle, natural differences in concentrations of ions and other impurities found in port from all ship activity can be enough to change the outcome of recommendation given by lab testing alone."

Although this is not Ramos' sole responsibility, he is cultivating relationships with new sponsor and





program offices to continue increasing the utilization of this facility/capability far beyond the 9:1 returns the command has already realized. As more engineers and scientists are becoming aware of this capability, more collaborative proposals

between Carderock's Platform Integrity Department, Signatures Department and Naval Architecture and Engineering Department are being developed.

Carderock Engineers Successfully Build and Test Unmanned Vessel

By Courtney Jones, NSWC Carderock Division Public Affairs

In January 2021, five Naval Surface Warfare Center, Carderock Division engineers took on a project to modify, assemble and water test a Wave Adaptive Modular Vessel (WAM-V), an unmanned boat with remote control capabilities.

Mathew Green, an engineer in the Seakeeping and Maneuvering Branch, led the team. His colleagues included Emilio Domenech in the Future Ship Concepts, Combatants and Unmanned Branch; Joshua Hull-Haines in the Acquisition Programs Branch; Dhawal Bhanderi in the Hydrodynamics and Maneuvering Testing Branch; Folkert Tytus in the Center for Innovation in Ship Design (CISD) Branch and Ryan Faber, the team's mentor and Director of Emergent Technology in the CISD Branch.

The other concurrent CISD project was the design of a ship intended to protect a carrier strike group. CISD's projects are normally design-



After a four-month project modifying and assembling a Wave Adaptive Modular Vessel (WAM-V) — an unmanned boat with remote control capabilities — a team of engineers took it out for its first water test at the Triadelphia Reservoir in Brookeville, Md., on April 20, 2022. (Photo provided by Mathew Green)

focused, but the WAM-V project prioritized testing.

"The WAM-V is a catamaran, so essentially, it looks like a water spider, comprised of two pontoons connected via an aluminum structure," Faber said.

"CISD was given the Wave Adaptive Modular Vessel — in particular, ours is a 16-foot long version, by one of CISD's sponsors, the Office of Naval Research," Green said. "Then, CISD purchased all the equipment for it. So, our project was to get it working, and then beyond that, we have a magnetometer on board to collect magnetic signatures, such as magnets or other large metal objects."

Although the WAM-V team was already off to a good start when the modular vessel arrived on base, there was plenty of work ahead to get it up and running.

"The modular part refers to the seven primary pieces," Green said. "We put those together, and we integrated all the electronics, built

the payload tray and developed a bunch of software to be able to collect data. Overall, it's workforce development. We're all learning in this."

After the four-month project, the team launched the boat for testing in the Triadelphia Reservoir, owned by the Washington Suburban Sanitary Commission near Brookeville, Maryland. Carderock regularly uses the facility for testing.

As the team lead, Green took on a lot of responsibility, noting that good communication was critical in his role in supporting his collaborators.



on are developing the budget, developing the test plan, preparing for our test readiness review, finding what work needs to be done, making sure someone on my team can work on it and supporting them as best as I can throughout the process," Green said.

He noted that the team had some trouble creating their own data acquisition system because they had limited software experience and were initially unfamiliar with the process. But, in the end, they all gained a new skill.

"We slowly worked our way into it," Domenech said. "It's the first time a lot of us have been working with testing, particularly

"Broadly speaking, some of the bigger things I've been working a lot of the data acquisition stuff. None of us have worked with the WAM-V before, so it took us a couple of weeks to get familiar with the vessel's characteristics and centers of gravity and see how it would actually function in the real world."

> With the success of the WAM-V, CISD asked the team to brainstorm ideas for the next venture, though CISD will ultimately decide which group of engineers will participate.

"There's a bunch of possibilities, some very feasible, some kind of out of this world, but we haven't really honed in on one certain project," Domenech said. "There are many talks about integrating the WAM-V with other systems for future projects."

Carderock Supports USMC in Collaboration Effort

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By Todd A. Hurley, NSWC Carderock Division Public Affairs

Naval Surface Warfare Center (NSWC), Carderock Division has collaborated with NSWC Crane Division in support of fielding the U.S. Marine Corps' (USMC) first production asset of the Expeditionary Fabrication (XFAB) system.

The XFAB system consists of a dual wall expandable shelter with a variety of additive and advanced manufacturing capabilities to enable expeditionary forces to shorten their supply chains and allow for the creation of critical, time sensitive or hard-to-procure components as far forward on the battlefield as possible. The contents of the shelter include no fewer than five 3D printers, a laser cutter and a laser 3D scanner with its own internal network, and several high performing computers required to successfully run the software suite. With this system, Marines will have the capability to design, reverse engineer and print components all in one location.

"The primary purpose of this system is to produce needed replacement parts, tooling, training aids and anything through use of additive manufacturing at a point of need," Drazen Hadzialic said, a mechanical engineer in the Additive Manufacturing Branch and Carderock's USMC Team Lead on this collaboration effort. "This capability already exists throughout the USMC, but it isn't at a point of need. This will give Marines the ability to forward deploy their equipment, reverse engineer components that fail in the field and create replacement parts, thereby increasing overall readiness. The whole goal is to fabricate components relatively quickly and inexpensively."

The origin of the collaboration effort goes back four years to when there was a desire to bring additive manufacturing to the warfighter, but recently came to fruition in December 2021, when the first XFAB system was delivered to Marines of the 2nd Maintenance Battalion in Camp Lejeune, North Carolina. Carderock's role in the collaboration effort is as the technical subject matter expert — developing the system requirements and providing recommendations to the sponsor on component selection. Carderock is uniquely positioned to serve in this role,

Brennen Cheung (blue shirt), a mechanical engineer in Carderock's Additive Manufacturing Branch, demonstrates the operation of the large format 3D printer inside the XFAB during NET at Camp Lejeune, N.C., Jan. 10-14, 2022. (U.S. Navy photo provided by Drazen Hadzialic)

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"We are scheduled to field 15 systems," Hadzialic said. "We are going to field six additional systems in FY22, and then two systems per year after that."

The primary locations will be at Marine Corps Bases at Camp Lejeune, North Carolina, Camp Pendleton, California and Okinawa, Japan.







Marines from 2nd Maintenance Battalion work together to set up the Expect (U.S. Navy photo provided by Drazen Hadzialic).

due to their knowledge of the state of additive manufacturing and its capability, coupled with an understanding of Marine user needs and requirements.

Meanwhile, Crane is serving as the lead integrator, designing the components necessary to house all the equipment in an expandable shelter and packaging them for expeditionary use. Crane also acts as the software and cyber security lead, developing the software image and network within the XFAB.

"Crane's role is the integration," Hadzialic said. "We write the requirements and recommend equipment selection, they integrate it into the shelter and make sure it passes environmental restrictions — ensuring it can withstand shock and can be transported."

Aside from being the technical subject matter expert, Carderock is responsible for providing Marines with

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Marines from 2nd Maintenance Battalion work together to set up the Expeditionary Fabrication (XFAB) system shelter at Camp Lejeune, N.C., Jan. 10-14, 2022.

- appropriate training on how to use the XFAB system, as well as developing the equipment specific training modules.
- "The training will take place on location where each XFAB system is deployed," Hadzialic said. "We will send three Carderock members to these locations to execute the training, which is a one-week event, though we expect to provide assistance for a longer period of time as needed."
- The first training event took place at Camp Lejeune from Jan. 10-14, 2022. The Marines were provided classroom instruction that included shelter set up and breakdown, equipment operation and maintenance and use of associated software.
- The program is sponsored by the USMC Program Manager Supply and Maintenance Systems, which is known for fielding and sustaining a wide range of equipment and support services for the Fleet Marine Force.



Naval Surface Warfare Center, Carderock Division engineers played a crucial role during Atlantic Thunder 2022 (AT22), a sinking exercise (SINKEX) conducted using the decommissioned ex-USS Boone (FFG 28), that took place in the North Atlantic Ocean on Sept. 7.

The SINKEX was a collaborative event between United States and United Kingdom forces conducted to gain proficiency in tactics, targeting and live firing against a surface target at sea.

Carderock, together with Naval Information Warfare Center (NIWC) Pacific (PAC), took a central role in planning and conducting AT22. The team's efforts focused on Battle Damage Assessment (BDA), 3D reality capture using Unmanned Aerial Systems (UAS) and providing crucial subject-matter expertise to 6th Fleet, Commander, Task Force (CTF) 65 and other AT22 planners and participants.

Carderock's participation was led by Dr. Ken Nahshon of the Hull Response and Protection Branch, with the participation of four separate branches across the Platform Integrity Department and the Naval Architecture and Engineering Department: Michael Kipp of the Weights and Stability Branch led hull stability, ballasting for tow and maintenance community BDA engagement; Sadie Johnson and Gretta Ouimette of the Vulnerability Assessment Branch and Eric Walzer of the Hull Response and Protection Branch conducted ship weapons effects analysis efforts; Douglas Griggs of the Resistance and Powering Branch and Steven Intolubbe of the Seakeeping and Maneuvering Branch designed and deployed a novel sensor system, Satellite Telemetry Event Recording System (STERS), that provided an unprecedented level of real-time hulk information to AT22 fleet participants.

"Carderock supported the four major phases for the event; preparing the ship in Philadelphia, conducting an at-sea precursor static detonation training exercise, final pre-SINKEX ship preps in

For the event, Griggs and Intollube developed STERS, a solar-Campbeltown, Scotland, including a pier side BDA event, and the powered vessel tracking system that monitored the ship's SINKEX itself," Kipp said. orientation, flooding and fire sensors; and transmitted data real time via satellite. The new system was developed and installed on the ship while in Philadelphia and immediately began sending Carderock became involved in the SINKEX due to their long history conducting full ship weapons effects testing and tow support on periodic messages to an Excel file stored on U.S. Navy Flank Speed decommissioned Navy vessels, as well as their collective expertise that anyone with approved access could watch in real-time. This supporting major fleet exercises, such as Rim of the Pacific, Valiant data provided an unprecedented level of information regarding Shield and Navy's Tactical Demonstrations. target hulk details during the transatlantic tow, as well as during the SINKEX itself.

"Our experience as a Warfare Center and our historical knowledge became crucial in completing the SINKEX." Nahshon said. "Military Kipp developed ballast for tow plans including surveying, led officers rotate every few years, so they don't have the longevity Carderock's involvement during the BDA review exercise portion of personnel that Carderock does. Much of our role was to in Campbeltown, and developed a detailed backup scuttle plan for be a knowledge library of past historical events of things that Combined Task Force 68 Explosive Ordnance Disposal personnel. went both right and wrong. This was an unprecedented level of In parallel with this effort, Kipp developed and updated a Flooding Casualty Control Software (FCCS) stability model of the ship for involvement that Carderock has had in a fleet SINKEX."



x-USS Boone (FFG 28) is towed from Campbeltown, Scotland, on Sept. 7, 2022, leaving port one inal time prior to the sinking exercise. (U.S. Navy photo provided by Michael Kipp)

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use during the SINKEX. FCCS is a powerful stability tool used aboard all U.S. Navy surface ships, in NAVSEA Incident Response, as well as for various vessel analytics.

During the Campbeltown BDA review exercise, Kipp walked maintenance and salvage community personnel from Forward Deployed Regional Maintenance Center Rota, including the Commander of Supervisor of Salvage, and the United Kingdom's Salvage and Marine Operations group through post damage assessment of the area damaged by the static detonation and assisted with action plans for real-life situations if a ship were to arrive with damage from a weapons event. Following the BDA review event, ex-Boone was towed to open ocean to conduct the SINKEX and Kipp headed to the test range control facility located in the Isle of Uist in the Outer Hebrides.

Carderock would take a central role at range control during the SINKEX.

"Four of us were in range control and directly supported SINKEX execution," Nahshon

said. "We were tasked with providing live updates from our instrumentation system and live updates of battle damage assessment based on modeling and simulation results to the mission director to inform follow-on weapons events. The STERS system was a crucial aspect and worked flawlessly." Weapons effects modeling and simulation results capturing internal damage, prepared by Johnson and Ouimette, were put on the range's main display.



The port Side of ex-USS Boone (FFG 28) suffers damage during Atlantic Thunder 2022, in the North Atlantic Ocean on Sept. 7, 2022. Waves can be seen sloshing in and around damage holing. (U.S. Navy photo provided by Michael Kipp)

"We used the Advanced Survivability Assessment Program (ASAP) software that is developed by Carderock's Vulnerability Assessment Branch to allow us to predict internal damage from a variety of weapon effects, and how that damage would affect mission capability," Johnson said. "In collaboration with best available information from the exercise and the intel, we assessed multiple likely threat impact scenarios. We prepared visual representations of these assessments to be able to pull up and discuss/display in real time based on the reports of where the ship was hit during the actual event."



Ex-USS Boone (FFG 28) succumbs to overwhelming flooding and loss of buoyancy during the Atlantic Thunder 2022 sinking exercise (SINKEX) in the North Atlantic Ocean on Sept. 7, 2022. These images, captured by the U.S. Marine Corps unmanned aerial vehicle V-BAT, show the final moments before the ship sinks to her final resting place off the coast of Scotland. This SINKEX provided the U.S. and U.K. with invaluable training, collaboration and data to perform future allied missions. (U.S. Navy photos provided by Michael Kipp)

able to rapidly update the FCCS model.

By putting the modeling and simulation and exercise data "Carderock provided a bridge between recent and historical SINKEX events, and it was an honor to be central to the planning sources together, the Carderock team was able to inform stakeholders of what would happen below deck after the ship and execution of an exercise that directly contributes to our took damage to determine the order and speed of planned Navy's capabilities," Nahshon said. weapons events in real-time. Real-time FCCS model updates during the final sinking proved crucial to operational decisions.

The Carderock team worked seamlessly with NIWC PAC in leveraging and developing their 3D reality capture capabilities.

"NIWC PAC's focus was reality capture and 3D model generation," Kipp said. "Using video footage from a Marine Corps UAS, V-BAT, as well as surface-based imagery, they were able to prepare a 3D model of the target hulk just prior to it sinking. The 3D data directly supports post-event survivability and stability assessments and facilitates using data for the SINKEX to validate Carderock-developed modeling and simulation tools used to support the fleet."



(Carderock) and Michael Kipp (Carderock). Photo taken in Campbeltown, Scotland, on Sept. 8, 2022. (U.S. Navy photo provided by Michael Kipp)

- The results of ASAP calculations were provided to Kipp who was The Carderock team took great pride in enabling the success of AT22.
 - Kipp echoed those sentiments, and expressed the importance of passing down experience to generations to come.
 - "We are standing on the shoulders of those who came before us, and the next generation will do the same because of events like Atlantic Thunder and the opportunities they provide us to train our shipmates," Kipp said.
 - For their efforts, Carderock's BDA team was awarded the FY 2022 4th Quarter Program Executive Office Integrated Warfare Systems Excellence Award. A virtual award presentation was held on Dec. 15.

Artemis I, the planned, non-crewed Moon-orbiting mission and first spaceflight in NASA's Artemis program, successfully launched on Nov. 16 from the Kennedy Space Center on Merritt Island, Florida. Included in the launch was the Orion spacecraft. for astronauts to practice ingress and egress in underwater."

Long-time Naval Surface Warfare Center, Carderock Division employees and NASAlovers alike will remember that, in March 2009, Carderock engineers, alongside a NASA test and evaluation team, designed, fabricated and built two full-scale models of the Orion spacecraft in Carderock's Model Fabrication facility, one of which was tested at the explosive test pond in West Bethesda, Maryland. This model came to be known as the PORT (Post Landing Orion Recovery Test Article Module). The other was delivered to the Neutral Buoyancy Laboratory (NBL) in Houston to act as an underwater astronaut trainer, and was referred to as the JENOM (Joint Extravehicular activity Neutral buoyancy laboratory Orion Mockup).

Additionally, Carderock built a transparent, one-tenth scale model, which was used to determine worst-case flooding and weight of entrained water. A fourth model was designed and built solely by NASA, that being a quarter-scale model, and was

delivered to Carderock, where it was tested at Carderock's to tank facilities, and in the outdoor wave pond at the U.S. Army Aberdeen Proving Grounds in Maryland, to optimize towing configurations and characterize seakeeping and dynamic stability in varying sea states.

Three members of the Carderock team included Richard Banko, Both models were collaboration efforts between Carderock's a retired aerospace engineer from Carderock's Maritime Systems Surface Ship Hydrodynamics Division and Marine, Aviation and Hydromechanics Branch, who was the principle designer and Unmanned Systems Division. project manager of the PORT and JENOM; Mark Melendez, a mechanical engineer in Carderock's Surface Ship Hydromechanics NASA wanted a high-fidelity Orion capsule for hydrodynamic Division at the time, created all of the detailed mechanical designs testing — a boilerplate — because the capsule may be aborted of the models; and Todd Carrico, a former Carderock employee in from the Artemis rocket system in the ascent stage of the the Surface Ship Hydromechanics Division, was the naval architect launch. Therefore, the capsule with astronauts aboard may be who focused on all of the anticipated hydrodynamic conditions susceptible to sea conditions up to 15-feet waves, and may be based on where the Orion would land in the water. subjected to seakeeping motions for several hours, or as long as 24 hours.

NASA's Space Launch System rocket carrying the Orion spacecraft launches on the Artemis I flight test, Wednesday, Nov. 16, 2022, from Launch ted flight test of the agency's deep space tion systems: the Orion spacecraft, Space Launch System (SLS) rocket, and ground systems Launch Pad 39B at the Kennedy Space Cen Photo Credit: (NASA photo by Joel Kowsky

"We built two fullscale models for NASA," Melendez said. "The first one was the big, metallic, full-scale boilerplate called the PORT, which took nearly nine months to complete.



By Todd Hurley, NSWC Carderock Division Public Affairs

Maria Silena



It was built to replicate the hydrodynamic behavior of the 606D Orion Command Module. The second one was the JENOM, which we made for use in the Neutral Buoyancy Lab in Houston — it was

Carderock employees Todd Carrico, Mark Melendez, Rich Banko and an intern work on assembly of the PORT in the high bay of Building 19 in West Bethesda, Md., on March 16, 2009, two weeks before delivery to the Kennedy Space Center in Florida. (U.S. Navy photo by Ryan Hanyok)

w	The JENOM capsule mock-up was not high fidelity, was
y's	constructed of corrosion resistant materials and only provided
	the exterior contour of the capsule. It is still being utilized
	for astronaut training at NBL to inspect, repair or conduct
	experiments external to the capsule while in space.

"The whole purpose was that the para jumpers who would go retrieve the astronauts needed something to practice on, and they wanted a full-scale model to put their hands on so they could actually climb on it and know the ins and outs," Melendez said. "They were trying to reinvent what they did in the Apollo Program, which meant they wanted to land in the water like they did in the '60s, but it had been almost 40 years since anyone had tinkered with any of this stuff, and everyone who initially worked on this had long since been retired. NASA

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wanted to know what kind of motions to expect from the capsule bobbing up and down in the ocean, so, due to our test and evaluation experience, they came to us to help build this full-scale model."

The 2009 test of the PORT had an objective of determining the environment for astronauts and recovery crews at ocean landing, while incorporating lessons learned into spacecraft design. Carderock's test pond provided a controlled environment for NASA space crew recovery personnel to conduct familiarization before testing procedures took place in the uncontrolled waters of the Pacific Ocean.

"NASA came to us in March 2008, and they wanted to get some performance trials with their capsules in actual waves. They wanted to test the action of whether or not the astronauts were going to be able to survive the wave action until somebody could actually come and rescue them from the capsule after landing," Banko said. "This was a new vehicle based on the Apollo capsules that they did a lot of sea testing with, and they wanted to see how this capsule interacted with the waves in various sea states and try to get indices on the safety of the astronauts as the capsule bobbed on the ocean's surface."

PORT, fabricated by Banko and his team, was an exact replica of the Orion capsule that was being designed by Lockheed Martin. This model measured 16.5 feet in diameter and weighed 18,000 pounds.

"They wanted a very high-fidelity test, so we had to model not only the external structure, but also the internal structure to see

EVERY ENGINEER DREAMS OF WORKING WITH NASA, SO TO **SEE THIS WHOLE THING COME FULL CIRCLE AND TO KNOW** I WORKED ON IT AND **MADE A SIGNIFICANT CONTRIBUTION HAS BEEN UNREAL.**

how water moved around on the inside and any obstructions to the water flow inside the heat shield," Banko said.

The NASA-built guarter-scale model, WEST (Water Egress and Survival Trainer), was brought to Carderock to test the hydrodynamic performance of the Orion Crew Module (CM), and consisted of two experiments — determining the towing



Visitors from NASA and U.S. Air Force pararescuemen come together to test fit the skirt and the upper airbags of the PORT while in the water for the first time in Carderock's Explosive Test Pond in West Bethesda, Md., on March 27, 2009. (U.S. Navy photo by Ryan Hanyok)



Navy divers, Air Force pararescuemen and Coast Guard rescue swimmers practice Orion recovery techniques at the Neutral Buoyancy Laboratory (NBL) at the agency's Johnson Space Center in Houston on Sept. 21, 2016. The recovery team is practicing underway recovery techniques using a test version of the Orion spacecraft that was built by Naval Surface Warfare Center, Carderock Division. Training helped the team prepare for Underway Recovery Test 5 for Exploration Mission 1 aboard the USS San Diego in the Pacific Ocean off the coast of California. The Ground Systems Development and Operations Program, along with the U.S. Navy and Lockheed Martin, prepared the recovery team, hardware and operations to support EM-1 recovery. (NASA photo by James Blair)

characteristics of the CM in calm water and in a sea state, as well as demonstrating the best tow arrangement for various appendage configurations, and was conducted at Carderock's tow tank facilities. The second experiment measured the seakeeping performance and was conducted at the Aberdeen Proving Grounds.

NASA's Constellation Program Test and Verification officer, Alan Rhodes, spoke highly of Carderock personnel for their efforts on the Orion project.

"The Carderock team has gone far above and beyond our expectations in support of this project that I'm almost at a loss for words of praise," Rhodes said in an interview in 2009. "When you look at where we started planning a year and a half ago, and look at the finished crew model, and its water testing, it's truly amazing how well this model was built, how well it fits within the tolerances we've asked for it. It's a test model we will use for years to come, and we have the right team from Carderock to thank for it."

Originally scheduled to launch in 2016, the mission has been postponed at least 16 times due to technical issues.

"We don't launch until it's right," NASA administrator Bill Nelson said. "It's just illustrative that this is a very complicated machine, a very complicated system. All those things have to work."

The mission is planned to last six weeks, with the spacecraft traveling 280,000 miles from Earth, and thousands of miles beyond the Moon.

Artemis I is the first integrated test of NASA's deep space exploration systems, and is the first in a series of increasingly complex missions that will provide a foundation for human deep space exploration.

The Orion spacecraft, which was built to take humans farther than they've ever gone before, will stay in space longer than any ship for astronauts has done without docking to a space station.

"Just being involved with NASA has been incredible," Melendez said. "Every engineer dreams of working with NASA, so to see this whole thing come full circle and to know I worked on it and made a significant contribution has been unreal."

Banko took that sentiment a step further, noting his desire to see this project on display one day.

"I consider the Orion capsule project we did at Carderock to be the highlight of my 48-year engineering career," he said. "I am glad to see these assets are still in use and have provided valuable

information and training for America's space program. Maybe someday we will see the PORT boilerplate in the Udvar-Hazy museum alongside the Apollo boilerplate capsule."



Naval Surface Warfare Center, Carderock Division employees from the Corporate Operations Department, Platform Integrity Department and Naval Architecture and Engineering Department show off the Post Landing Orion Recovery Test Article Module (PORT) in Carderock's Explosive Test Pond in West Bethesda, Md., one day before its delivery to the Kennedy Space Center in Florida in March of 2009. (U.S. Navy photo by Ryan Hanyok)

Carderock's Combatant Craft Division Celebrates 55th Anniversary

By Todd Hurley, NSWC Carderock Division Public Affairs

Naval Surface Warfare Center, Carderock Division has seven detachments throughout the United States — the Acoustic Research Detachment in Bayview, Idaho; the Acoustic Trials Detachment in Titusville, Florida; Detachment Puget Sound in Silverdale, Washington; the Memphis Detachment in Tennessee; the Southeast Alaska Acoustic Measurement Facility in Ketchikan; the South Florida Ocean Measurement Facility in Cape Canaveral; and the Combatant Craft Division (CCD) in Norfolk.

One of those detachments — CCD — recently reached a milestone: celebrating their 55th anniversary. Established on Aug. 11, 1967, this year marked 55 years of CCD being the Department of Defense's (DOD) technical support center and primary source for watercraft design and system engineering.

Until 1967, the U.S. Navy's design function for boats and small craft was located in the Navy Yard, Washington, D.C., and consisted of a small group who developed primary designs, drawings and specifications for Navy boats. However, they were restricted by having no direct, physical testing and evaluating of prototype craft developed for the verification of these designs.

Originally termed the Boat Engineering Department, Naval Ship Engineering Center (NAVSEC), Norfolk Division, CCD was formed after the functions of the Boats and Small Craft Design Branch were transferred to NAVSEC Norfolk Division on Aug. 11,



A Patrol Craft Fast (PCF) 9, also referred to as a Swift Boat, underway near Little Creek, Virginia, circa late 1960s. The PCF 9 was 50-foot long shallowdraft vessel that was made of aluminum and meant to run in mud. The Combatant Craft Division militarized and ruggedized them in preparation for use in the Vietnam War. (U.S. Navy photo provided by John "Jack" Mathias)

1967, establishing a Test and Evaluation Branch within the Boat Engineering Department at NAVSEC Norfolk. Technical personnel were then detailed to NAVSEC Norfolk Division for the purpose of developing the organizational structure.

"Back then, it was a small outfit, with only 27 of us," John "Jack" Mathias said, the boat inventory manager for the Logistics Engineering Resource Branch, and CCD employee for more than 47 years. "We didn't do much in the way of design back then. Instead, we looked for boats being built and tried to get them to be militarized and would do whatever it took to get them to meet operational requirements."

CCD has been located in several locations and endured many name changes throughout its 55-year tenure. Design and test personnel were located in the Amphibious Maintenance Support Unit until the fall of 1969, when the department was relocated in NAVSEC Norfolk Division's headquarters in Norfolk. In 1980, it was designated the Combatant Craft Engineering Department Naval Sea Systems Command (NAVSEA) Detachment Norfolk, where it continued to grow for 12 years before joining Carderock in 1992, officially becoming the Combatant Craft Division. A year later, in 1993, it was moved to its new location in Suffolk, Virginia, where it stayed for a decade before relocating to the Little Creek Naval Amphibious Base in Virginia in 2003.

The first big breakthrough for CCD came in the late '70s when Naval Special Command Warfare contacted them to do a planing hull for them.

"That is when we became experts in our craft," Mathias said. "It was a 65-foot Mark 3, with an off-centered pilot house and three Detroit diesel engines — you couldn't keep them running. But we were able to build 100 of them, all of which were very successful, which gave us a good reputation within the Navy. I have never seen anything more beautiful than a boat that did what it was supposed to do — that was when I realized that this was my niche."

They first began doing design work in 1976, when they worked on the Coastal Patrol and Interdiction Craft (CPIC).

"CPIC was a 95-foot craft, and it was incredibly successful," Mathias said. "However, the Navy had no operational requirement for it at that time. They wanted to keep it on a shelf and use it only if it was needed. That is when we started designing some inexpensively built boats used for targets."



It wouldn't be until Oct. 12, 2000, that Mathias' life, and CCD, would change forever.

"The attack on USS Cole (DDG 67) changed my life," Mathias said. "After the attack, the admiral sent a message to all ships in the fleet saying that we were responsible for security. That meant that we had to put guns on boats and buy security boats for all homeports. Up until that point, I dealt with requirements, and making sure boats were operationally read Now, our focus had changed."

After the attacks on 9/11, the group's priority and focus changed again.

"I was out buying security boats when the attacks in New York happened," Mathias said. "We bought more than 100 boats in a hurry and got them into the field even quicker. Then, while they were building the Guantanamo Bay (GTMO) prison, we had to take three boats down to Key West, Florida, in order to transport them to GTMO. However, getting them to Key West meant we would have to shut down the major roads and bridges along the way. I wrote a letter to the Florida State Police asking for help they ended up escorting the trucks and shut down the roads for me. I still get choked up about this — they told me, 'thank you fo helping fight the war on terrorism."

	Today, the primary administrative and engineering offices
	are located at the Joint Expeditionary Base Little Creek-Fort
	Story in Virginia. CCD is responsible for conducting waterfront
	operations in support of engineering, test and evaluation on
5	demonstration and in-service watercraft from a facility at Naval
	Station Norfolk. Together, these facilities provide synergistic
	integration of all watercraft design, engineering and test
	and evaluation functions in one geographical area, enabling
ly.	a specialized design and test center with optimal test and
	evaluation conditions, and in close proximity to its primary
	military clients enabling rapid fleet interface.
	The biggest difference between the beginning days of CCD and
	now is simple: the amount of boats.
	"In our infancy, we were strictly buying commercial boats to fill
	commercial requirements," Mathias said. "The biggest thing now
	is the boat inventory – we have all different kinds of boats – the
t	boat family has grown exponentially from a few boats to an
	enormous amount, nearly 3,200."
	Note from editor: Since the original publishing of this article in
	August 2022, Jack Mathias passed away in November 2022. He
or	was a valuable member of the Carderock Team, with whom he

served for nearly 50 years. He will be missed.

Center for Innovation in Ship Design (CISD) Celebrates 20th Anniversary

By Todd Hurley, NSWC Carderock Division Public Affairs

Naval Surface Warfare Center, Carderock Division's Center for Innovation in Ship Design (CISD) celebrated its 20-year anniversary on Oct. 18. A ceremony consisting of guest speakers, former staff and alumni was held in West Bethesda, Maryland.

CISD was established in 2002, after a charter was signed by the Deputy Commander of Integrated Warfare Systems, the Assistant Deputy Commander for Surface Ship Technology and the Chief of Naval Research.

The purpose of CISD was, and still is, to advance the theory and practice of ship design by combining the best ideas and experience of industry, government and academia.

At its core, CISD consists of three main focus areas: people — developing technically skilled ship designers for the naval ship design community; knowledge — identifying, learning and integrating new technologies, engineering methods and management tools to improve the naval ship design and development process; and technology — drawing upon the combined strengths of the greater naval enterprise in a collaborative team-learning environment for innovative ship design studies utilizing advances in ship design and analysis tools and design methodologies.

In order to make these focus areas come to fruition, there was a need to focus on nurturing interest and developing experience in the field of naval engineering. To do so, it was necessary to focus on core objectives: learning-by-doing design; the technology of design and integration; and to stimulate innovation in order meet the Navy's needs.

The original and long-time CISD director, Jeff Hough, who recently retired from Carderock, spent his entire career, which spanned more than 40 years, in ship design. In that position, he specialized in mentoring young ship designers, while focusing his efforts on the design of future ships and the Navy's capabilities to design affordable, mission-capable naval ships. Although retired, Hough remains a long-time CISD supporter.

"People are the most critical part of that capability," Hough said in an interview in 2019.

Since Hough, CISD has been home to a few different directors over the years, including Carderock's current Deputy Technical Director Steve Ouimette (Code TDB), former Carderock employee Michael Bosworth and Michael Goodman (Code 8202), who is the current CISD Director.

The vision of CISD has always been to develop and sustain world-class innovative ship designers with the knowledge and tools to create the Navy of the future. However, at the time, colleges were not producing enough graduates with naval design experience.

"There was a study done that looked at how the Navy will produce ship designers when schools and colleges are only providing so many naval architects per year," Ouimette said. "The demand of the Navy was going to exceed what schools were able to produce, so we decided to produce an environment where we can bring students to us and familiarize them with ship design and teach them what we do, how we do it and why we do it. These young people are the Navy's future, so we have to invest in them."

Originally, CISD hosted a robust summer internship program, offering students real-life work experience by working on ship design projects. However, it has since expanded.

"The biggest difference we have seen over the last 20 years is that, when it began, it concentrated on its summer program, but it has since grown into a year-round program," Ouimette said. "If students have a good real-life work experience while they are still in school, they tend to become better students. It got to a point where the students would graduate, join CISD full-time, and then lead the summer programs themselves. This model evolved around 2007, when we were able to grow it into a year-round program; actually hiring entry-level employees into CISD and training them for their first three years."

Throughout its 20-year existence, focusing on the mentorship and development of its people has been a prime focus for the program.

"One of our continued projects is working with interns, which we have around 18-30 of each year," Goodman said. "For most of them, this is their first time doing any Navy ship design. A number of fantastic employees have come from this program."

To date, CISD has had 150 newly hired employees come through the program, 85 percent of which continue to work with the Navy. While quite the accomplishment, it is only one of many that CISD has performed.

"One of our biggest accomplishments came in 2020 with the Naval Research Enterprise Internship Program (NREIP) in the



Naval Surface Warfare Center, Carderock Division celebrates the 20th anniversary of its Center for Innovation in Ship Design in West Bethesda, Md., on Oct. 18, 2022. CISD was established in 2002 to focus efforts on people, knowledge and innovation to nurture interest and develop experience in the field of naval engineering. Signing the new charter for 2022 to renew Carderock's and the Navy's commitment to the purpose of CISD was (front row, from left) Larry Tarasek, Carderock's Technical Director; Rear Adm. Jason Lloyd, Chief Engineer and Deputy Commander for Ship Design, Integration and Naval Engineering at Naval Sea Systems Command; and Dr. Thomas Fu, Head of the Mission Capable, Persistent and Survivable Naval Platforms Department of the Office of Naval Research. Other speakers at the event included (back row, from left) Michael Goodman, CISD director; John Hootman from Integrated Warfare Division of the Chief of Naval Operations' staff; Jay Stefany, Performing the Duties of Assistant Secretary of the Navy for Research, Development and Acquisition; Steve Ouimette, Carderock's Deputy Technical Director; and Capt. Todd E. Hutchison, Carderock Commanding Officer. (U.S. Navy photo by Nick Brezzell)

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midst of COVID," CISD's Deputy Director Dr. Richard Meyer said. "The program was in jeopardy of being cancelled due to the pandemic, but we were able to put together a completely virtual program in a short amount of time. All of the interns were able to work on CISD projects that were relevant to ship design, which was a great success."

Other major accomplishments over the years include: supporting the early phases of the Navy's T-AGOS 19 Replacement Program which became T-AGOS 25; working on the Defense Advanced Research Projects Agency No Manning Required Ship early phases program, which seeks to build and demonstrate a revolutionary new medium unmanned surface vessel; and hosting collaboration events with Carderock's Submarine Training, Leadership and Education cohort, which places emphasis on nextgeneration submarine designers training.

Currently, CISD has two major projects in the early stages. One focuses on a mine laying ship, while the other is a light aircraft

carrier that is conventionally powered and tailored toward unmanned aircraft.

"This project is a dedicated unmanned aerial vehicle (UAV) ship," Goodman said. "It is a UAV aircraft that is exploring the smaller range of ships, rather than the larger carriers. For this, we are working alongside NAVSEA and Naval Air Systems Command."

Navy ship designers work hand-in-hand with industry, with CISD focusing on the early concepts and handing the advanced design efforts over to industry.

"Ship design is very complex, so what we do is try to map out what needs to be done," Ouimette said. "We make sure we meet the requirements and the concept is feasible, affordable and constructible."

The 20-year anniversary ceremony consisted of guest speakers such as: Jay

THE CENTER FOR INNOVATION IN SHIP DESIGN IS A MAJOR PIPELINE FOR THE NAVSEA ARCHITECTS, NAVAL ARCHITECTS AND ENGINEERS... I AM EXCITED TO BE A PART OF THE AWESOME ANNIVERSARY CELEBRATION OF THIS IMPORTANT NAVY INSTITUTION THAT HAS BECOME A CRITICAL LINK IN SHIP DESIGN WORKFORCE DEVELOPMENT CHAIN. Stefany, Performing the Duties of Acting Assistant Secretary We are excited to sign a refreshed and relevant CISD charter of the Navy for Research, Development and Acquisition; Vice today, and we look forward to working with the Warfare Adm. Paul Sullivan, retired, who was an original signer of the Centers, Office of Naval Research and academia toward charter; John Hootman, Deputy Director of Integrated Warfare continued success with CISD as a key development center for Division at the Office of Chief of Naval Operations (N96I); Rear our well-trained, trusted and competent workforce." Adm. Jason Lloyd, Chief Engineer and Deputy Commander for Ship Design, Integration and Naval Engineering at NAVSEA; Present at the ceremony were 75 alumni and supporters. Ouimette, as well as Carderock's Commanding Officer Capt. Todd Hutchison and Technical Director Larry Tarasek. "We offered them the opportunity to brief the audience on

"The Center for Innovation in Ship Design is a major pipeline for the NAVSEA architects, naval architects and engineers," members were even present and came up to speak." Lloyd said. "There are currently 15 CISD alumni in NAVSEA billets ... I am excited to be a part of the awesome anniversary At the end of the ceremony, an updated charter was signed by the heads of the three organizations that signed the original celebration of this important Navy institution that has become a critical link in ship design workforce development chain ... charter, marking the start of the next 20 years of CISD.



Naval Surface Warfare, Center, Carderock Division Technical Director Larry Tarasek signs the 2022 charter for the Center for Innovation in Ship Design to reaffirm Carderock's and the Navy's commitment to CISD, which was established in 2002 to focus efforts on people, knowledge and innovation to nurture interest and develop experience in the field of naval engineering. Signing the new charter for 2022 along with Tarasek is, from left, Rear Adm. Lloyd, Chief Engineer and Deputy Commander for Ship Design, Integration and Naval Engineering at Naval Sea Systems Command; and Dr. Thomas Fu, Head of the Mission Capable, Persistent and Survivable Naval Platforms Department of the Office of Naval Research. Mike Goodman (standing in back), CISD Director, was the emcee of the 20th Anniversary celebration on Oct. 18, 2022, in West Bethesda, Md. (U.S. Navy photo by Nicholas Brezzell)

projects they did years ago, and discuss how CISD affected them," Goodman said. "Some sponsors and original charter

Carderock Celebrates the Opening of New Olney Support Center

By Courtney Jones, NSWC Carderock Division Public Affairs

Naval Surface Warfare Center, Carderock Division kicked off its ribbon-cutting ceremony with opening remarks from Commanding Officer Capt. Todd E. Hutchison about the division's newly acquired Olney Support Center, in Gaithersburg, Maryland. A crowd of Carderock employees looked on as red, white and blue ribbons ruffled in the wind, and Hutchison thanked his staff for their dedication to the acquisition and renovations of the center.

"Thanks so much for joining us," Hutchinson said. "This is a huge day at the ribbon-cutting for Carderock's Olney Support Center. We're just really thrilled with acquiring such an incredible, additional facility for the Carderock footprint."

The Olney Support Center was originally a Nike missile site in 1955 and was in service as such until about 1960. Since then, however,



Naval Surface Warfare Center, Carderock Division's Commanding Officer, Capt. Todd E. Hutchison, delivers a speech to the workforce at the command's newly acquired Olney Support Center in Gaithersburg, Md., on April 19, 2022. Hutchison and Carderock's Technical Director, Larry Tarasek, welcomed the Warfare Centers Commander, Rear Adm. Kevin Byrne, and Acting Warfare Centers Executive Director, Dr. Peter Adair, to the ribbon-cutting ceremony. (U.S. Navy photo by Nick Brezzell) the facility has been home to multiple government organizations.

"Other tenants included the Secret Service, the Centers for Disease Control and even the National Archives," Hutchison said. "The Constitution actually called it home."

In 1972, the current underground structure was built as a communication continuity operations center for use during the Cold War. In 1979, ownership was transferred from the Army to the Federal Emergency Management Agency (FEMA), which ran the facility as a communications co-site until 2019. With the help of the General Services Administration and Carderock's technical departments, they began to evaluate the site and develop the process for transferring it from FEMA to Carderock. In November 2019, the Navy purchased it as an extension of the command's West Bethesda headquarters.

During phase one renovations, the mechanical systems were replaced and the facility's layout was changed for Carderock's incoming technical codes.

Hutchison extended a special thanks to Deputy Corporate Operations, Feza Koprucu, and Olney Support Center Site Manager, David Svir, for their essential roles in making the acquisition and renovations a reality for the command.

"We've been going through various phases of renovation and design since November 2019," Svir said. "The first phase was completed in January 2022. We had to move walls, lighting, heating, ventilation, air conditioning and sprinkler heads to make the layout fit."



Phase two of renovations, including upgrades to other building areas, began in the summer of 2022, with hopes for completion near April 2023. Currently, 30 people work at the Olney Support Center, and about 100 employees are expected to work on-site by next year. "What was a crazy, near-unprecedented acquisition process took about eight months, naming us as the owner in November

"What was a crazy, near-unprecedented acquisition process took about eight months, naming us as the owner in Novemb 2019, and it really was completed for pennies on the dollar," Hutchison said.

Division's Commanding Officer, Capt. Todd E. Hutchison, welcomes NAVSEA Warfare yrne, and Acting Warfare Centers Executive Director, Dr. Peter Adair, to the command's Gaithersburg, Md., on April 19, 2022. The Olney Support Center was previously used ational Archives and the Federal Emergency Management Agency, before the Navy lity now operates as an extension to Carderock. (U.S. Navy photo by Nick Brezzell)

The Navy's Indoor Ocean Comes to Life

Naval Surface Warfare Center, Carderock Division hosted YouTube channel Veritasium to its Maneuvering and Seakeeping Basin (MASK) in West Bethesda, Md., on Nov. 4, 2022. Veritasium is a YouTube channel established in 2010 that features videos about science, education, and "anything else the creator/host/ YouTuber, Derek Muller, finds interesting." Currently, Veritasium channel has more than 13 million subscribers, and is in the top 1% (globally) of science video creators on the internet. During the MASK filming, Muller talked with Ocean Engineer Miguel Quintero about the science of waves and witnessed a series of simulated waves that mimicked some of the most intense sea state environments in the world. The resulting, "Inside the Navy's Indoor Ocean," currently has more than 16 million views. (U.S. Navy photo by Edvin Hernandez)

Watch Veritasium's video "Inside The Navy's Indoor Ocean" on YouTube: https://www.youtube.com/watch?v=pir_muTzYM8







Carderock TD and Ship Signatures Department Head Visit Scotland

By NSWC Carderock Division Public Affairs

The U.K. Ministry of Defence is upgrading their range and facilities at BUTEC and have asked Carderock to provide a High Gain Measurement System (HGMS) similar to those at STAFAC, SEAFAC and ARD. The trip to Scotland was an opportunity for Tarasek and Shang to get a firsthand view of the facilities, meet U.K. counterparts and show Carderock's support for the project.

BUTEC, located on Inner Sound, is divided into the Shore Support Base (SSB) in Kyle of Lochalsh and the Range Terminal Building (RTB) in Applecross. The SSB provides logistics support and analysis spaces (among other functions) for the range, where the RTB functions as the trials operations center. The two facilities are only 11 miles apart as the crow flies but a 40-mile precarious drive along a winding single lane road. Due to the nature of the 1 hour 15 minute drive, BUTEC runs short flights by helicopter to transport staff between facilities.

Dr. Drazen Graduates BTG Leadership Development Program

By Todd Hurley, NSWC Carderock Division Public Affairs

Dr. Dave Drazen, Chief Technology Officer and one of Naval Surface Warfare Center, Carderock Division's Senior Scientific Technical Managers, graduated from the Department of the Navy's (DoN) Bridging the Gap (BTG) Leadership Development Program on April 6, 2022.

BTG is a one-year, DoN Executive Management Program Office Leadership Development Program that is focused on the development of senior civilian leaders — GS14-GS15 level employees — in preparation of becoming a member of the Senior Executive Service (SES).

It is centered on the Office of Personnel Management Executive Core Qualification (ECQs), where students demonstrate competencies in leading change, leading people, business acumen, building coalitions and being results-driven. During the program, participants assess leadership and management competencies through a variety of self-assessments.

"I got involved with this program because I was looking for a way to grow as a leader and to improve my leadership skills," Drazen said.

The program typically takes place at the Washington Navy Yard in D.C., but this session was hosted virtually via Microsoft Teams. It consisted of 10 monthly Brown Bags with SES's, along with 40-hours of shadowing different SES's, self-assessments, leadership training, ECQ writing workshops, book discussions, mock interviews, networking, professional coaching and an action learning project sponsored by an SES.

Drazen was in an Action Learning team with six members from various naval installations, including: Naval Air Systems Command, Naval Sea Systems Command and Naval Information Warfare Systems Command. Their action learning project revolved around the topic of Position Description (PD), which are referred to as Addendums at Carderock. A PD Library is a centralized repository of job descriptions, which provides stakeholders the ability to easily search and create new PDs. His groups' problem statement stated that the lack of access to PDs across the DoN causes inefficiencies which can increase the time to hire and impact our ability to retain talent. The objective of the team was to provide a recommendation and proposed action plan for implementation of a standard PD library across DoN.

"The action learning projects were interesting," he said. "SES's showed up with projects they wanted help with and we got to pick those that we were interested in. We quickly learned about the lack of uniformity across the DoN in the hiring process and the desires of the Office of Civilian Human Resources for leveraging data within those PDs to help streamline the process. This project helped me to learn quite a bit about the human resources side of things and the hiring process."

The SES for Drazen's group was Marcie McLaughlin, Director, Manpower, Analytics and Human Resource Systems, Office of Assistant Secretary of the Navy Manpower and Reserve Affairs.

"The first week of the program consisted of discussing the resume process and what ECQ's are, and the second week was when the different SES's came in and briefed us on the projects," Drazen said. "After meeting with our SES sponsor, my team met once every other week for a few hours at a time to discuss what needed to be done."

Drazen also found immense value in the 40hour shadowing portion of the program, in which he got to shadow four SES': Dr. Bruce

WAVES 🔆 ROCKSTARS



Danly, Director of Research for the U.S. Naval Research Laboratory; Matthew Sermon, Executive Director for the Program Executive Office, Strategic Submarines; Paul Mann, DoN Chief Engineer; and Paul Landauer, Associate Deputy Assistant Secretary of the Navy, Financial Management Systems for Data and Digital Transformation.

"I got to shadow four different SES'," he said. "I was awarded the opportunity to get to know them as people and learn their leadership styles. One thing I took away is that they are leaders within the Navy and the federal government for a reason, so there is always something I could learn from them no matter where they worked."

The BTG program not only helped Drazen to grow as a leader, but also allotted him the opportunity to reflect on his career.

"This program forces you to reflect on your career to find experiences that demonstrate executive leadership," he said. "It gave me the opportunity to think about what I've done, not only what I've done well, but where I am lacking and where I can improve. No matter where you are in your career, there is always an opportunity for improvement."

Carderock Members Receive DON Test and Evaluation Awards

By Todd Hurley, NSWC Carderock Division Public Affairs

The aircraft carrier USS Gerald R. Ford (CVN 78) successfully completes the third and final scheduled explosive event for Full Ship Shock Trials while underway in the Atlantic Ocean on Aug. 8. 2021. The U.S. Navy conducts shock trials of new ship designs using live explosives to confirm that its warships can continue to meet demanding mission requirements under harsh conditions they may encounter in battle. (U.S. Navy photo by Mass Communication Specialist 3rd Class Jackson Adkins)



Naval Surface Warfare Center, Carderock "For the DON Lifetime Achievement Division employees were announced as 2021 Department of the Navy (DON) Test and Evaluation (T&E) Awards Program winners on Feb. 1, 2022.

Coming on the heels of his Dr. Murray Strasberg Award for Lifetime Achievement he received as part of the 2020 Magnificent Eight Awards, Carderock's Gordon "Scott" Price, a technical project manager in the Program Management Branch, received the 2021 DON T&E Lifetime Achievement Award.

Additionally, the USS Gerald Ford (CVN 78) Full Ship Shock Trial (FSST) Team, led by Carderock's Joe Venne, the Program Manager for the Underwater Explosion Tests and Trials Program Office, and Shock Trial Director for the FSST, received the 2021 DON Test Team Award. and Evaluation Program. It consisted of



Joe Venne

Award, our very own Gordon (Scott) Price earned the win for shaping Test and Evaluation efforts for the Navy's first-line-of-defense ships against the mine threat. With more than 44 years working for the Navy (20 active duty), Scott is really the expert in this area," Carderock Technical Director Larry Tarasek said in an announcement to the command. "I'm sure it will come as no surprise that our CVN 78 Full Ship Shock Trials Team won the DON Team Test Award ... Their hard work was not only evident in the successful outcome of the trials, but also resulted in a highly visible event on media," Tarasek wrote.

The USS Gerald Ford (CVN 78) FSST Team executed the FSST during the summer of 2021 off Mayport, Florida, in support of the PMS 378 Live Fire Test three explosive events, and was the most complex and largest

scale FSST since the USS Theodore Roosevelt (CVN 71) FSST that took place in 1987.

While it was Carderockled. the FSST was a collaborative event that also included NSWCs Philadelphia **Division and Dahlgren** Division, Naval Air Systems Command, Naval Sea Systems Command (NAVSEA) 05P1, 05V and 08 and Director, Operational Test and Evaluation (DOT&E), among others. In total, including the crewmembers aboard USS Ford, more than 3,000 individuals were involved.

"The test team exhibited the ability to leverage off previous experiences and the technical skill and professionalism of the team members to

plan the event while working remotely. Once on-site, we rapidly established the high-power teaming atmosphere in short order with the ship's crew to complete preparations for the at-sea evolution," Venne said. "During the at-sea evolution, the test team worked tirelessly to react to emerging technical issues and adverse weather and sea conditions to safely and successfully execute the explosive events, respond to the test findings rapidly to repair and restore the ship and ship systems for the next event and brief the results to program senior and DON leadership. The results of this effort and the contributions from the test team that enabled it, will play a significant role in improving the survivability of the CVN 78 Class and the ability to maintain its mission keeping capabilities after an underwater explosive event."

Venne is extraordinarily proud of his team's efforts, especially in their ability to come together to reach a common goal.

"This is a big honor for everybody who executed and participated in the event," he said. "These folks spent so much time working on this to make it happen. This was truly the most collaborative and best group of people I have ever worked with, in particular with DOT&E and NAVSEA08. Each stakeholder organization had their own specific goals for the program, which at times were conflicting; however, the on-site team leadership put aside their differences for the overall common end goal."

Each of the three explosive events went as planned, resulting in a successful FSST event. Aside from Venne, Carderock employees and affiliated members included in the award were: Steven Rutgerson, Joshua Yates, Chris Wong and Roy Javier of the UNDEX Research and Development Branch; Lana Craig, Matt Strawbridge and Alexander Burr of the Dynamic Measurements and Testing Branch; Tom Douglas of the Acquisition Safety and Environment Branch; Noel Monardes of the Vulnerability Assessment Branch, and three contractors: Rafael Olivieri, Mark Cotter and Danny Eads.

As for Price, he was aware that he had been nominated, but did not expect to actually receive the award.

"I knew I was nominated by my division head for this award, but I had no expectations," he said. "There are a lot of very talented people doing their best for our Navy every single day and I am honored to have been singled out. When you get towards the end of your career, they start giving out these lifetime achievement awards as a way of saying thank you, but it also served as a gentle push that it is time to make way for the younger folks. It's a great honor to receive the award, and makes me feel that the command really cares about the work I've done."

Price enlisted in the Navy right out of high school, where he served for 20 years before retiring in 1997 as a Chief Warrant Officer. During his Navy career, Price spent the majority of his time dealing with naval intelligence, primarily the support of mine warfare (MIW).

After retiring from active duty, he went on to spend five years as a contractor on the staff of Commander, Mine Warfare Command (COMINEWARCOM). He then spent six years as a Department of the Navy employee at COMINEWARCOM and the Naval Mine and Anti-Submarine Warfare Command, as the Assistant Chief of Staff (ACOS) for Mine Warfare Doctrine, Requirements and Experimentation (N5/8/9). He has since been a Carderock employee for the last 14 years, where he continues to support U.S. MIW.

"I have spent more than 45 years of my life with the Navy," Price said. "And 28 of those years have been related to MIW."

During his career before Carderock, Price was instrumental in conducting at-sea systems testing for tools that provided situational awareness and intelligence information for military operations, including Joint Operations Tactical System, Joint Maritime Command Information System, Global Command and Control System-Maritime, Basic Electronic Intelligence Tracker, Ocean Surveillance

Information System Baseline and Ship's Signal Exploitation Space. The success of these systems was leveraged in creating modern C4I systems.

During the 1980s and 90s, Price also participated in atsea testing of the **TOMAHAWK** Weapon Control System, which is still in use today.

As the Chair of the MIW Operations and Tactics Group while serving as ACOS for Experimentation at Commander, Mine Warfare Command/ Naval Mine and Anti-Submarine Warfare Command, Price led fleet experiments for surface, air and underwater mine countermeasure (MCM), mining and assault breaching forces and oversaw numerous fleet experiments resulting in initiation of new acquisition programs.

Per his award nomination package, "Price has defined and implemented T&E best practices and processes through innovative solutions, improving T&E effectiveness and efficiency. In addition to planning and overseeing dozens of Assessment and Identification of Mine Susceptibility acoustic and magnetic stray-field and underway test events for MCM ships, unmanned surface vehicles and small craft in Bahrain, Japan and San Diego, Price advocated for new underwater electric potential measurement capabilities, configurable measurement systems and moving the Bahrain measurement site."

Relocating the Bahrain underway measurement array helped to not only alleviate concerns about the current site's proximity to shoal water WAVES 🔶 ROCKSTARS



Gordon "Scott" Price

and vessel traffic, but also supported measurements for other forwarddeployed ship classes, which enabled the Fifth Fleet to meet its MIW mission.

While at Carderock, Price has supported the MIW community to shape Littoral Combat Ship and MCM T&E programs. During this time he has planned and executed an unprecedented, comprehensive series of magnetic, acoustic and in-situ mine actuation measurements for USS Sioux City (LCS 11) at six range sites to validate the Navy's long-standing approach to developing susceptibility data against sea mines.

Joshua Daubert Receives ESGR Patriot Award

By Todd Hurley, NSWC Carderock Division Public Affairs

Joshua Daubert, Naval Surface Warfare Center, Carderock Division's Infrastructure Liaison Office Program Manager, was awarded the Employer Support of the Guard and Reserve (ESGR) Patriot Award on March 15, 2022. The award presentation took place in the Command Briefing Room, with Michael Sternfeld, a representative from ESGR on site to present the award to Daubert.

The Patriot Award is the first in ESGR's series of awards. An employee serving in the National Guard or Reserve may nominate individual supervisors and bosses for support provided directly to the nominating service member and his or her family. The Patriot Award reflects the efforts made to support citizen warriors through a wide-range of measures including flexible schedules, time off prior to and after deployment, caring for families and granting leaves of absence if needed.

Daubert received this award for his support of Zhen Deng, a materials coordinator in the Infrastructure/MAM Program Office, while he was deployed to Bahrain as an Individual Augmentee in the U.S. Navy Reserves from January-December 2021.

"I had no idea that I had even been put in for the award," Daubert said. "I showed up to work one day and was told to meet in the Command Briefing Room. I had no idea that I was about to receive an award — it was all guite a nice surprise."

Deng nominated Daubert for the award as an acknowledgment of thanks for his support before, during and after his year-long deployment.

"When I received orders in September 2020, I told Josh that I would be deployed for a year," Deng said. "He did not give me any issues or problems, instead, he was happy to assist me to ensure my pre-deployment process went as smoothly as possible. While I was deployed, he even took over my duties and projects and carried them as his own until the day I returned."

At Carderock, Deng primarily deals with materials and asset management — making sure all materials are received in a timely manner, managed properly and is delivered to the customer.

"In our branch, we do a lot of inventory, ensuring all the proper documentation are in the users' hands, and making

Carderock Divisio



it easy for requesters to get the materials when needed." Daubert said. "We do a lot of inventories geared towards materials management, and Zhen is a big part of that work."

In the Navy Reserves, Deng is a Petty Officer First Class Logistic Specialist. While in Bahrain, he was the government purchase cardholder, in charge of purchasing materials for base-wide operations.

During his year-long deployment, Daubert made sure to stay in touch with Deng, making sure he was doing well and seeing if he needed anything.

"During my deployment, Josh contacted me every month or so to make sure I was doing okay," Deng said. "I would email him often, asking a lot of questions, and he would never fail to respond very quickly. He also kept track of my civilian status, making sure I did not fall through the cracks or miss out any benefits while on military orders. At the end of my military order, he reached out to me and coordinated with the Human Resources Department to make sure I had everything I need prior returning to Carderock."

Deng returned to the States in December 2021, and got back "Because of all the help I received from Josh, I was able to to work at Carderock in February 2022. have a smooth transition back to Carderock," Deng said.

Materials coordinator Zhen Deng (left) and Michael Sternfeld (right), a representative from the DoD program, Employer Support of the Guard and Reserve (ESGR), present Infrastructure Liaison Office Program Manager Joshua Daubert with the ESGR Patriot Award for his support of Deng while on a year-long deployment to Bahrain with his U.S. Navy Reserves unit from January-December 2021. (U.S. Navy photo by Devin Pisner)

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Navy Reservists at Carderock

By Todd Hurley and Kelley Stirling, NSWC Carderock Division Public Affairs

There is only one active duty U.S. Navy service member stationed at Naval Surface Warfare Center, Carderock Division — the Commanding Officer, Capt. Todd E. Hutchison. However, he is not the only Sailor to be stationed at Carderock; there are currently 12 Navy Reservists on yearlong rotations throughout the base.

Positions as a Navy Reservist stationed at Carderock are on a volunteer basis, and there are typically numerous applications each year, making selection more difficult. Generally, it is required for the chosen Reservists to have been in the Navy for several years, and for them to have been previously deployed.

"When Sailors are chosen to come here, we are expected to have a good amount of military experience," Hospital Corpsman 1st Class John Offre said. "When the Sailors are chosen, they receive orders for one year. After that, they can potentially have those orders extended for another year, up to three years. However, a new Navy instruction has recently changed that from three years to five years."

Offre, who has been on orders at Carderock for three years, hopes to get extended another year. In his civilian job, he worked in healthcare administration, and he is also a Registered Nurse.

The orders these Sailors receive typically last an entire fiscal year, October through September. With the current fiscal year coming to an end, there are several Reservists that are heading home. Lt. Cmdr. Ashley Henderson is one of those Reservists.

Coming in as the Executive Officer for Carderock a year ago, Henderson said her primary function was to help Carderock transition facilities and maintenance management from Naval Facilities Engineering Command to Carderock's Facilities Division. And, as the top Reserve Sailor at Carderock, she is also responsible for the other Reservists.

Henderson said these types of orders can be very beneficial to a Reservists' career, both professionally and financially. The Reservists are able to earn the maximum number of retirement points per year and allows them to collect their retirement pensions before age 60. They also receive other military entitlements, such as Tricare Prime and GI Bill education benefits.

"Professionally, they can learn new skills, forge new networks and gain knowledge to possibly set new military or civilian



career goals," Henderson said. "Reservists are typically multi-faceted people. Bringing their diverse experiences and perspectives to the command is a powerful tool that, as leaders, we need to harness for everyone's betterment and to complete the Navy's mission."

The work the Reservists on base do range from being mail clerks, working with purchasing cards (P-Cards), performing physical security, reporting to the Chief of Staff, among other duties. "For a lot of us, when we come here, we don't always necessarily do the same types of jobs as we do as a civilian," Offre said.
"When I first started, I was a mail clerk. From there, when COVID
started, my duties transitioned to tracking immunization records
and running COVID reports for Carderock and the detachments,
and reporting that data to the Chief of Staff. We have a guy who
works with P-Cards who does information technology work on
the outside for the Internal Revenue Service."
the Sailors who have left or are leaving have been offered civilian
jobs by the Carderock department they were supporting.
For Offre, as well as the other 11 reservists, they are proud of the
work they are doing, and appreciate that it is being noticed.
"The main thing for us Sailors is coming in here and getting our

According to Offre, most of the Reservists will be ending their tour of duty at Carderock, with two new ones coming in. A handful of

"The main thing for us Sailors is coming in here and getting our work done," Offre said. "A lot of the time, we will do our job for the year and then move on. At the end of the day, we are all trying our best."

Carderock Employees Graduate from NAVSEA Next Generation **Leadership Program**

By Todd Hurley, NSWC Carderock Division Public Affairs

Four Naval Surface Warfare Center (NSWC), Carderock Division employees graduated from the Naval Sea Systems (NAVSEA) Next Generation Leadership Program on Jan. 19, 2022.

The graduation was streamed live via Microsoft Teams, with Vice Adm. William Galinis, the Commander at NAVSEA, and Giao Phan, the Executive Director at NAVSEA Command, presiding.

The NAVSEA Next Generation Leadership Program, a yearlong program, is the first in the three-step NAVSEA Leadership Development Continuum. The Continuum allows employees to focus on leadership development through various stages of their careers, in preparation for future opportunities within the organization. The other two stages consist of the Journey Level Leaders (JLL) Program, as well as the Commander's Executive Fellows Program.

Being the first in the Continuum, the Next Generation Leadership Program focuses on entry-level NAVSEA employees within their first five years of employment, who are looking to take on more leadership roles at NAVSEA.

Among the Carderock participants were Dr. Kylee Fazende, the Corrosion Control Assistance Team Deputy Project Engineer in the Corrosion and Coatings Engineering Branch; Alexis Douglas-Hargro, Deputy of the Supply Branch; Gabriel Upton, a structural composites engineer in the Structural Composites Branch; and Akeel Channer, a materials engineer in the Additive Manufacturing Branch.

The program consisted of nearly 50 individuals from across NAVSEA, and was split into seven different groups. Each group were assigned a mentor, and given several assignments to be completed throughout the year, including online leadership courses through the Defense Acquisition University, reading and examining two leadership-centric books, hosting a leader within NAVSEA as a guest speaker and a final group capstone project.

For the final project, each group was assigned a different naval installation, and were tasked with doing surveys and conducting interviews to gather information on the culture at these installations, and how they align themselves with the NAVSEA Campaign Plan 3.0. The two main focuses were to determine the workforce perception of culture, as well as finding out the cultural perception of the Navy's leaders and supervisors.

"This has been a great experience seeing the different ways people do things across the Navy — we all view the Navy's mission differently,"

Fazende said. "It was refreshing to interact with people who aren't science, technology, engineering or mathematics (STEM) - type technical people, and it has been a good reminder that there are other parts of the Navy than what you specifically work on. It helped us visualize how big the Navy really is, and how what we do fits into the larger picture."

Fazende's group was assigned to Supervisor of Shipbuilding (SUPSHIP), Conversion and Repair in Bath, Maine.

"During our group work, we talked a lot about integrity and honor, and having trust with your employees," Fazende said. "It was really enlightening. Some people take doing the right thing for granted, but as a supervisor you have to be able to trust employees to do the right thing and have integrity."

For the mentors, each participant was assigned an individual participating in the 2021 JLL Program. Coincidentally, Fazende, along with Channer, were both assigned Dr. Matthew Draper, a metallurgist in Carderock's Physical Metallurgy and Fire Branch.

"This was as much for the JLL participants as it was for us," Fazende said. "Part of their development was to build up to being supervisors and leaders where they have people under them that they mentor. Having Matt as our mentor is great, and we learned quite a bit from him. He showed us the importance of planning out our career goals over the next five years. The main takeaway I have is that you don't always have to stick to your plan, but if you have a plan it is a lot easier to pivot from rather than going blind without a plan."

Channer, who was also mentored by Draper, was assigned to SUPSHIP Conversion and Repair in Groton, Connecticut.

"It was definitely a great experience to be able to go up there and check out the work that they do," Channer said. "It is a smaller activity, with only about 450 employees. I immediately noticed that they have an advantage since it is so small, which made it more personable. Everyone was nice and inviting and super helpful in any way they could be of assistance. I would describe their activity as a family culture."

Douglas-Hargro spent her portion of the final capstone project at NSWC Crane Division in Indiana.

"You can have such a singular experience at your command, but going to see how other Warfare Centers are doing business is eye-opening,"

she said. "This type of experience gives you a new perspective of organizational culture. I was excited to bring that valuable insight back to the command and share it with my colleagues."

At Crane, Douglas-Hargro and her group were provided the opportunity to meet with the command and senior leadership in order to learn about their culture.

"We went through a number of interviews, and in a week's time, we were able to understand their culture and strategic framework smaller size." principles," she said. "We were able to see what works for them and areas for improvement. Her appointed advisor is a champion Each of the four Carderock employees were successful in completing of "fearless feedback", a concept she says is, "transformative". The their program. They seem grateful for the opportunity to not only see what life is like at other naval installations, but for the ability to bring main takeaway is that permeates through what we do - our values, beliefs, and motivations. At the beginning of this experience, we were the knowledge gained back to Carderock to enhance the culture in unaware of just how much culture is embedded in our day-to-day. I their everyday lives. am encouraged to continue cultivating a positive one."

The groups presented the results of their final capstone project For Upton, like Channer, he was provided the opportunity to to Galinis and Pham on Jan. 18, which was followed by an official experience life at a smaller naval installation, going to the Southeast graduation on Jan. 19.

PROGRAM ATI ER G SHIP N EX Ŕ EADE AVSI Ż





Akeel Channer

Regional Maintenance Center (SRMC) in Mayport, Florida.

"My group's overall consensus at SRMC was that, because of their smaller size, communications are able to flow guite freely between leadership and enlisted and civilian personnel," Upton said. "They seemed really proud of the work they do, especially their ability to provide combat power on time, and making sure ships get in and out as guickly as possible. Their leadership wants to keep open communication, which seems to work well for them due to their



Carderock Team Receives DHS Under Secretary's Award

By Todd Hurley, NSWC Carderock Division Public Affairs

BARNEGAT LIGHT

47314

A 47-foot Motor Life Boat crew from U.S. Coast Guard Station Barnegat Light, in Ocean County, N.J., is shown here exiting the Barnegat Inlet and into the Atlantic Ocean, Aug. 8, 2021. (U.S. Coast Guard Photo by Seaman Kesami Hitaffer)

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Department of Homeland Security (DHS) and U.S. Coast Guard (USCG) in collaboration with Naval Surface Warfare Center, Carderock Division (NSWCCD) received the 2022 DHS Under Secretary for Science and Technology (S&T) Collaboration Award. The award was given for their exceptional efforts in the planning and execution of the 47-foot Motor Life Boat (MLB) Initial Operational Test and Evaluation (IOT&E), which was part of the Service Life Extension Program (SLEP). A virtual award ceremony was held on Microsoft Teams on Nov. 17.

The awardees consisted of a test team from NSWCCD's Test and Evaluation (T&E) Engineering Resource Branch within the Combatant Craft Division in Little Creek, Virginia, including; John Huber, test director and East Coast test lead; Maeanna Stover, test lead and test support; Alice Freese, West Coast test lead and test engineer; and Phillip Pullen, test engineer.

The USCG 47-foot MLB was designed to weather hurricane force winds and heavy seas, capable of surviving winds up to 50 knots and breaking surf up to 20 feet. More importantly, should the boat capsize, it self-rights in fewer than 10 seconds with all equipment fully functional. The SLEP was designed to refit these boats and bring them up to a modern configuration — updating the electronic systems and propulsion systems onboard, as well as inputting better human factors, such as shock absorbing seating.

As part of this program, the Carderock test team collaborated with the USCG to conduct an operational assessment (OA), as well as the IOT&E, which had to be completed in both the Atlantic and Pacific Oceans. For the OA, the test team collaborated with the USCG National MLB School at Station Cape Disappointment in Ilwaco, Washington, which took place during the winter of 2020-21.

"The IOT&E event that we were nominated for was the result of many years of solid work by Maeanna Stover and Ryan Faber," Huber said. "Our success as a team was reliant on years of supporting work by Faber and Stover. Stover was the continuing thread through this multi-year event, and a large amount of the work supporting this nomination: identifying requirements, creating metrics, tracing requirements to measure the metrics and the deputy test director for OA."

In total, this was a six-year effort, run by Faber and Stover through the completion of the OA and Huber through the completion of IOT&E.

"The first portion of testing was the OA to determine program risks to IOT&E," Stover said. "We were able carry forward many lessons learned from OA into IOT&E."

The purpose of the IOT&E was to thoroughly test the MLBs in operationally realistic conditions and determine if the platform remained effective and suitable. For this testing, USCG stations Barnegat Light in New Jersey and Yaquina Bay in Newport, Oregon, were chosen as the East and West Coast test site locations.

IN TOTAL, THIS WAS A SIX-YEAR EFFORT.

Testing at the East Coast test site, USCG Station Barnegat Light, took one month, while the West Coast site at USCG Station Yaquina Bay took a month and a half.

"The pace at each station was significantly different," Huber said. "On the West Coast, it was their busy season, which meant it was demanding and harder for us to be able to go out and collect data. Meanwhile, for the East Coast testing, they were not as busy, and were able to devote more resources toward maximizing the test event."

Additionally, the 47-foot MLB is an active boat, which provided additional challenges to the test team.

"A lot of times we would get underway with the crew and not know if we would even be able to complete our test objectives," Freese said. "The station on the West Coast was constantly training new members — it was a new test platform, so everyone who was going to be onboard needed to be trained and qualified to ensure everyone would be safe. It was difficult because when we normally do developmental testing the boat is not an active boat, which was not the case here."

The overall findings for the program proved to be effective and suitable for the fleet moving forward, although the final report is currently still in progress.

"We conducted testing with DHS oversight," Huber said. "DHS used our data and findings to make final recommendations to the USCG program office. This effort required a large amount of collaboration between DHS, USCG program office, USCG active stations and Carderock. Each group had significant contribution to the success of the test program."

Naval Surface Warfare Center, Carderock Division employees from the Test and Evaluation Engineering Resource Branch after receiving the 2022 Department of Homeland Security Under Secretary of (S&T) Collaboration Award for their efforts in the planning and execution of the 47-foot Motor Life Boat Initial Operational Test and Evaluation. From left: Alice Freese, John Huber, Maeanna Stover and Philip Pullen. The photo was taken in Little Creek, Va., on Sept. 22, 2022. The award ceremony was held on Nov. 17. (Photo provided by John Huber)



Carderock's Dr. Maureen Foley Supports Ship-to-Shore Connector Program at the Washington Navy Yard

By Todd Hurley, NSWC Carderock Division Public Affairs

From left: Cmdr. Rebecca Macus, Ship-to-Shore Connector (SSC) Fleet Introduction Officer; Capt. Scot Searles, PMS 317 Program Manager; Lyle Watkins, SSC ILS Assistant Program Manager; David Yauger, SSC Principal Assistant Program Manager; and Dr. Maureen Foley, SSC Assistant Program Manager, pose in front of Landing Craft, Air Cushions 101 and 102 after their delivery to Assault Craft Unit 4 in Little Creek, Virginia, in February 2022. (U.S. Navy Photo provided by Dr. Maureen Foley)

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Dr. Maureen Foley, a materials engineer in Naval Surface Warfare Center (NSWC), Carderock Division's Integrated Manufacturing and Composite Materials Branch, recently finished a year-long rotation at PMS 317 at the Washington Navy Yard in Washington, D.C., to assist with the Ship-to-Shore Connector (SSC) Program.

PMS 317, a program office within Program Executive Office Ships (PEO Ships), encompasses Light Amphibious Warship, Landing Craft, Air Cushion (LCAC) Service Life Extension Program, Landing Craft Utility and the SSC.

The SSC is an evolutionary replacement for the existing fleet of LCAC vehicles. It is an air cushion vehicle whose mission is to land surface assault elements in support of operational maneuver from the Sea, at over-the-horizon distances, while operating from amphibious ships and mobile landing platforms.

For this rotation, which lasted the entirety of the 2022 fiscal year, Foley was assigned to the SSC Program as the assistant program manager.

"Since this was a training rotation, I asked Mr. Tarasek to see if there was any possibility of workforce development funding to be able to cover the rotation, and he agreed," Foley said. "I got to be downtown supporting the SSC Program on a daily basis, which was great. I was able to get involved with the acquisition program and see for a whole year what goes on as far as reporting construction; dealing with shipyards; dealing with Supervisor of Shipbuilding; and understanding how we go through the different builders and acceptance trials, and then finally delivery off the craft to the Navy and eventually the fleet."

While supporting PMS 317, Foley was able to be part of several separate LCAC deliveries to the Navy. She was the acting principal assistant program manager for the days leading up to the delivery of LCAC 103, and had to work with numerous entities to ensure the requirements and paperwork for delivery was in place. During her tenure, the first four LCAC crafts (101-104) were delivered to the fleet via lifts, two in February and two in August 2022.

"We delivered the first two craft to Assault Craft Unit 4 in Little Creek, Virginia," she said. "That was a really big day for the program, so it was incredible that I was able to attend."

Conveniently, Foley was involved in developing the Composite Maturation Plan in the Hull Systems Study Report for SSC in 2008 during the analysis of alternatives stage of the program.

As the assistant program manager, Foley was responsible for assisting in performance, budgeting and schedule for the acquisition program — roles that were outside of her science and technology (S&T) manager role at Carderock.

"I have a much more technical role at Carderock, so for this rotation I was trying to focus and learn more about program

management and how programs work in terms of cost, schedule and budgeting," she said. "They look at funding much differently than we do. I got to work with the financial team for budgeting to understand how much money the program had, and how much it needed. I was also part of weekly shipyard calls to discuss production and test schedules, as well as part of weekly meetings with the captain to go over the program. I received a much higher level of interaction and exposure than what I am used to at Carderock, which was real valuable."

Foley proved to be such a valuable member to the program that she was offered an extension to stay at PMS 317, but she ultimately decided to return to Carderock.

"A lot of people go on rotations and stay on rotations," she said. "However, I decided to come back because it was better for me and my unique skillset within the S&T field. I found that I am a better fit at Carderock. It was a great learning opportunity for me to get a better understanding of how the program office operates, but I realized that I would rather use the knowledge that I gained on the rotation for my work here at Carderock."

Although she did not take them up on their offer, because of the work and support she provided, she left in good graces in case she were to ever take another rotation.

"I really loved the opportunity to interact at the active duty military level, because we don't really have a lot of that



Landing Craft, Air Cushion 102 is delivered to Assault Craft Unit 4 in Little Creek, Va., in February 2022, as part of the Ship to Shore Connector Program. Carderock's Dr. Maureen Foley went on a year-long rotation to assist with the program, which included being the acting principal assistant program manager for the delivery. (U.S. Navy Photo by Dr. Maureen Foley)

- d. available at Carderock due to the limited active duty billets," she said. "I was right down the hall from Capt. McNeal, who used to be the Commanding Officer at Carderock. It was interesting to interact with him and Capt. Searles and Capt. Grabelle, PMS 317 Program Managers, on a daily basis, as well as have the opportunity to develop briefs and attend meetings for other high ranking officers on a regular basis. I also enjoyed the interactions on a working level with a variety of people with different background and endowing the interactions on a working level with a variety of people with different background and endowing the interactions on a working level with a variety of people with different background and endowing the second and the optimization of the second endowing the second end
- he different backgrounds and organizations, such as NSWC Panama
 City, who acts as the In-Service Engineering Agent for LCAC. At
 Carderock, I mainly interact with S&T people, so this was a nice
 change. Overall, it was a great experience."

The fifth grade class of Charles R. Drew Elementary School posing with their teachers Ms. Harvey, Mrs. Landry and Mr. T., the teacher's aide after the rocket launch. (Photo provided)

Carderock Supports Rocket Launches at Dr. Charles R. Drew Elementary School

By Benjamin Morley, NSWC Carderock Division Public Affairs

At the field outside of Dr. Charles R. Drew Elementary school in the Arlington, Virginia, all eyes were on the sky. On April 22, 2022, a joint effort between the school and Naval Surface Warfare Center, Carderock Division's Science, Technology, Engineering and Mathematics (STEM) Outreach Program launched rockets. Students in the fifth grade and their teachers were all excited to participate in the project.

When Michael Vargas, an Albert Einstein Distinguished Educator Fellow working in Carderock's Technology and Innovation Office Branch, was their age, bottle rocketry was commonplace. Carderock helped bring this magic back for a new generation of future engineers and scientists.

"Most of those kids have never flown a rocket before, not even a straw rocket. For them to actually see it work was amazing," Vargas said. "These kids were blown out of the water."

The rocket launch was made possible by a collaboration between the school's STEM lead Mrs. Landry and Charlotte George, Carderock's STEM and Outreach Program Director.

"Charlotte is a dynamo when it comes to getting local schools engaged, fostering community partnerships and getting programs off the ground," Vargas said. "Great stuff is taking place at Carderock and she is the point of contact for all of it."

While working with kids to launch rockets is fun, Carderock is an asset to STEM education.

"We are a resource to the community and the DMV," Vargas said. "It is a huge deal. I don't think a lot of folks in education think about the Navy doing research. There's a huge infrastructure in the background of scientists and engineers working on these things to make our country better. Showing folks what is possible is never a bad thing. If kids can see it, then they can be it."

Flying rockets is more than simple fun with science. Carderock's STEM-based programs are a model example of the STEM education architecture across the Department of Defense (DoD).

"The fact that Carderock works with local community members to do STEM nights and STEM projects, is invaluable," he said. "We do not have enough of that across all the DoD."

These programs help develop future STEM professionals to maintain the United States' competitive advantage.

"It is a small investment with massive returns," Vargas said. "From the viewpoint of input versus output, it's very little amount of time, money and resources - you're affecting people's lives in a way that is unique and immeasurable."

Mrs. Harvey's fifth grade class picked up some of the skills required to be successful engineers. They learned perseverance, patience and cooperation.

The students were introduced to the growth mindset process, learning attributes like talent, skills and intelligence can grow over time with both successes and failures – a critical asset to developing the confidence to experiment in STEM careers. Students also learned the engineering design process, an openended problem solving process that guides engineering teams when they tackle problems like designing and building rockets.

Students were not the only ones learning to fire rockets. Even Ms. Gaither, the principal of Charles R. Drew Elementary School got in on the action by launching her first rocket. The experience left both students and teachers wanting more. Next year, the teachers of Charles R. Drew Elementary are planning to have another rocket launch for students with the help of the community. There were several memorable events that day for Vargas.

LOCAL COMMUNITY MEMBERS TO DO **STEM NIGHTS AND STEM PROJECTS, IS INVALUABLE...WE DO NOT HAVE ENOUGH** OF THAT ACROSS ALL THE DOD.



WAVES | INVESTING



Students building rockets in the "Dragon's Den," the STEM room of Charles R. Drew Elementary School. They are assisted by local volunteers. (Photo provided)

However, the one that stuck with him was the emergence of a future engineer.

"A little girl came up to me and said 'I think I want to be an engineer someday too," Vargas said. "I explained to her that the folks providing all of this are mostly scientists and engineers at Carderock. I had to make sure they knew where these rockets came from. I explained to her that this was part of the STEM outreach that the command does. I don't think they understood much of that part, but the fact that it was coming from other engineers and they got to do what the engineers did, that was invaluable. Getting to hear that from a fifth grader -'I want to be an engineer someday', that was pretty awesome."

THE FACT THAT CARDEROCK WORKS WITH

Carderock Partners with ignITe Hub

By Todd Hurley, NSWC Carderock Division Public Affairs

Naval Surface Warfare Center, Carderock Division has partnered with Montgomery College's ignITe Hub, a collaborative space created to ignite and inspire innovation in Montgomery County, Maryland.

Located in Rockville, Maryland, ignITe Hub is a unique space where students of all ages can learn coding and entrepreneurial skills to help prepare them for the future workforce. Moreover, it is a collaboration space that is not only open to Montgomery College, but also the community — small businesses, individuals and anyone that is interested in coming in and renting the space. "The partnership between Carderock and the ignITe Hub is an important collaboration that will impact all Montgomery County residents who are seeking an educational, career or entrepreneurial tech pathway into the Federal government," ignITe Hub Director Kimberly Bloch-Rincan said. "We are looking forward to having Carderock as a key partner at the forefront of our foundational programming."

Carderock's involvement with ignITe Hub stems from Lauren Hanyok, Carderock's Capital Tech Bridge Director.

"I visited the grand opening of ignITe Hub and met the director, Kimberly Bloch-Rincan, as well as Montgomery County Councilmember Craig Rice," Hanyok said. "He was the visionary for ignITe Hub. When they told me who it was geared toward — students and adult learners — I recommended the government, and they agreed. We discussed their goal and how Carderock fits in with that. One of the things Carderock's STEM (science, technology, mathematics engineering) has been looking to do is find an external space to do teacher trainings and whatever stems out of that."

Additionally, Hanyok and fellow employees, Charlotte George, Carderock's STEM and Outreach Director and Dr. John Barkyoumb, Carderock's Director of Strategic Relations, are looking to put together experimental projects where command employees take Distro A level projects to ignITe Hub.

"This will allow us to use their resources and people to help on projects to get a chance to give exposure to Montgomery County of Carderock — who we are and what we do," Hanyok said. "The idea is to give exposure to Carderock, but also to provide people the opportunity to learn about our internships and career opportunities — it's a great way to provide more insight into who we are to the community."

Based off of these conversations with Bloch-Rincan and Rice, Hanyok had the idea to give them a tour of Carderock, which took place on July 14, 2022.

"It was great having leadership from the local area visit and tour Carderock," Carderock's Deputy Technical Director Steve Ouimette said. "Our mission is not only important to the Navy, but also the local community and its economy. Our next step is to begin a dialogue of collaboration as our Capital Tech Bridge makes end roads into the local ecosystem and to be more involved in the community."



The tour consisted of a meet-and-greet with Ouimette and Dr. Dave Drazen, Carderock's Chief Technology Officer. Then, Hanyok, George and Barkyoumb led Bloch-Rincan and Rice to the Command Briefing Room in Building 2; the Model Shop and David Taylor Model Basin; the Maneuvering and Seakeeping Facility in Building 18; the Additive Manufacturing Lab in Building 60; the newly created Additive Manufacturing Prototyping Lab in building 9; and finished with meeting the Science and Engineering Apprenticeship Program and Naval Research Enterprise Internship Program interns.

"Councilmember Rice seemed quite impressed with the diverse student cohort we have here at Carderock,"



Montgomery County Councilmember Craig Rice and his Chief of Staff Sharon Ledner looking at an additively-manufactured metal part, while ignITe Hub Training and Development Director, Rey Aponte (left) looks on, at Carderock's AM Lab in Building 60 in West Bethesda, Md., on July 14, 2022. (U.S. Navy photo by Lauren Hanyok)

Naval Surface Warfare Center, Carderock Division's Chief Technology Officer, Dr. Dave Drazen (left), showing Carderock's Maneuvering and Seakeeping Facility to Montgomery County Councilmember Craig Rice (center), his Chief of Staff Sharon Ledner (second from right) and ignITe Hub Director, Kimberly Bloch-Rincan (right), in West Bethesda, Md., on July 14, 2022. (U.S. Navy photo by Lauren Hanyok)

> Ouimette said. "This was his initial visit here, so we wanted to help him have a better understanding of what we do here, as well as how to be involved and partner with our Tech Bridge. He has a three-week summer program for students that exposes them to activities alongside STEM, so we are looking into ways that we can support that."

Carderock's STEM and Outreach Program Creates STEM-In-a-Box for Educators

By Edvin Hernandez, NSWC Carderock Division Public Affairs



When Naval Surface Warfare Center, Carderock Division welcomed its first Department of Defense Albert Einstein Distinguished Educator Fellow in 2019, it signaled a new approach for the command's STEM and Outreach Program in helping educators across the country.

Debbie Reynolds, Carderock's first Einstein Fellow and an educator for the Pittsburgh school system, joined the command for 11 months beginning in September 2019. The objective for her fellowship quickly took shape, helping identify shortcomings for science, technology, engineering and mathematics (STEM) teachers in America. Reynolds visited many naval STEM stakeholders during her fellowship and was accompanied by Carderock's STEM and Outreach Program Director, Charlotte George. During their time together, they identified that several naval organizations would benefit from a naval themed collection of hands-on STEM activities. Since then, Carderock has worked closely with

three generations of Einstein Fellows to create, develop and progress a naval STEMin-a-box kit, which contains small navalrelevant activities, books and other STEM resources for K-12 students and teachers.

"That journey started with Debbie Reynolds," George said. "As an experienced and accomplished educator, she was able to share her perspective on naval STEM programs. She was very familiar with national initiatives from other government organizations like the National Aeronautics Space Administration, but was surprised to learn the vast scope of opportunities from naval STEM stakeholders, including Naval Sea Systems Command (NAVSEA). We wanted to create a well-branded product that created some synergy within NAVSEA STEM, and appealed to educators across the U.S."

Carderock and other Warfare Centers' STEM Outreach programs fall in line with DoD and National STEM Strategic Plans, but they vary greatly from center to center. George and her team have attempted to provide a solution that all naval stakeholders can use.

In last year's set of Einstein Fellows, Suzy Otto, an educator from Paris, Missouri, revealed some of the obstacles rural-based teachers have in gathering supplies for STEM projects. This, in turn, inspired a shift in the naval STEM-In-a-Box activities to use easily accessible, common everyday items.

"Suzy gave us this great context on rural communities," George said. "She mentioned how there are great resources online, but the closest supply store she has is a dollar store. That's a challenge because she can't find a lot of the materials in-time to do a project, or locally at all. Utilizing accessible and affordable everyday materials to teach these STEM fundamentals is important."



The cover of a STEM literacy book "Oh Barnacles," included in the early childhood STEM-In-a-Box collection. The literacy books are used by students and teachers, and provides detailed directions on materials and instructions of small STEM related projects. (Designed by Kristin Behrle).

During Otto's Fellowship, she drafted lesson plans for a sixth-to-eighth grade middle school kit and a high school kit. However, due to COVID-19 restrictions, only virtual workshops with the new activities were shared with teachers.

Now, in Carderock's third year of hosting Einstein Fellows, George has been able to evolve the kits with this year's Einstein Fellow, Stephanie Klixbull. Both Klixbull and George have also been able to identify one key area needing improvement in Carderock's STEM and Outreach Program: Early childhood education.

"The National Academy of Sciences just released a call to action proposal for science education," Klixbull said. "They found that one of the biggest issues in the schooling system is the time, resources and materials allotted for elementary science. The average elementary school science teacher is only allocated 20 minutes a day – that's a statement from the actual National Academy of Sciences proposal."

According to George, most of the activities the command provides have traditionally targeted students in middle school and high school. Klixbull, who is also an early childhood educator, has introduced new ways Carderock can expand its reach to all age groups, K-12.

"I understood there was such a lack of research in this space, for early childhood educators," George said. "I think Stephanie and I feel passionate about this toolkit she created, which is incredibly valuable. Carderock, traditionally, has always said we are a K-12 program, but we really didn't have anything for that age group. So, this has been a reckoning within our own portfolio to improve our resources."

To address this concern, Klixbull created two more kits for the naval STEM-In-a-Box Collection for kindergarten-to-second grade and third grade-to-fifth grade teachers and students.

On March 12, Carderock held its first professional development training for local educators in West Bethesda, Maryland. Four teachers attended the kindergartento-second grade workshop, which focused on naval-relevant, hands-on accessible STEM activities specifically designed for early childhood educators.

During the workshop, each teacher received a naval STEM-In-a-Box with eight ready-to-go classroom activities focusing on the theme, Ocean Creations. They also received teacher guides and student workbooks for each activity, as well as a tour of Carderock's David Taylor Model Basin and Maneuvering and Seakeeping Basin. STEM professionals from the command, including George, Klixbull and Engineer Ashlee Floyd, assisted the workshop and provided realworld context from their experiences in the STEM workforce.

One of the STEM-In-a-Box activities included in the kindergarten-to-second grade kit is "Oh Barnacles", which teaches students how barnacles create resistance or drag on a vessel.

"My favorite one, Oh Barnacles, teaches about marine life and ecosystems," Klixbull said. "It discusses how it can have a positive and negative impact. With students, we talk about what a barnacle is and how they can cause drag on a boat. Then we do a controlled variable test or activity to evaluate."

Klixbull added that students attach glue dots or pom-poms to their small boats to mimic the effect of barnacles on a naval ship. After the first round of testing, students are instructed to add a coating of petroleum jelly to act as anti-fouling coat on actual vessels. George and Kilxbull plan each STEM-In-a-Box activity to mirror accurate naval concerns and applications.

"This is just one of the many activities we have, but it is a great visualization about how to fix a problem," Klixbull said. "I've worked with Carderock engineers and scientists to confirm the accuracy of these small projects. We make every lesson tie back in with the Navy."

Moving forward, George hopes to continue improving the toolkit; and she believes students, especially at a young age, would benefit from learning STEM holistically through a multidisciplinary approach.

"We want these STEM opportunities to be accessible," she said. "Accessibility means it's affordable, it's easily implemented in a classroom with limited time and resources, it's relevant, and it's equitable. These kits are intentionally designed with inclusive and scaffolded curricula-supporting content to accommodate the diversity of our nation's classrooms".



An example of materials included in a naval STEM-In-a-Box toolkit. On March 12, Naval Surface Warfare Center, Carderock Division hosted a workshop to introduce kindergarten-to-second grade educators to naval-relevant, hands-on accessible STEM activities. (Photo Provided by Charlotte George).



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