WAVES

2023 Year in Review

Cover Image:

A wide shot of Building 1, 2 and 3 at Naval Surface Warfare Center, Carderock Division in West Bethesda, Md., on Oct. 19, 2023. The Research and Development Warfare Center provides cradle-to-grave support for its technical products in various scientific areas related to surface and undersea platforms. The base is home to two unique state-of-the-art facilities: The David Taylor Model Basin and the Maneuvering and Seakeeping Basin – also known as the Navy's "Indoor Ocean." (U.S. Navy photos by Aaron Thomas)

WAVES

CORPORATE COMMUNICATIONS TEAM

PUBLIC AFFAIRS OFFICER:
Kelley Stirling

CORPORATE COMMS TEAM:
Edvin Hernandez
Brittny Odoms
Todd Hurley
Kevin Sykes
Tamari Perrineau-Palmer
Jonathan Thompson
Kristin Behrle
James Contreras
Devin Pisner
Aaron Thomas
Lena Simmons
Travis Troller
Corum Byers

Supporting Contractors:
Benjamin Morley
Dana Klosner

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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. The command 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 nation's modern fleet. The Division's expertise includes naval architecture and engineering, electrical and mechanical engineering, computer engineering, and physics, as well as several other maritime concentrations.

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.

The Division, which is home to the Navy's "Indoor Ocean," prioritizes solving key operational problems to meet future fleet needs. For more than a century, Carderock has been at the forefront of technologies vital to the success of the U.S. Navy and Maritime Industry.

MISSION

Naval Surface Warfare Center, Carderock Division's (NSWCCD) mission is to conduct world-class ship design & engineering that protects our Sailors & Marines and enables delivery of 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 MATTHEW L. TARDY, USN
COMMANDING OFFICER

Capt. Tardy became the 40th commanding officer of NSWC Carderock Division on May 12, 2023. He came from Naval Sea Systems Command headquarters in Washington, D.C., where he had most recently served as the Major Program Manager for Surface Ship Modernization.

After graduating from the University of Illinois at Urbana-Champaign in 1998, Tardy was accepted into Officer Candidate School in Pensacola, Florida, where he earned his commission. As an officer, he served aboard USS Dewert (FFG 45) and USS John F. Kennedy (CV 67) before earning his Master of Science from the Naval Postgraduate School in Monterey, California, in 2003.

Since then, Tardy has served at several naval installations around the U.S. and world, including Combined Joint Task Force – Horn of Africa. His experience as an Anti-submarine Warfare Officer and Program Manager give him a unique perspective on the work that is conducted at not only Carderock, but also other Warfare Center Divisions.

LAWRENCE TARASEK, SES
TECHNICAL DIRECTOR

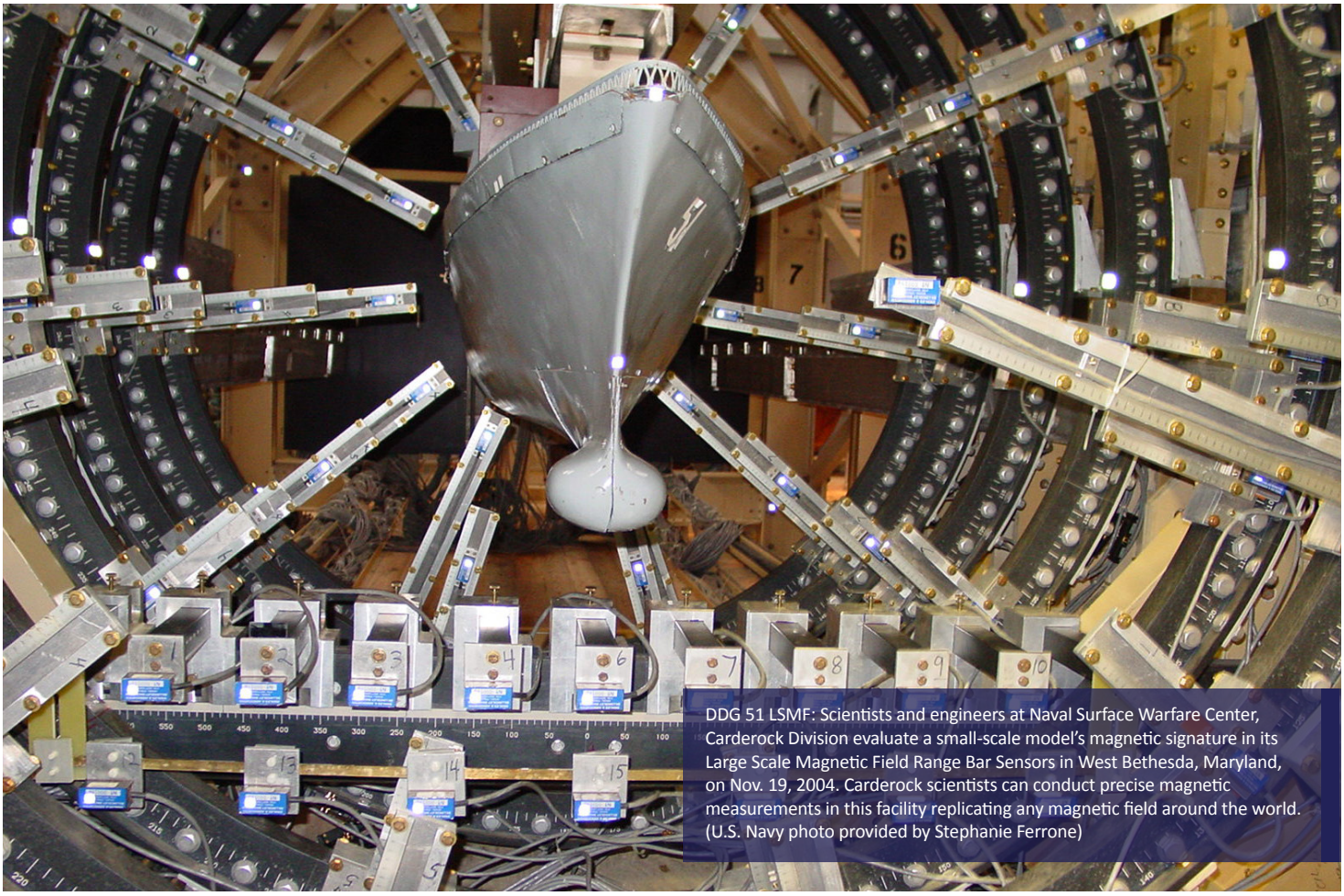
Lawrence Tarasek was appointed to the Senior Executive Service in September 2018 and became Technical Director for NSWC Carderock Division. Prior to that, he had served as the Deputy Technical Director for seven years.

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.

Carderock's Magnetic Lab Professionals Reduce Risk for Critical Naval Operations

By Edvin Hernandez, NSWC Carderock Division Public Affairs



DDG 51 LSMF: Scientists and engineers at Naval Surface Warfare Center, Carderock Division evaluate a small-scale model's magnetic signature in its Large Scale Magnetic Field Range Bar Sensors in West Bethesda, Maryland, on Nov. 19, 2004. Carderock scientists can conduct precise magnetic measurements in this facility replicating any magnetic field around the world. (U.S. Navy photo provided by Stephanie Ferrone)

The U.S. Navy boasts a capable armada that patrols the free and open oceans around the world. To maintain its dominant maritime presence, the fleet relies on its technical experts to identify its own vulnerabilities and create solutions. Naval Surface Warfare Center, Carderock Division in West Bethesda, Maryland, employs several of these technical experts who play a critical role in developing the next generation underwater vessels and surface ships for the U.S. Navy.

Home to some of the most unique and state-of-the-art research laboratories, Carderock's Underwater Electromagnetic Signatures and Technology Division provides mission-critical capabilities to Sailors at sea. Electromagnetic signatures have the ability to expose a ship's geographical location and have been used to trigger underwater mines. Since most of the submarines and surface ships in the U.S. Navy are built from magnetic material, technical experts like Division Program Manager Stephanie Ferrone have a major responsibility to limit a hull's exposure or detection while underway.

"Any material that has magnetic content on it is going to be magnetically detectable," Ferrone said. "Even those that don't have magnetic material in their hull have magnetic material on the inside. So that means any sensor looking for something magnetic will be able to see our platforms."

Apart from detecting major naval assets, electromagnetic signatures can also be weaponized.

"Those sensors can be put into different weapons, too, including underwater mines," Ferrone said. "These weapons can then look for magnetic signatures and know when to fire. If we don't do anything to counter this ability, it presents a vulnerability or limitation on our ships' ability to operate."

That's where the command's Underwater Electromagnetic Signatures and Technology Division provides an advantage to the fleet. Technical experts like Ferrone and her fellow team members conduct extensive research, test and evaluation to reduce magnetic signatures of naval ships and submarines to a point where there is little-to-no difference between them and the operating environment.

"One of the main ways we counter those magnetic threats is by developing and implementing degaussing systems for our platforms," she said. "Those are sets of magnetic coils that go on the inside of a ship or a submarine to cancel out the magnetic signature of that platform. If you have ever heard of the fact that the United States switched its pennies from copper to steel in World War II because of naval needs, that's actually in part because of the work that we do."

Today, the U.S. Navy continues to use degaussing systems on its platforms; and Carderock has the professionals who provide the designs for those degaussing systems. The command's Magnetic Field Lab supports degaussing testing on physical models created at the base and are evaluated to ensure Sailor safety in contested environments. Ships and submarines, however, aren't the only thing the Warfare Center supports with regards to electromagnetic signatures.

The Virginia-class attack submarine Pre-Commissioning Unit (PCU) Missouri (SSN 780) conducts sea trials July 2, 2010, in the Atlantic Ocean. Missouri commissioned July 31, 2010, at Naval Submarine Base New London. Naval Surface Warfare Center, Carderock Division supported signature testing for the submarine. (Photo courtesy of General Dynamics Electric Boat/Released)

"We are often called in to look at signatures of other items, whether that is the signature of a component that's going to go in a platform such as the engine for a small craft, or the signatures of onboard items like tool boxes – or the signature of equipment that divers are going to carry," Ferrone said. "We do work that runs the gamut from basic research all the way up to things that are going on Navy platforms and from things that are unclassified collaborations with academia."

Unlike other buildings on base, Carderock's Magnetic Field Lab was built almost entirely of nonmagnetic material, including its infrastructure and features inside. This allows Carderock scientists and engineers to conduct precise magnetic measurements in the facility without magnetic clutter radiating from materials such as steel beams or components of an HVAC system.

Another unique feature about the lab is its two sets of tri-axial magnetic field control coils that are inside the building.

"This gives us the ability to replicate the magnetic field of any place on earth and see how our ships and submarines are going to perform," Ferrone said. "I am constantly in awe of this capability. The size and the scope of what we can do in our building is completely unique within the U.S. Navy."

Carderock's lab enables its technical experts to understand each operating environment and keep mission-critical assets intact. Recently, the Division has been working with the U.S. Navy's mine sweeping fleet to measure and control the magnetic signatures on its platforms in Bahrain.

Other projects the Division supports include understanding the magnetic signature of diving equipment used for operations in high-risk and potentially life-threatening maritime regions. Carderock continues to be an integral component of the Navy and, thanks to experts like Ferrone, add to Carderock's growing reputation for technical excellence. The base's magnetic facilities not only offer a unique advantage to a forward deployed Navy, but it also reduces risk to critical naval operations.

Carderock Hosts 21st Century Workforce: A Leadership in a Diverse Environment Event

By NSWC Carderock Division Public Affairs

The Maritime Technology Information Center auditorium at Naval Surface Warfare Center, Carderock Division was packed on March 1, 2023, for the 21st Century Workforce Leadership in a Diverse Environment Event (LDEE), hosted by Carderock's Inclusion, Diversity, Equity and Accessibility Employee Resource Group (IDEA ERG) chaired by Danielle Gerstner, Materials for Advanced Systems and Sensors Branch Head. In addition to the Carderock team, there were virtual attendees from Naval Sea Systems Command (NAVSEA) Headquarters and all NAVSEA Warfare Centers in greater Washington D.C.

The exciting all-day event delved into the themes of the multi-generational workforce, accessibility for the disabled, working in the new hybrid environment and enabling everyone in our workforce to feel safe to be themselves.

The crowd was in for a treat when keynote speaker Travis Mills bounded onto the stage on his prosthetic legs, gesturing with his prosthetic left hand and his right arm missing from the shoulder down. He is a retired 82nd Airborne Staff Sergeant who survived the impact of an Improved Explosive Device (IED) on his third tour of duty in Afghanistan in 2012, but unfortunately, lost all his limbs. He immediately made the audience comfortable and had them nearly forgetting he was a quadruple amputee. Through his good-natured jokes and exuberance folks were swept up in his story of overcoming tremendous adversity and the joy he takes in living life to the fullest every day.

His message came across loud and clear - while you can't change your circumstances, you can change your attitude.

"Life is easy for me," he said. "Because life is about perspective."

In September 2013, Travis and his wife Kelsey founded the Travis Mills Foundation, a nonprofit organization, formed to benefit and assist post-9/11 veterans who have been injured in active duty or as a result of their service to our nation.

Former Denver Bronco running back, Reggie Rivers was the next guest speaker. He regaled the crowd with stories of how the game of football relates to life and leadership skills. He used his experiences getting tackled again and again as a metaphor for failing and getting back up again in the workplace.

"Go out and fail and learn from those experiences," he said.

In his experience with head coach Mike Shanahan, he learned that a successful leader nurtures his team members. He listens and learns what motivates them.

"A good leader gives you things that help you grow, and you are drawn to them because you see a future in yourself," he said. "This way you are recruiting people's voluntary effort."

After the speakers came the 21st Century Workforce leadership panel, comprised of some of the Navy's top leaders, who discussed pressing diversity issues. The four panelists were: Dr. Brett Seidle, Deputy Assistant Secretary of the Navy for Research, Development, Test and Evaluation; Giao L. Phan, Executive Director, Naval Sea System Command; Rear Adm. Kevin P. Byrne, Commander, NAVSEA Warfare Centers; and Dr. Daramia T. Hinton, Associate Director for Strategic Programs and Policy, Defense Civilian Personnel Advisory Services. Steve Ouimette, Carderock's Deputy Technical Director, moderated for the panel.

When asked about the challenges of working in a diverse environment, Seidle was the first to respond with an inspiring message.

"The human condition is the same," Seidle said. "Everyone desires to be loved, needed and useful and wants to work for an organization that has a mission and a purpose. We want to be in an environment that welcomes our whole self every single day. We have to be very intentional about our workplace environment and culture regardless of the changing dynamics."

The office philosophy has to agree with that to make it work.

"It's about creating the right culture and the trust that goes along with that," Byrne said. "We have to look at those different approaches and backgrounds and bring those forward. We have to embrace different backgrounds and different thoughts."

What about the challenges of working in a multigenerational environment that spans five generations – from Traditionalists, born before 1945, all the way through to Gen Z – born as late as the early 2000s?

"In the first half of my career I was always the youngest specialist and the only black specialist among the group of labor and employee relations specialists in the civilian personnel office at every duty location I went to," Hinton said, who started her career in her early 20s while she was a military spouse moving to 10 duty stations in 19 years. "That wasn't okay then, but I didn't take it as a negative

Naval Surface Warfare Center, Carderock Division hosts a 21st Century Workforce: A Leadership in a Diverse Environment Event (LDEE) in West Bethesda, Md., on March 1, which consists of guest speakers, a 21st Century Workforce Panel discussion, breakout sessions and closing remarks from Carderock's Commanding Officer Capt. Todd E. Hutchison. The LDEE guest speakers are Travis Mills and Reggie Rivers, and the a 21st Century Workforce Panel feature: Dr. Brett Seidle, Deputy Assistant Secretary of the Navy for Research, Development, Test and Engineering; Ms. Giao Phan, Executive Director, Naval Sea Systems Command (NAVSEA); Rear Adm. Kevin Byrne, Commander, NAVSEA Warfare Centers; and Dr. Daramia Hinton, Associate Director for Strategic Programs and Policy for the Defense Civilian Personnel Advisory Service. (U.S. Navy photo by Brittny Odoms)

… I was eager. Those more mature specialists took me under their wings and poured into me everything they had. But they also listened to me coming in with new and fresh eyes and new ideas I had about better ways we might be able to do things. Every voice matters and every person should be valued."

These thoughts were reiterated in the breakout session, "Thriving in a Multigenerational Workforce," hosted by Lesley Gibson Boseman, EAP field consultant. She discussed the stereotypes and challenges of every generation as well as tips on how to work together.

"We must appreciate the differences and similarities," she said. "We must share our knowledge and come to an agreement in order to achieve our goals successfully.

When the panel was asked about work/life balance everyone agreed that it is very important to maintain that balance. "I've been that guy. Go home, have dinner with the family then open your computer," Seidle said, adding that schedules two hours of "down time" in his calendar each day. "Control your workday – that's how things get done."

Work smarter not faster seemed to be the golden rule among the panelists.

"It's not about the number of activities," Phan said. "It's about the result and outcome. Focus on what matters most. That will give you the most return on your investment."

Another new situation in today's workforce is the number of people teleworking. This was discussed in the breakout session "Teaming in a Hybrid Environment" hosted by Sue Rossi, of Carderock Division's Labor and Employee Relations Department.

"A sense of belonging is essential for success so that must be kept in mind when planning a hybrid environment," Rossi said. There were two other breakout sessions: Feeling Safe Everywhere, which focused on actionable allyship, providing proactive steps to support our shipmates, and Navigating the High-Grade Hiring Process.

At the end of a very fruitful day, Byrne gave his closing remarks by video.

"Many individuals make up our team," he said. "War fighters count on us for solutions."

Carderock's Commanding Officer Capt. Todd E. Hutchison gave the closing remarks.

"I was significantly impacted by today's event," Hutchison said. "We must not only respect, but celebrate our diversity, we will be stronger to meet the needs of our warfighters."

Carderock Shines at Sea-Air-Space Expo

By Dana Klosner, NSWC Carderock Division Public Affairs

Naval Surface Warfare Center, Carderock Division Engineer Lee Huntington demonstrates how to use the virtual painter system during the 2023 Sea-Air-Space Exposition in National Harbor, Md., on April 4, 2023. (U.S. Navy photo by Monica McCoy)

The annual Sea-Air-Space Conference and Exposition was held from April 3-5, 2023, at the Gaylord National Resort and Convention Center in National Harbor, Maryland. It is the Navy League's Global Maritime Exposition attracting maritime leaders and military stakeholders from around the world. Naval Surface Warfare Center, Carderock Division engineers were amongst the attendees, demonstrating their virtual reality painter training system.

The three days were packed with speakers, educational sessions and policy discussions. The exhibit halls were bursting with 400 exhibitors displaying their newest innovations designed to improve and streamline Navy ships, submarines and other equipment.

Top Navy officials were among the many notable guest speakers, including: the Honorable Carlos Del Toro, Secretary of the Navy, Adm. Michael Gilday, Chief of Naval Operations; Adm. Lisa Franchetti, Vice Chief of Naval Operations; Rear Adm. Lorin Selby, Chief of Naval Research; Vice Adm. William Galinis, Commander, Naval Sea Systems Command (NAVSEA); and Rear Adm. Byrne, Commander, NAVSEA Warfare Centers.

Additionally, the Office of Naval Research hosted a science, technology, engineering and mathematics (STEM) exposition prior to the event on April 2, 2023. Carderock's STEM Director Charlotte George and Engineer Ashlee Floyd were present, showcasing their STEM-in-a-Box activities such as buoyancy and drag to interested school-aged children.

In the exhibit hall, key officials from NAVSEA provided program updates in their exhibit booth. Carderock engineers were on-hand to demonstrate the virtual reality painter trainer known as the virtual painter, and members of Carderock's small business department were also present to help small businesses learn the necessary requirements to win contracts with Carderock.

Carderock employees displaying the virtual painter were Dr. Lee Huntington, ngineer, Andrew Sheetz, materials engineer, and Brian Everett, lead engineering technician, all from the Corrosion and Coatings Engineering Branch.

Throughout the exposition, NAVSEA leaders gave presentations about their latest endeavors.

Between presentations, small business leaders could interact with Carderock's Small Business Deputy Carlos Duran, Office of Small Business Programs.

"As the liaison between Carderock and small businesses, I connect businesses with the requirement generators so that they can better understand the requirements that we have and how those requirements align with the capabilities of their business," Duran said. "This helps them submit a well-defined proposal that could possibly win them a contract with Carderock."

A Carderock highlight was when Huntington donned the virtual reality headset, picked up the virtual paint gun and started "painting" a ship's hull. The monitor showed the swipes he was making with the gun. He twisted and bent to get to the piping. He was demonstrating the Virtual Painter, while Sheetz, explained the system. "The virtual painter is a training tool for painters to reduce waste in their processes and teach better painting techniques," he said. "Paint is a hazardous material in its nature. The more that's applied to the item of interest the less that it ends up either out in space or as droplets on the floor or missing in places. If you put it on too thick you actually use too much. So, there's a significant amount of training that goes into the paint application process. Coating is a primary tool to fight corrosion."

The virtual painter has the dynamics of the coating accounted for. The gun has a series of electronics in it giving it the capability to understand trigger pull and air pressure settings, fan patterns and more. Those multiply back through the software and are modeled against the actual dynamics of the material to give the user what would be the application rate. The painter trainer gives visual cues to part of the paint application process by using industrial paint application tools such as high-velocity, low-pressure guns, a common industrial application tool.

It's important for a painter to be able to do a coating

Naval Surface Warfare Center, Carderock Division engineer Lee Huntington briefs Vice Adm. William Galinis, Commander, Naval Sea Systems Command, on Carderock's virtual paint sprayer during the 2023 Sea-Air-Space Exposition at the Gaylord Convention Center in National Harbor, Md., on April 4. (U.S. Navy photo by Monica McCoy)

"I BELIEVE THAT THIS SYSTEM IS A VERY GOOD TOOL FOR ACTUALLY UTILIZING AND GETTING A FEEL FOR PAINT APPLICATION WITHOUT HAVING TO WASTE MATERIAL AND DO SET-UPS AND BREAK DOWNS. IT CUTS HOURS, IF NOT DAYS, OFF OF LEARNING HOW TO DO IT."

Rear Adm. Kevin Byrne, Commander, NAVSEA Warfare Centers talks with Lee Huntington, engineer, Naval Surface Warfare Center (NSWC) Carderock Division, at the NAVSEA booth during Sea Air Space (SAS) symposium 2023 at the Gaylord Convention Center in National Harbor, Md., on April 4, 2023. (U.S. Navy photo by Monica McCoy)

application correctly and in one iteration reducing the need for rework which makes the maintenance process more expensive. Correct application also extends the longevity of the coating, which will extend the period of time between when a system will need to be repainted. The training tool can be used for any platform where industrial painting is done – ships, submarines, ground vehicles, weapons systems rehabilitation, as well as aviation units.

"There are several different models within the virtual space that you can utilize. This model is called the advanced training tool," Sheetz said of the demonstration. "The gun is equal to what they would be using. It gives you the feel you would have with a hose similar to that attached to the paint gun. The gun itself is the same type of paint application gun and the controls on it are active. You can measure fan pattern and air pressure and the amount of paint that you trigger."

In addition to the Marine Corps, Lee Huntington is one of the end users of the Virtual Painter within his work as a Carderock engineer. "I do a lot of the exterior coatings work within the branch. I do all of our paint systems that go on the outside of ships," he said. "I do a lot of testing and evaluation both in the lab and in the field. I also do failure analyses on ships, as well. The Virtual Painter does a very good job simulating what you would actually see in a paint booth. I've been able to do a lot of this when we may not either have the coating on hand or be able to go into the paint booth."

Everett constructs and performs most of the testing in-house and in the lab for Carderock.

"I do practical application in-house of the actual paints," he said. "I believe that this system is a very good tool for actually utilizing and getting a feel for paint application without having to waste material and do set-ups and break downs. It cuts hours, if not days, off of learning how to do it."

The team demonstrated at the exposition to present the technology and what Carderock is doing with the Marine Corps to a broader base.

Naval Surface Warfare Center (NSWC) Carderock Division Engineers Charlotte George and Ashlee Floyd showcase STEM-in-a-Box activities on topics such as buoyancy and drag to a packed house during the Office of Naval Research (ONR) STEM event to kick off Sea Air Space 2023 at the Gaylord Convention Center in National Harbor, Md., on April 2. (U.S. Navy photos by Monica McCoy)

Carderock Employees Participate in Earth Day Events

Jasmin Tyson, the Storm Water Program Manager with Naval Support Activity Washington Public Works Department Environmental Division, stands with a team of active duty Sailors who participated in the cleanup of locations onsite at Naval Surface Warfare Center, Carderock Division in West Bethesda, Md. on Aug. 26, 2023. (U.S. Navy photo provided)

Mike Phillips, an environmental engineer with the Environmental Branch, leads the Earth Day 5K at Naval Surface Warfare Center, Carderock Division in West Bethesda, Md. on Aug. 26, 2023. The 5k was one of the three events for Earth Day 2023 at Carderock. The trail goes through several locations onsite that have environmental importance such as habitats for deer and geese. (U.S. Navy photo provided)

University of Memphis Tours Carderock's LCC

By Todd Hurley, NSWC Carderock Division Public Affairs

Naval Surface Warfare Center, Carderock Division hosted members from the University of Memphis (UofM) for a meet-and-greet, command overview briefing with presentations and a tour of the William B. Morgan Large Cavitation Channel (LCC) at Carderock's Memphis Detachment in Tennessee on Feb. 6, 2023. Also present were four congressional staff members from the offices of U.S. Senator Marsha Blackburn, U.S. Senator Bill Hagerty and U.S. Congressman Steve Cohen.

The purpose of the visit was to kick off a partnership between Carderock and UofM, which involves two projects: the Unmanned Aerial Vehicles (UAV) Environment Degradation Lab and Cavitation Erosion Research. A large amount of the surface area at the Memphis Detachment is underutilized, so this partnership will allow UofM to bring equipment to the LCC for this research.

"The work to be done at our LCC will be led by the University of Memphis, and we are excited to leverage the partnership as they expand their research footprint," Carderock Chief Technology Officer Dr. Dave Drazen said, adding that UofM achieved R1 status in December 2021, which is the highest level of research activity.

Additionally, with the idea of reaching the future workforce, Carderock and UofM have partnered to allow graduate and undergraduate students to conduct internships at the LCC, with hopes of developing and enhancing their interest in working not only for Carderock, but also the U.S. Navy in general.

"We continue to work at ways to diversify our workforce and to focus on what is core to Carderock Division and what the Navy needs us to do," Carderock Technical Director Larry Tarasek said. "In doing this, we want to expand our reach, and working with the University of Memphis is giving us another pool for new engineers and researchers. I continue to look at ways to work with our university partners in understanding and researching solutions to hard Navy problems."

The command overview was conducted by Tarasek, and followed by presentations on science, technology, engineering and mathematics (STEM) opportunities at Carderock by Drazen, unmanned systems by Eric Silberg, Unmanned Aerial Vehicle's Lab Project Lead in the Sea-Based Aviation and Aeromechanics Branch and on the importance of cavitation erosion research by Dr. Thad Michael, the Cavitation Erosion Projects Lead in the Propulsors Branch.

Matthew Brantz (center), Site Director of Naval Surface Warfare Center, Carderock Division's Memphis Detachment, leads University of Memphis (UofM) staff, Carderock employees and congressional staffers around the Large Cavitation Channel (LCC) at Carderock's Memphis Detachment in Tennessee during a tour on Feb. 6. (U.S. Navy photo by Todd Hurley)

Also present were: Feza Koprucu, Deputy Director of Operations; Dr. Paul Shang, Signatures Department Head; Ross Hempel, Deputy Department Head of the Naval Architecture and Engineering Department; Dr. Paisan Atsavapranee, Director of Science and Technology in the Submarine Maneuvering and Control Division; and Matthew Brantz, LCC Site Director, all of whom provided relevant insight and expertise. Brantz gave an extensive tour of the facility, showcasing the LCC and the large areas where the new lab and other research will take place.

Dr. Bill Hardgrave, President of UofM, was present and shared his excitement for the opportunity, and acknowledged the congressional

Naval Surface Warfare Center, Carderock Division employees, University of Memphis staff members and congressional staffers pose at the base of the Large Cavitation Channel (LCC) at Carderock's Memphis Detachment in Tennessee on Feb. 6, 2023, where they kicked off a partnership to develop an Unmanned Aerial Vehicles Environment Degradation Lab and do Cavitation Erosion Research. (U.S. Navy photo by Todd Hurley)

"I CONTINUE TO LOOK AT WAYS TO WORK WITH OUR UNIVERSITY PARTNERS IN UNDERSTANDING AND RESEARCHING SOLUTIONS TO HARD NAVY PROBLEMS.

support, specifically when it comes to the funding for the projects they will be working on with the Navy. The staffers present were Nick Kistenmacher, State Director for Senator Marsha Blackburn; Jeffrey Parish, State Counsel and Field Director for Senator Marsha Blackburn; Chris Connolly, Field Representative for Senator Bill Hagerty; and Wiley Henry, Representative Steve Cohen's Office.

"We are excited for this partnership and to grow our operations, as well as your operations," Hardgrave said of the future collaboration with Carderock.

Swedish Defence Delegation Visits Carderock

By NSWC Carderock Division Public Affairs

Brig. Gen. Patric Hjorth (center), Director Naval Division, Swedish Defence Materiel Administration (FMV), and other members from the FMV, as well as Office of Naval Research-Global, visit Naval Surface Warfare Center, Carderock Division's David Taylor Model Basin (DTMB) on Jan. 25, 2023. Dr. Martin Donnelly (fourth from left) and Dr. Paisan Atsavapranee (right of Hjorth), both from Cardeorck's Naval Architecture and Engineering Department, briefed the Swedish delegation about the capabilities of the DTMB. (U.S. Navy photo by Jennifer Brewster)

Brig. Gen. Patric Hjorth (center), Director Naval Division, Swedish Defence Materiel Administration learns about Naval Surface Warfare Center, Carderock Division's David Taylor Model Basin (DTMB) on Jan. 25, 2023, during a visit with other members of his group and Office of Naval Research-Global. (U.S. Navy photo by Jennifer Brewster)

Hull Maintenance Technician 2nd Class Marc A. Paz welds an additively manufactured sprayer nozzle onto the additively manufactured sprayer plate in West Bethesda, Md., in June 2023. Paz was on temporary orders from USS John P. Murtha (LPD 26) for this assignment. (Photo provided by Bryan Kessel)

Carderock Provides Afloat Additive Manufacturing Remote Support to USS Bataan

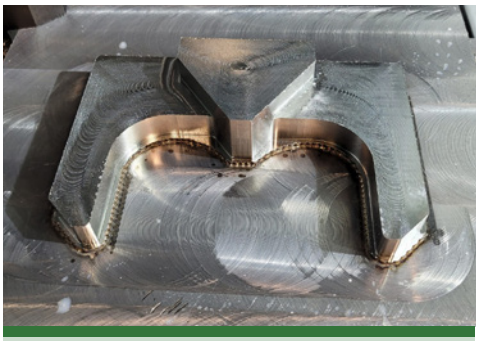
By Todd A. Hurley, NSWC Carderock Division Public Affairs

Naval Surface Warfare Center, Carderock Division's Additive Manufacturing (AM) Branch, in an exercise led by Mechanical Engineer Bryan Kessel, collaborated with Johns Hopkins Applied Physics Laboratory (APL) in Laurel, Maryland, to remotely develop and validate a process for underway fabrication of a de-ballasting air compressor (DBAC) sprayer plate aboard USS Bataan (LHD 5), by using expeditionary hybrid additive/subtractive manufacturing equipment.

For this effort, which took place on June 1-2, 2023, Carderock's AM Branch and Johns Hopkins APL were part of a larger team within Naval Sea System Command's (NAVSEA) AM Research and Development Program under NAVSEA's Technology Office. Kessel and the team worked closely with Bataan crew, in particular its Chief Engineer Lt. Cmdr. Gaston Hatfield, and AM operator Machinery Repairman First Class Cory "Mike" Hover.

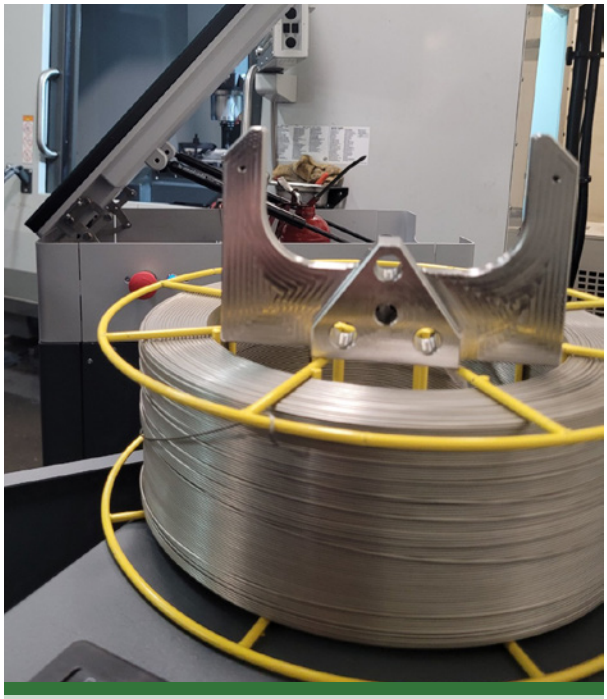
"We recently completed a remote engineering support exercise as part of the NAVSEA Technology Office's Afloat Additive Manufacturing equipment installations, in which we validated digital files for AM on the shore side and transferred the data to an underway ship, USS Bataan, to fabricate our first additively-manufactured metal component at sea," Kessel said.

What is unique about this effort is that it was Carderock's first metal part request that was done while a ship was underway. In the past, these efforts were conducted using polymer parts, rather than metal out of stainless steel. The DBAC sprayer plate required the use of remote collaboration tools such as the recently-installed Digital Manufacturing Environment (DME), a shipboard network that enabled regular file transfer between Bataan and the Afloat AM team.



The additively-manufactured sprayer plate directly after rough machining at Naval Surface Warfare Center, Carderock Division in West Bethesda, Md., in June 2023. The sprayer plate is shown attached to the build plate. (Photo provided by Bryan Kessel)

"While Bataan was underway, they had a system that went down and they needed assistance repairing it," Kessel said. "We had recently installed a hybrid-metal 3D printer aboard Bataan, the first such install in the Navy, so we leveraged that asset and remotely made build files to send to the ship."



Finished sprayer plate on top of stainless steel feedstock material (foreground) with Haas/Meltio TM-1 hybrid metal AM system (background). (Photo provided by Bryan Kessel)

Carderock reviewed and made minor adjustments to the 3D model that was developed by Hover. Then, Kessel wrote a set of instructions to pass off to the ship on how to use that build package. Carderock also facilitated the file transfer to the ship using the DME.

"Hopkins put their hybrid machinist, Hunter Turco, on this effort, who specializes in hybrid AM," Kessel said. "He has expertise on the machining side of things, so we really leveraged his knowledge in the validation stage to make sure the whole build approach was appropriate. From the time I received the urgent request from Hatfield, I was able to get the SolidWorks 3D computer-aided design model finalized from the drawing side, and then the next day I provided the ship with the additive build instructions. So within three days total we had the full package of manufacturing files completed, validated and transferred to the ship using our DME network."

Once Bataan had the files, they were able to print the part while underway on their hybrid-metal 3D printer. Hover completed the shipboard fabrication and operationally tested the component in the DBAC system on June 5, 2023. The test yielded satisfactory results.

From Carderock's AM Branch standpoint, the next step is to get this DBAC sprayer plate into NAVSEA's list of approved AM components so that ships can simply go on and print it and install as needed.

"Through the DME connection, these ships have access to all past efforts we have done," Kessel said. "We currently have about 330 parts that are approved, but this is by far the most significant one because it is the first hybrid metal component that we have done on a ship that was deployed and underway. Including submarines, we currently have 14 ships in the fleet that we have installed with AM equipment. It is definitely a significant effort to get these metal printers installed on the ships, and we continue to support the ships that we have installed on, making sure they are going to be successful with the printers. We do our best to ensure that the equipment remains useful."

Currently, Hatfield has begun the Departure from Specification process for this component and NAVSEA's Technology Office is pursuing approval of the shipboard component as this particular part has been identified as a long-lead item.

Carderock Assists in Calibration Trials of USNS John Lewis

By NSWC Carderock Division Public Affairs

The U.S. Navy protects its surface ships and submarines from underwater magnetic influence mines through a two-step process consisting of magnetic treatment followed by degaussing system calibration, typically at the beginning of the ship or boat's service life. USNS John Lewis (T-AO 205) underwent treatment and calibration at Naval Base Point Loma in San Diego in March 2023. Personnel from Naval Surface Warfare Center (NSWC), Carderock Division and NSWC Philadelphia Division, Naval Undersea Warfare Center, Division Keyport's San Diego Detachment, as well as Naval Sea Systems Command (NAVSEA) were involved in the trial. Carderock served as the In-Service Engineering Agent for the degaussing system that was being calibrated. The purpose of the trial was to minimize the ship's susceptibility to underwater mines.

Carderock employees Marella Camello, a technical program manager with the Program Management Branch, and William Gay, the Technical Lead with the Underwater Electromagnetic Signature Control, Analysis and Susceptibility Branch, worked on the trial.

"It was a two-part trial, the first part was the magnetic treatment, the second part was the calibration of the advanced degaussing system for magnetic signature control," Gay said.

According to Gay, the process of magnetic treatment changes a ship or boat's magnetic signature by removing construction-related magnetic irregularities and stabilizing the signature to prevent future changes throughout the service life of the ship or boat. Treatment also ensures the degaussing system can best perform its job of cancelling the ship's signature more effectively, by smoothing out the signature and putting it in a state the degaussing system was designed to mask. Treatment ensures the degaussing settings established during the degaussing system calibration are valid for a longer period of time due to the signature being stable.

Camello served as the technical program manager for the planning and coordination leading up to the trial. Beforehand, she determined the personnel needed to support the trial, as well as the funding to complete the trial. Gay had several roles for the entire program. Before the trial, Gay was a mentor for Camello and helped develop the test plan used for the calibration. During the trial, his job was to analyze signature data as it was acquired and adjust the degaussing system settings to minimize the ship's magnetic signature. After the calibration, he will perform any necessary post-trial analyses and write a report documenting all efforts of the trial team.

Developing the test plan was actually a straightforward process according to Gay.

"This trial is very similar to many previous ones, giving us the advantage of being able to leverage prior test plans," he said. "We came up with a prior test plan and added whatever nuance we needed for this ship, which was first in class."

Even though the test plan was straightforward, the calibration itself posed several challenges for both Camello and Gay. Weather delayed calibration for a couple of days. For Camello, she recently became a technical program manager and was learning on the job.

"This was my first trial as a program manager," she said. "I am still learning how to run trials, who to talk to and balancing my time with everything else that's in my portfolio that I have to manage."

Gay noted other challenges. There was the challenge of establishing hardware communications and debugging degaussing system components, a common aspect of all such trials. In addition to preparing the ship for the calibration, there was also duration of the calibration efforts itself. The trial took place in San Diego, a long time away from families and friends. Normally, these were not long engagements, but John Lewis was a first-in-class trial, requiring additional measurements.

"As this was a first in class, it is never a cakewalk," he said. "We

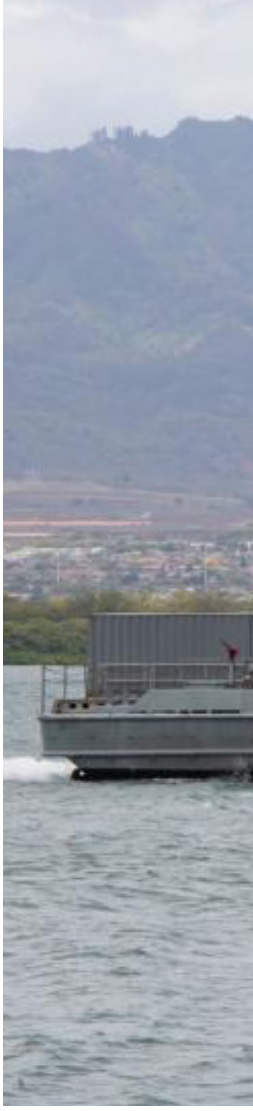
USNS John Lewis (T-AO 205), the Navy's lead ship of its new class of fleet replenishment oilers, returns to port Feb. 1, 2022, during initial Builder's Trials. (Courtesy photo by General Dynamics National Steel Shipbuilding Company)

have a pretty good idea of what we think the signature is going to look like both before and after the ship is magnetically treated. However, there is a lot of stuff you're finding out for the first time with a new ship class. Additionally, this is a time critical process, especially toward the end because time is short and we're trying to finalize the calibration."

High intensity and long duration degaussing system calibration trials requiring Carderock involvement are not performed for legacy ships – ships with degaussing systems dating back to the 1980s with capabilities and technology from that era. Treatment and calibration of legacy ships is straightforward and is performed by local magnetic silencing personnel. Advanced Degaussing ships such as USNS John Lewis, equipped with complex and highly capable degaussing systems intended to defeat the modern mine threat, do require a more involved calibration process and Carderock's magnetic signature control expertise and assistance.

"Since the end of the second World War, we lost more ships to naval mines than any other threat there is – missiles, terrorist attacks or anything," Gay said. "Mines are really a nightmare for the Navy. They're very asymmetrical form of warfare since they are cheap relative to the cost of a naval warship. They are simple devices with an explosive charge and a little bit of logic attached. You can throw those overboard and they go to the bottom and just wait until a ship comes along. The degaussing system minimizes the ship's signature and makes it a lot harder for mines to detect the ship and attack it."

Inter-collaboration at Carderock Brings Success to Ghost Fleet Unmanned Vehicles at RIMPAC



By Benjamin Morley, NSWC Carderock Division Public Affairs

Every other summer, the U.S. Navy exercises with allied nations in the Rim of the Pacific (RIMPAC) exercise. RIMPAC 2022 consisted of 26 nations participating with 38 ships, three submarines, 170 aircraft and more than 25,000 personnel in joint exercises off the coasts of Hawaii and California.

Four unmanned surface vessels (USV) joined the exercises including two from the Ghost Fleet Overlord Program. Started in 2018 as a collaborative effort between the Department of Defense's Strategic Capabilities Office (SCO) and the Navy, the program aims to provide USVs for fleet integration by converting commercial ships to autonomous ships.

The presence of the Ghost Fleet vessels – USV Ranger and USV Nomad – highlights the collaboration between Naval Surface Warfare Center, Carderock Division's In-Service Ship Structures Branch and In-Service Systems Engineering (ISSE) Branch, Naval Sea Systems Command (NAVSEA)'s program offices for Unmanned Maritime Systems (PMS 406) and Littoral Combat Ship Mission Modules (PMS 420).

From the structural side of the collaboration, Andrew Quillin, a naval architect and engineering agent, and Mary Meares, the Technical Lead, both with Carderock's In-Service Ship Structures Branch, work with the Ship Structures Branch on vessel acceptability and conversion.

The large unmanned surface vessel Ranger transits the Pacific Ocean to participate in Exercise Rim of the Pacific on June 22, 2022. (U.S. Navy photo by Mass Communication Specialist 1st Class Tyler R. Fraser)

"The USVs were commercial vessels converted for use with the Navy and unmanned systems," Meares said. "We started by assessing already built vessels to look at their existing condition and performing finite element analysis to support the modifications that the Navy would need to make to those vessels and developing inspection plans for the life of the ship."

The life-cycle support side of the collaboration is handled by the In-Service Systems Engineering Branch, which serves as the Platform In-Service Engineering Agent (ISEA) for the USVs. They're also preparing to transfer custody of vessels to the U.S. Navy and will continue providing life-cycle sustainment for the USVs after they join the fleet.

Working with the In-Service Ship Structures Branch was not very challenging for Steve Yacconi, the Technical Project Manager for the In-Service Systems Engineering Branch as he, Quillin and Brian Sah – the Structures ISEA for the Overlord Unmanned Surface Vessels program – shared the same office in San Diego.

"The challenge is engaging other Warfare Centers," Yacconi said. "The challenges have been 'are they funded' and 'what's their bandwidth?' From an inter-Carderock perspective, it's been smooth primarily because we're sitting in the same office."

For Quillin, program awareness by leadership is one of the biggest challenges of the program. A visit by Mayer Nelson, Unmanned Underwater Systems Branch Head, sparked the collaboration between branches that would lead to the success of the Ghost Fleet Overlord Program.

"The Marine and Aviation Division is in charge of unmanned underwater vehicles, and Mayer was out here one time with Steve Yacconi," Quillin said. "That started off the dialogue

The large unmanned surface vessel Nomad arrives at Pearl Harbor to participate in Rim of the Pacific (RIMPAC) on June 29, 2022. Unmanned and remotely operated vessels extend the capability of interconnected manned platform sensors to enhance capacity across the multinational force. Twenty-six nations, 38 ships, four submarines, more than 170 aircraft and 25,000 personnel are participating in RIMPAC from June 29 to Aug. 4 in and around the Hawaiian Islands and Southern California. The world's largest international maritime exercise, RIMPAC, provides a unique training opportunity while fostering and sustaining cooperative relationships among participants critical to ensuring the safety of sea lanes and security on the world's oceans. RIMPAC 2022 is the 28th exercise in the series that began in 1971. (U.S. Navy photo by Mass Communication Specialist 3rd Class Demitrius J. Williams)

"WE'RE ALL ON THE SAME TEAM; WE'RE ALL WORKING TOGETHER; AND THIS IS A PRIME EXAMPLE OF HOW WE CAN WORK TOGETHER ON A DAILY BASIS TO GET THE JOB DONE TO MEET THE NEEDS OF THE NAVY.

about the In-Service Ship Structures Branch potentially getting involved in the program."

In addition to better communication across Warfare Centers and branches, Meares wants to leverage Warfare Center location.

"We need to look strategically across multiple programs and utilize people located in other places outside of West Bethesda to improve collaboration across branches," Meares said. "We collaborated with the Integrated Manufacturing and Program Management Office to help bring their technology to the waterfront. My branch will continue pursuing opportunities for collaboration with other branches and to work with our waterfront-located personnel."

Yacconi highlighted the work with Carderock's Combatant Craft Division in Little Creek, Virginia, as an example of cooperation between technical branches.

"We're all on the same team; we're all working together; and this is a prime example of how we can work together on a daily basis to get the job done to meet the needs of the Navy," he said.

Carderock Collaborates with NUWC Newport on LDUUV Composite Payload Fairings

By Todd Hurley, NSWC Carderock Division Public Affairs

Deployable from the dry deck shelter of a submarine, Snakehead provides guidance and control, navigation, situational awareness, propulsion, maneuvering and sensors in support of the intelligence preparation of the operational environment mission. The large displacement unmanned undersea vehicle has undergone tests recently at the Naval Undersea Warfare Center Newport Division's Narragansett Bay Test Facility in R.I. (U.S. Navy photo by Rich Allen)

Naval Surface Warfare Center, Carderock Division employees from multiple branches have collaborated with Naval Undersea Warfare Center (NUWC) Newport Division in Middletown, Rhode Island, by helping to develop two ship sets of composite payload fairings for NUWC Newport's Snakehead Large Displacement Unmanned Underwater Vehicle (LDUUV). The process, in which Carderock collaborated by supporting design reviews, design updates and analyses and manufacturing of the fairings, commenced in quarter four of fiscal year 2019, and is currently ongoing.

"This was the most complex composite part we've produced at Carderock," Gabriel Upton, a structural composites engineer from the Structural Composites Branch, said.

Most of the work at Carderock took place in the Platform Integrity Department's Composite Lab, as well as at the Model Shop. The effort delivered two ship sets with four major 61-inch-by-44-inch quarter-inch thick panels.

"This was a good opportunity to not only collaborate with NUWC Newport, but also with our Model Shop," Upton said. "They are a very helpful group to work with."

The team worked closely with NUWC Newport's Snakehead LDUUV team, led by Rick Hammond, NUWC Newport mechanical systems lead, Alex Deluca, mechanical engineer and Jeff Picard, engineering technician, to balance composite panel design and production process requirements.

"We are actively trying to expand the use of composites and composite production techniques for unmanned vehicles, both surface and under surface," Dr. Daniel Hart, an aerospace engineer from Carderock's Structural Composites Branch, said. "This effort highlights the importance of collaboration across Warfare Centers and is another successful application of composite structures. We are searching to apply our expertise to support other unmanned composite structures and applications — there are several unmanned vehicles platforms out there that we are trying to support."

Carderock's work with Newport included designing the reconfigurable mold surface concept and developing the contract to secure mold production, which was awarded to Touchstone Research Labs, coordinating 3D geometry and 3D composite panel machining operations with Carderock's Model Shop Operations and Management Branch and fabricating a transportation and shipping carriage.

"Composite fairing panels demonstrated the ability to integrate complex features into the manufacturing process, reducing the part count, volume of material machined, machining tolerances and finishing work required for each part, as well as the reduced life-cycle cost due to corrosion resistance and improved fatigue performance," Upton said.

The composite fairing panels consist of four unique parts per ship set, and were manufactured using a GURIT E-glass and ST94 epoxy resin pre-preg with an integral gray Axiom surfacing ply.

Throughout these efforts, Carderock and NUWC Newport also worked closely together on bolted joint design and finite element analyses to assess composite panel response to operational loads and support panel design modifications to support an updated load case. The approach selected uses flexible urethane bushings at the fairing to hull bolted connections.

"We had early discussions with NUWC Newport on potential composite design support," Hart said. "The support needed narrowing in on the payload fairings, and we ended up producing them out of composite due to panel geometry, sensor and anode integration with the panels, and because the initial metal design was going to require significant machining and a large amount of material to deliver a curved-stiffened shape properly."

Hart added that the composite materials selection matched the previously designed and delivered flooded nose section (FNS), fabricated by Material Sciences Corporation LLC. Payload fairing production also adopted a modular mold concept similar to that of the FNS, which allows sensor and component integration. Integrating sensor and component mounting surfaces in the composite production reduces the total part count and saves machining and wasted materials.

"As we would finish the parts, we would demold them and get them right over to the Model Shop for machining," Hart said. "Once machined panels returned to the composites lab for outfitting and final fabrication steps."

Members from Carderock's Model Shop led the computerized numerical control (CNC) programming and CNC machining. Additionally, the shop fabricated a custom machining fixture and two custom containers to ship and store both ship sets of fairings. CNC machining accomplishes complex alignment of bolt holes, pockets and recesses with the mold line curvature of the composite by establishing a detailed part reference. Carderock and NUWC Newport's collaboration saved cost, compared to setting up a contract, and allowed the flexibility to overcome design changes that occurred during composite production.

The Carderock employees involved in the collaboration consist of: Mike McDonald, Structures and Composites Division Head; Hart, Upton, Dr. Corey Arndt and Bret Landis from the Structural Composites Branch; Chris Chiodo, Dr. Maureen Foley, Marc Daley and Wendelle Sparrer, Integrated Manufacturing and Program Management Office; Anindita Mukherjee, Ship Structural Modeling and Simulation Branch; Mike Swormstedt, Submarine Structures and Propulsors Branch; Tim Kennelly, Maritime Systems Hydromechanics Branch; David Schwarzenberg, Facilities Engineering and Operations Division; Ben Barnes, Maneuvering and Seakeeping, Water and Wind Tunnels Operations Branch; Mike Johnson, Justin Freyburger, Mark Sawyer and Jim Hicks, Model Shop Operations and Management Branch; Timothy Molesworth and Robert Gallant, Non-Metallic Materials Research and Engineering Branch; and Carol A. Broderick, Naval Sea Logistics Center Carderock Operating Materials and Supplies Deputy Site Lead.

The Snakehead large displacement unmanned undersea vehicle prototype operates in Narragansett Bay in Rhode Island on June 30, 2022. Naval Undersea Warfare Center Newport Division staff recently demonstrated an end-to-end intelligence preparation of the operational environment mission, demonstrating a new milestone in total sortie endurance. (U.S. Navy photo)

Carderock Engineers File Patent for Lithium 6T Top Cap Invention

By Todd Hurley, NSWC Carderock Division Public Affairs

Engineers in Naval Surface Warfare Center, Carderock Division's Expeditionary and Development Power and Energy Branch from left: Matthew Huffman, technical area lead, Kevin Lin, electrical engineer and James Mulford, mechanical engineer, display their invention, the Lithium 6T Top Cap, in West Bethesda, Md., on March 8. The engineers are shown with three of their four prototypes, which is a modular, field-reconfigurable direct current power distribution device that can be installed and mounted on top of a Li6T battery. (U.S. Navy photo by Aaron Thomas)

Naval Surface Warfare Center, Carderock Division engineers in the Expeditionary and Developmental Power and Energy Branch recently developed and filed a patent for their invention, a Lithium 6T (Li6T) Top Cap, which is a modular, field-reconfigurable direct current (DC) power distribution device that can be installed and mounted on top of a Li6T battery in less than 30 seconds.

The inventors are Matthew Huffman, technical area lead, Kevin Lin, electrical engineer and James Mulford, mechanical engineer.

The device consists of an additively-manufactured shell with interfacing connectors that installs on top of a Li6T battery's positive and negative terminals. It allows users to utilize the direct current capabilities of the Li6T battery in a manner that also complies with the charging, discharging and safety specifications of the battery. The device utilizes a NATO slave connector for charging the Li6T battery from an external direct-current power source, and four paralleled ITT Cannon connectors for providing power to downstream DC loads. All five connectors utilize externally-accessible circuit breakers for high visibility, ease of resetting, and protection against overloads while charging or discharging. A prominent side-mounted emergency stop button allows the user to easily turn on and shut down the device with one hand.

"This came about as a Carderock concept," Huffman said. "This product is an in-house, hand-built prototype designed right here at Carderock. We originally discussed the origins of this product back in 2018, but it took many years for it to gain an appreciation for the concept."

That appreciation arose when the need came from the Warfighter for a newer, safer battery charging method.

"The Marine Corps asked us if we could develop a prototype that could mount on top of Li6T batteries and act as a direct replacement to the lead acid batteries," Mulford said. "This product has a lot of advantages over the lead acid batteries, such as its clever battery management system that we are pulling information directly from and displaying on our user interface screen for situational awareness. It also provides an inherent protection of exposure against live voltages."

Some additional advantages consist of its ease of use, novel integration of functionality and minimalism — this device is significantly smaller, lighter and capable of accepting more DC power charge than existing Li6T charging and discharging devices. Most military generators require a forklift to move, whereas this device is man-portable and can be easily packed into a rucksack for field use.

"One thing to note is that Li6T, unlike lead acid batteries, have more energy inside of them," Lin said. "Unlike a car battery where you can only use it for starting, lights and ignition, you can use this independently and you can deeply charge and discharge

The Lithium 6T Top Cap is shown in West Bethesda, Md., on March 8. (U.S. Navy photo by Aaron Thomas)

Electrical engineer Kevin Lin (left) and mechanical engineer James Mulford (right) explain their new invention, the Lithium 6T Top Cap, during an interview in West Bethesda, Md., on March 8. (U.S. Navy photo by Aaron Thomas)

this. That means you can use this for other purposes such as providing DC power to loads downstream."

This device's ease of use is critical and involves a specific part of the patent — the screws that are used to attach the Li6T Top Cap to the Li6T battery.

"The bottom of the Top Cap is where the patent really lies — with the floating screws," Lin said. "There are two screws that are different sizes. One is a 3/8 inches -16 threaded hole and the other is a 5/16 inches - 18-threaded hole, which means the positive and negative screws install directly into the positive and negative terminal threaded holes. Essentially, you can't place the Top Cap on incorrectly or backwards. These screws can move around several millimeters to accommodate for mechanical tolerances. When you put the Top Cap on the battery and tighten the screws, not only are the terminals now protected, but they are now compressed onto pads for the best possible transfer."

This device's ease of use also comes into play with its user interface. The three engineers designed the user interface on the product to be as intuitive as possible.

"We designed this user interface with simplicity in mind," Lin said. "It is meant to show the user all the essentials of the battery at a glance. There are no additional pages, so what you see is what you get."

Additionally, the Top Cap is the only device that incorporates a color user interface screen.

"There are active electronics within the device, such as the color user interface screen," Mulford said. "This screen provides data such as battery voltage, input and output current, charge and discharge, total power in or out of the battery, internal temperature in both Celsius and Fahrenheit and the available capacity based on the state of charge."

The inventors demonstrated the device at the Pentagon Energy Expo in Washington, D.C., from Sept. 21-22, 2022, where they received fantastic feedback, according to Mulford. They currently have three upcoming demonstration events: two in March at Marine Corps Base Quantico in Triangle, Virginia, supporting the Expeditionary Energy Office, and another event in April with the Technology Operational Experimentation Exercise at Marine Corps Base Camp Lejeune in North Carolina.

Carderock Conducts AM Feasibility Study at the David Taylor Model Basin

By Edvin Hernandez and Brittny Odoms, NSWC Carderock Division Public Affairs

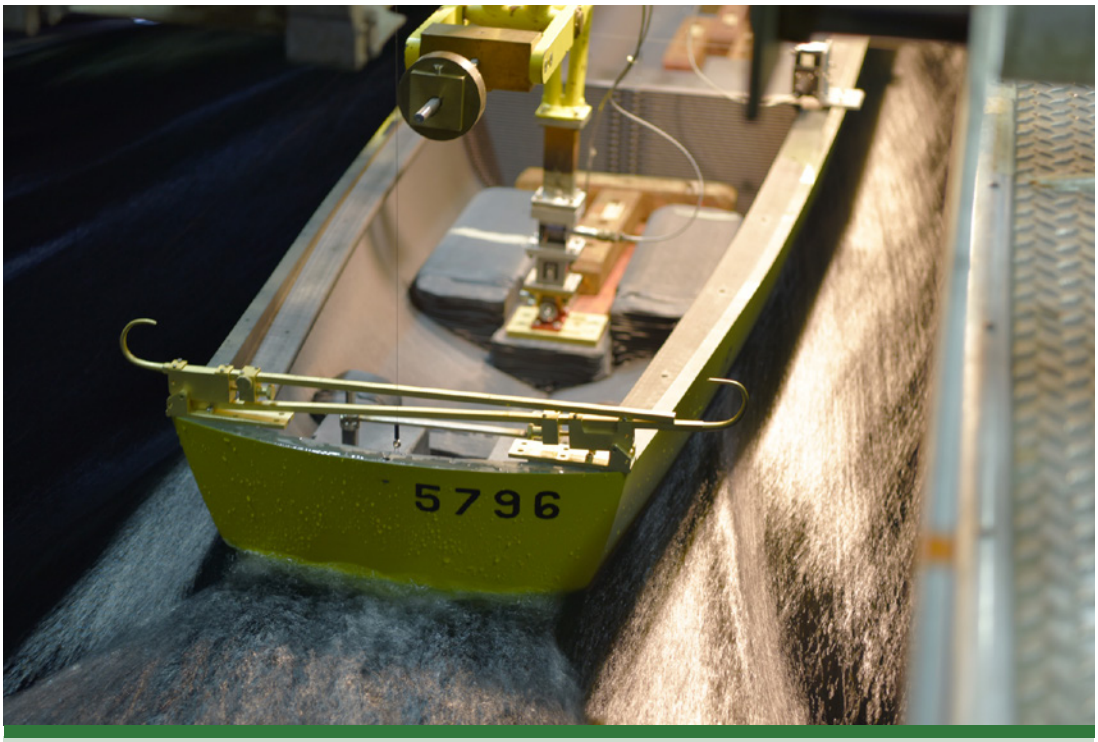
Naval Surface Warfare Center, Carderock Division's Naval Architecture and Engineering Department is conducting a Large-Scale Additive Manufacturing (LSAM) model feasibility study to assess the accuracy of using additively manufactured (AM) models for future experiments. The study, which also includes resistance testing on Carriage 1 in Carderock's David Taylor Model Basin (DTMB), will determine if AM models can withstand the typical stresses of a carriage test and match the results from the same hull design manufactured from fiberglass material.

Carderock's Surface Ship Hydromechanics Division is leading the study with the support of the Naval Innovative Science and Engineering (NISE) program as part of the LSAM FY 21-23 testing environment task proposal. Testing in Carderock's DTMB, in West Bethesda, Maryland, took place in September 2023.

Discussions about the idea to test LSAM technology at the command began in late 2019 to early 2020. As a proof of concept, Carderock's Facility Engineering and Operations Division 3D printed a model-scale submarine bow. Encouraged by the results, the Naval Architecture and Engineering Department head instructed Carderock's Surface Ship Hydromechanics Division to pursue printing a full-size surface ship model to see if this approach was worth further pursuit. The group submitted their proposal to NISE in 2021 and was funded to proceed.

"I think one of the big interests within Carderock as a whole, and especially our department, is wanting to transition this technology for practical use," Engineer Kyle Mosqueda said. "We could build models a lot faster and a lot cheaper."

If this experimentation is successful, it could provide the U.S. Navy significant cost and time savings in manufacturing, rigging and testing capabilities. It is also possible it could change the way Carderock designs its models for testing and influence the next generation of model making.

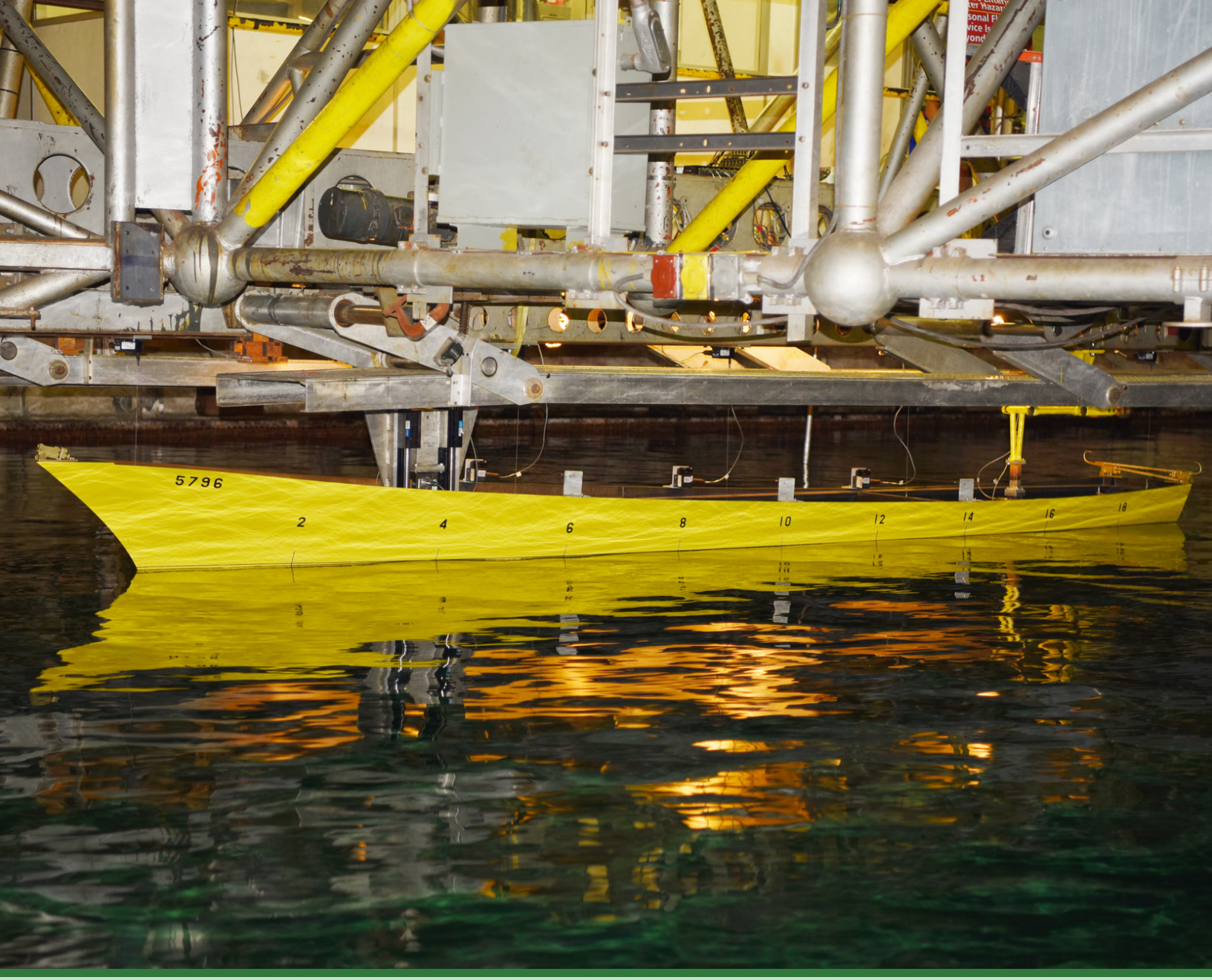


Calm water tow-tank testing of a large-scale additive manufactured (LSAM) ship model of the Arleigh-Burke class destroyer (DDG 51) runs through Carriage 1 in Carderock's David Taylor Model Basin in West Bethesda, Md., on Sept. 7, 2023. The feasibility study led by the Surface Ship Hydromechanics Division, with the support of the Naval Innovative Science and Engineering program, is assessing the accuracy of using additively manufactured (AM) models for future experiments and will determine if AM models can withstand the typical stresses of a carriage test and match the results from the same hull design manufactured from fiberglass material. (U.S. Navy photo by Brittny Odoms)

The hull tested at the DTMB is a pre-contract representation of the Arleigh-Burke class destroyer (DDG 51). This hull form is widely utilized as a benchmark geometry for engineering and scientific investigation in the naval hydrodynamics community.

Some of the specific model characteristics the group will be observing are water absorption changing the geometry of the model, hull crack development and the magnitude of hull deformation while underway.

The ship model was designed at Carderock and contracted out for 3D printing to Airtech International, Inc. in Springfield, Tennessee. It is 20.23 feet in overall length with a beam of 2.49 feet.



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Mosqueda and his team have high expectations for the result of this trial. The model underwent a calm water tow tank test at a maximum Froude scaled speed of 6.4 knots, which is equivalent to a little more than 7 miles per hour.

"I'm curious to see if the DDG 51 model deflects while underway," Mosqueda said before the test in September. "I am testing the fiberglass model and the LSAM model one after the other, and then comparing the results. I have high confidence that they will be comparable and will further validate this great piece of technology for future implementation."

Preliminary results from the study indicate that the LSAM model compares well to the fiberglass model in terms of total resistance and underway deformation observed while testing. Because of this, Mosqueda and his team believe that LSAM technology is a feasible alternative to model making for calm water resistance testing. As part of the continued feasibility assessment for other types of experimental testing, Mosqueda was awarded funding through a FY 24 NISE proposal to structurally evaluate the LSAM model with the intent in FY 25 to put the model through a seakeeping and loads experiment in the Maneuvering and Seakeeping Basin where the model will be exposed to scaled sea states.

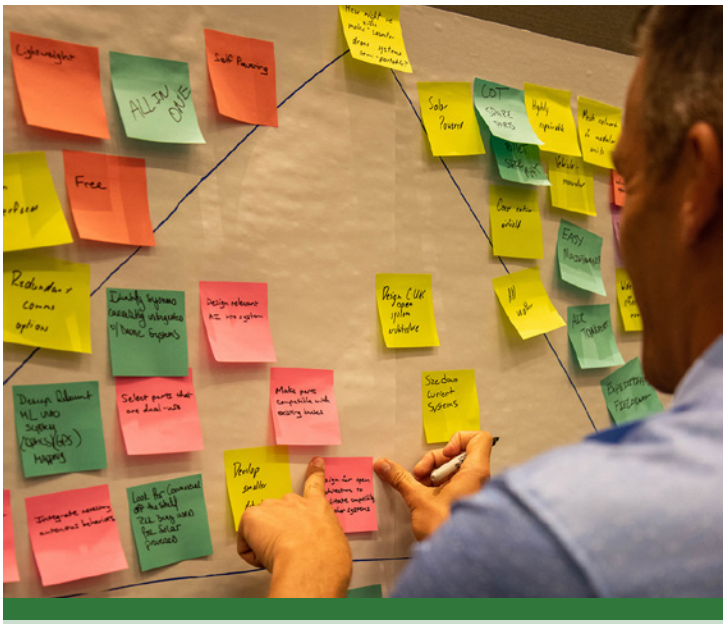
NavalX Capital and Mid-Atlantic Tech Bridges Facilitate Warfighter-Centered Design Thinking Workshop

By Edvin Hernandez, NSWC Carderock Division Public Affairs

Naval Surface Warfare Center (NSWC), Carderock Division Science and Technology Manager for Combatant Craft Dr. Julie Stark and Capital Tech Bridge Director Lauren Hanyok facilitated a warfighter-centered design thinking workshop at the Atlantic Diving Supply Warrior East Exposition in Virginia Beach, June 21-22. The event was co-sponsored by the National Center for Manufacturing Sciences, a key Mid-Atlantic Tech Bridge (MATB) partner.

The workshop challenged Department of Defense attendees to think of innovative ideas that have the potential to enhance naval warfighting capabilities. Dr. Scott Steward, the Office of Naval Research TechSolutions Deputy Director, was also a key participant at the workshop.

"The mission for this event was to get a chance to talk to warfighters to understand what their immediate needs are," Hanyok said. "On day one, we had three groups that were mostly active duty personnel. They were able to share with us something that wasn't working as efficiently for them out on the field. This workshop was a chance to hear what the warfighters have to say and input it into ONR's TechSolutions."



A Department of Defense employee pastes his idea on the wall during a collaborative warfighter-centered design thinking workshop at the Atlantic Diving Supply Warrior East Conference in Virginia Beach, Va., on June 21, 2023. Science and Technology Manager for Combatant Craft Division Dr. Julie Stark and the Capital Tech Bridge Director Lauren Hanyok facilitated the workshop in collaboration with the Office of Naval Research and several other tech bridges. (U.S. Navy photo by Edvin Hernandez)

In total, there are 18 tech bridges scattered across the world. Although most of the tech bridges are in the U.S., a first international space was opened in London last year. According to Stark, this connection of tech bridges is a super-network between the naval research enterprise and non-traditional partners. The network identifies opportunities for strategic and tactical innovation that may yield high-impact capabilities for the U.S. Navy and Marine Corps.

"The NavalX and tech bridges provide opportunities to connect directly with warfighters to learn directly from them about what science and technology gaps are directly interfering with their warfighter readiness," Stark said.

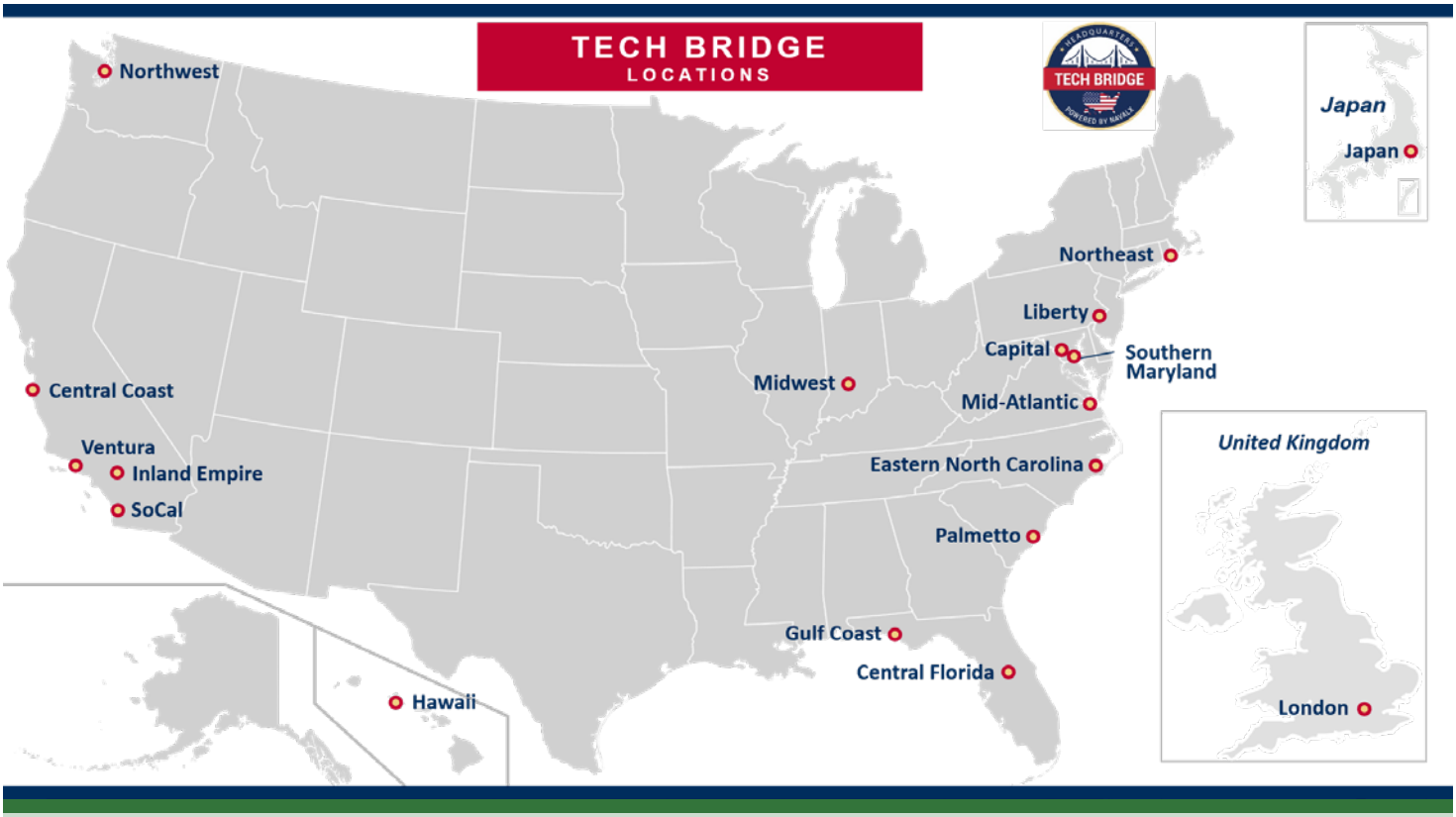
Established in 2019, MATB is co-led by three naval organizations: Carderock's Norfolk Detachment, NSWC Dahlgren's Dam Neck Activity and Naval Information Warfare Center Atlantic Hampton Roads Detachment. MATB maintains a presence at an off-base collaboration and office space in the Assembly building in downtown Norfolk. The purpose of tech bridges is to build, enhance and sustain regional naval innovation ecosystems centered around U.S. Navy labs that support greater collaboration with a variety of partners and stakeholders on projects of relevance to the Department of the Navy.

MATB hosts regular tech talks, engagements with small businesses and non-traditional partners, STEM events, and industry engagement events. To learn more about these activities, view recordings or see upcoming events, visit the MATB LinkedIn page: https://www.linkedin.com/company/navalx-mid-atlantic-tech-bridge/.

The Capital Tech Bridge, led by NSWC Carderock, also consists of NSWC Dahlgren, NSWC Indian Head, the Naval Research Laboratory and the Marine Corps Warfighting Lab. Each entity engages with its own local community to host prize challenges, hackathons, STEM and industry events, such as West Bethesda's current STEM partnership efforts with Montgomery College and Montgomery County.

"Events like Warrior East are a fantastic opportunity for disaggregated tech bridges like us to join forces with Warfare Centers in other tech bridges to run truly collaborative engagements," Hanyok said.

At Warrior East, Hanyok began the workshop by asking attendees to think about technologies they would like matured and encouraged



A map of the United States, as well as London and Japan, show all 18 tech bridges scattered around the world. (U.S. Navy graphic provided by Dr. Julie Stark).

them to reference the commercial solutions they saw inside the exhibit halls at the convention center.

"Before they came to us, they were already looking at the new tech," she said. "This helps them think 'oh I could use this or that,' and primed them for our discussion. While ONR TechSolutions doesn't involve commercial solutions, there is potential in finding an existing or new Cooperative Research and Development Agreement."

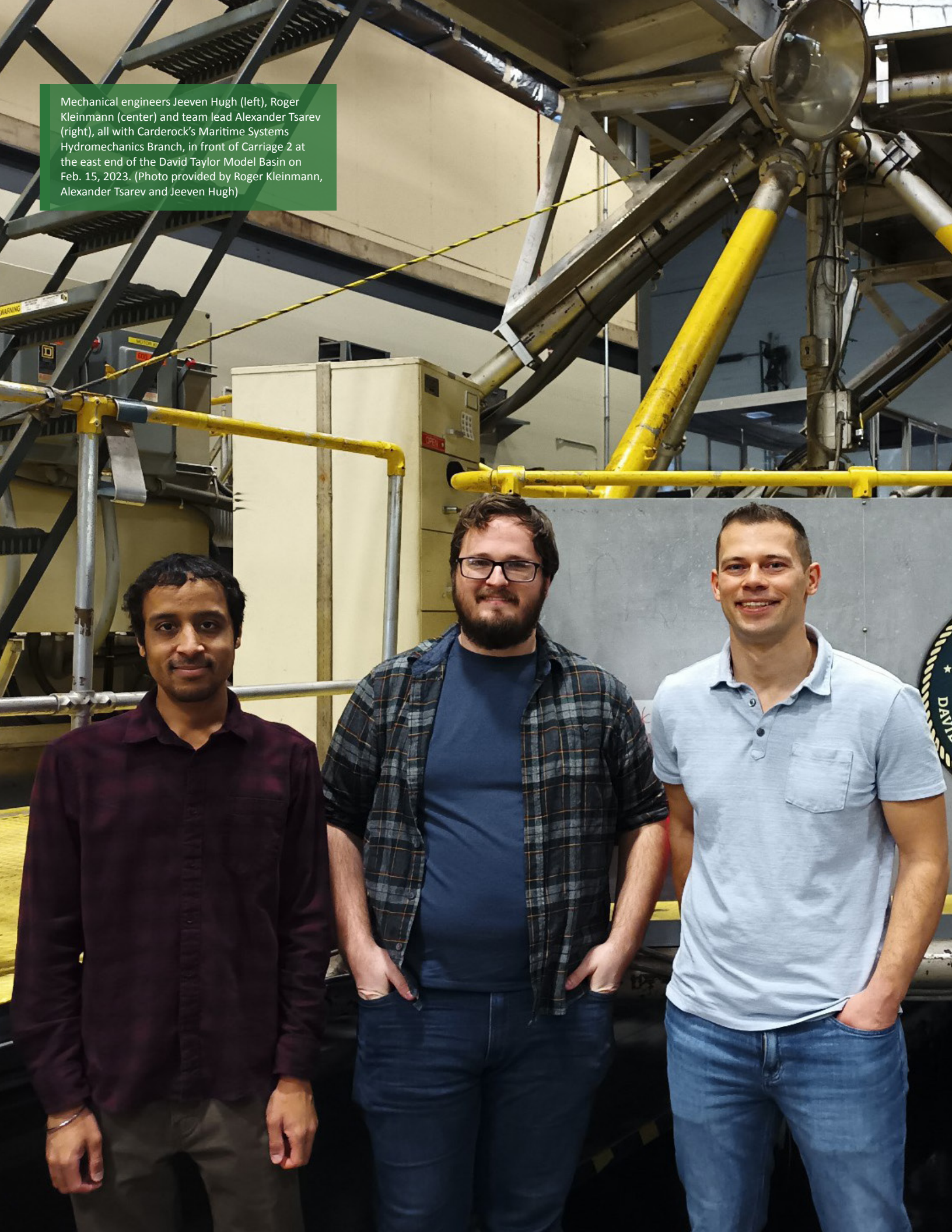
Capital Tech Bridge Director Lauren Hanyok challenges workshop participants to think of ideas that could boost warfighting capabilities for the Navy and Marines at the Atlantic Diving Supply Warrior East Conference in Virginia Beach, Va., on June 21, 2023. (U.S. Navy photo by Edvin Hernandez)

Attendees jotted their thoughts down on a sticky note and pasted them on the wall before dividing into small groups and voting on an idea to further develop. The ideas that weren't chosen were collected by MATB staff for future consideration.

ONR's TechSolutions Program selects requests that are submitted by warfighters and works with them on the problem to fund a solution within 12-18 months. Proposals are then offered to the Warfare Centers to field a technology solution.

"The goal of TechSolutions is to provide new and improved capability to the warfighter in the near-term by developing Technology Readiness Level 6 or 7 prototypes to the warfighter for evaluation within 12 months," Steward said. "Ultimately, we want the prototypes to transition into a sustained capability across the force, making the job of Sailors and Marines a bit easier each time. By better defining the problems up front, we can produce a capability that will have more impact for the warfighter."

These warfighter-centered workshops help ONR and the greater naval research enterprise to understand challenges in real-world application. According to Steward, ONR looks forward to continue building a partnership with the tech bridges and NavalX to more effectively reach out to Sailors and Marines, and to rapidly solve their day-to-day technology related problems.



Mechanical engineers Jeeven Hugh (left), Roger Kleinmann (center) and team lead Alexander Tsarev (right), all with Carderock's Maritime Systems Hydromechanics Branch, in front of Carriage 2 at the east end of the David Taylor Model Basin on Feb. 15, 2023. (Photo provided by Roger Kleinmann, Alexander Tsarev and Jeeven Hugh)

Carderock Inventors Patent New Modeling Software

By Benjamin Morley, NSWC Carderock Division Public Affairs

A team of engineers from Naval Surface Warfare Center, Carderock Division recently patented a new software modeling capability that digitally replicates the physics of underwater vehicles and towed bodies, and tracks the movements of the tow cable when bodies attach or detach.

The patent, U.S. Patent 11,554,838 B1, titled "Maneuvering and Control Simulator for Underwater Vehicles," was filed in support of the Maneuvering and Control Simulator for Underwater Vehicles (MACSUV) Program. The team responsible for developing the MACSUV Program are Team Lead Alexander Tsarev and Mechanical Engineers Roger Kleinmann, Jennifer Nunes and Jeeven Hugh, all with Carderock's Maritime Systems Hydromechanics Branch.

Originally developed by Nunes, Hugh and Tsarev, MACSUV is a tool to simulate underwater vehicles and develop control systems for them. When Kleinmann came along in September 2018, Tsarev asked him to add a new capability to the program.

"I added cable interactions, which allows us to model towed bodies and vehicle-to-cable interactions beyond towed bodies," Kleinmann said. "Through this design process, I was able to get what we call 'discontinuous dynamics between cables and bodies,' and that is the patentable feature of MACSUV. In other words, we can model for instance bodies detaching and deploying from tow cables or something attaching to a cable during a tow."

Like all ships, a towing ship moves through waves and changes direction, all of which affects the cable and towed vessels. Other simulation tools model the cable to respond to continuous dynamics, which can handle most scenarios, such as towing in waves and performing maneuvers. However, these other tools cannot model cable response to sudden stimuli. For ships that recover unmanned vehicles, this was a major problem.

Towing vessels are subject to discontinuous cable contact, specifically how something attaches or detaches itself from a tow cable. The team researched the loads that cables and vehicles see during contact since these interactions were not a simple steady-state case.

In addition to being able to test for discontinuous dynamics in simulation, the program also creates a cost-savings measure by allowing naval architects to examine and modify towing designs in simulation and avoid the more expensive and time-consuming physical testing stage for dealing with design errors. Oftentimes, the design process, from conception to product, will start with basic calculations, general system design and model testing. While there are simulations in the process, it depends heavily on the program.

"By having this capability and invention as part of our tool suite now, we are able to do the numerical simulations, which allow us to look at it earlier in the design process compared to if we were doing it by test only," Tsarev said.

MACSUV began as essentially a free-running model simulator where the designer could input a vehicle into the program, give it navigational commands and then see how it behaves untethered to a line. Designers also had a capability called Dynamic Cable and Body (DCAB) written by Carderock personnel decades ago. While DCAB could model tow bodies in various conditions in waves, currents, with various speeds and depth, MACSUV provided an easier way to build, model and tweak controllers and implement those changes on real-life systems.

The Maritime Systems Hydromechanics Branch wanted to add vehicle capabilities in MACSUV for control design, as well as the cable capabilities from DCAB. When Kleinmann joined the command four years ago, Tsarev asked if he could implement a cable component from DCAB into MACSUV. There were two ways to add the capability – the first was to port the code from DCAB and adjust it, the other was to build new code from the ground up. Kleinmann chose the latter, adding discontinuous cable contacts along the way.

The team plans on using MACSUV to work on various upcoming projects, as well as possibly improving the use of the software's interface. Any future changes to MACSUV will be heavily project-driven and the team is excited to add capabilities as the opportunities arise.

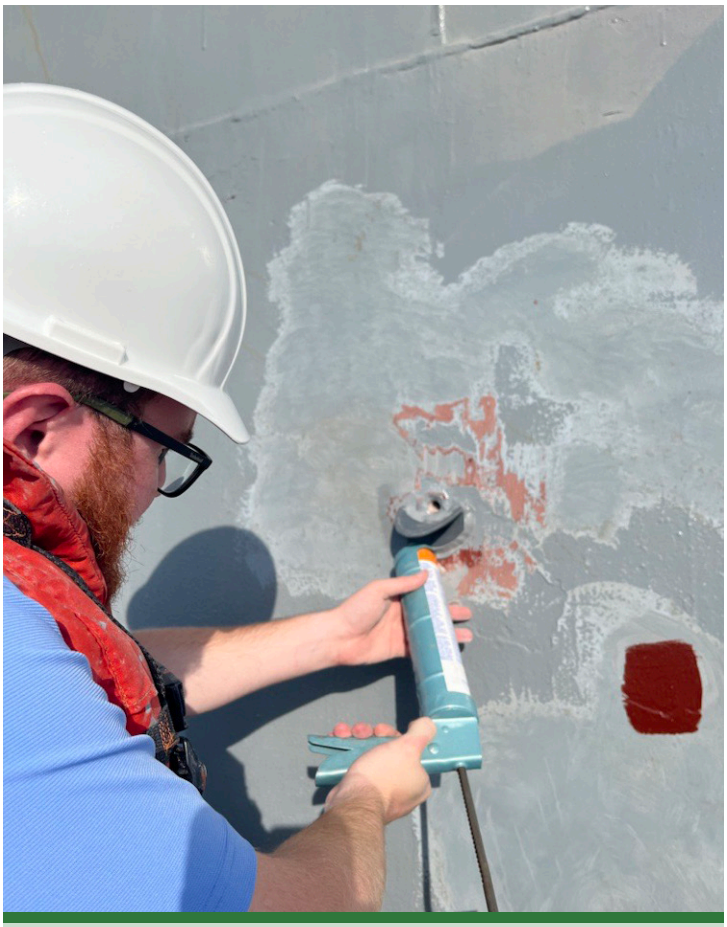
"We've been using MACSUV for other projects and plan to use it for future projects, as well," Tsarev said. "It wasn't a one-time use kind of deal to maintain this kind of capability. It certainly seems like there is a lot of demand for its use going into the future especially with a renewed focus on multi-body interactions."

Carderock Designs 3D-Printed Overboard Discharge Scupper Technology

By Todd Hurley, NSWC Carderock Division Public Affairs

Naval Surface Warfare Center, Carderock Division (NSWCCD) employees have collaborated with Mid-Atlantic Regional Maintenance Center (MARMC) in Norfolk to design and 3D print overboard discharge scupper technology using polymers to eliminate running rust stains from U.S. Navy ships. The project is funded by Naval Sea Systems Command's Painting Center of Excellence.

Carderock's team consists of three members from the Integrated Manufacturing and Composite Materials Branch: Dr. Maureen Foley, composites team lead, and Engineers Bill Manning and Brandon Newsome.



Engineer Bill Manning uses a sealant to prevent water from getting in between the Very High Bond tape on the scupper and the surface of USS Kidd (DDG 100) in Everett, Wash., on June 21, before attaching the 3D-printed overboard discharge scupper. (U.S. Navy photo provided by Dr. Maureen Foley)

"These overboard discharge scuppers go below the discharge ports on the side of a Navy ship where water comes out — the current problem is that a lot of our ships have running rust from water that continuously dribbles out," Manning said. "The whole idea is to reduce the amount of time our Sailors spend sanding and painting the ships by preventing that rust from occurring in the first place."

The scuppers are attached after priming the surface of the ship and scupper with an adhesion promoter. Then, after waiting two minutes, a Very High Bond (VHB) tape is directly applied to the scupper and attached to the ship. Finally, a sealant is used to prevent water.

"The resulting bond of the scuppers to the hull is pretty strong, and we have two different versions — a flexible one and rigid one," Foley said. "The harder ones we are putting up higher, but ones that might get hit by a tug or something else we are using the flexible option. We are currently in our initial phases to see how long and how well they will last on the ship. To do this, we are simply attaching them to the ships before they go on deployment and observing the results when they return to homeport."

For this effort, Carderock does all of the design work, which currently consists of 13 variations in sizing, while MARMC completes the 3D printing portion. The Integrated Manufacturing and Composite Materials Branch has been able to leverage previous interactions with Steven Peterson, MARMC Technology and Innovation Lab Manager, to finalize the designs and partner with their lab to print the scuppers to support our FY23 demonstrations. NSWCCD will provide MARMC with some installation materials for more ships to perform additional demonstrations.

"Manning and Newsome are both relatively new hires, having on boarded earlier this year," Foley said. "But, they really hit the ground running with this project, going out to the ships and getting the surveys set up. They helped develop an entire laser-based setup that allows us to go out to the side of the ship and actually measure the size of the overboard discharge holes, since it can be difficult to get up close enough to physically measure them. They have been key in getting this project going."

Currently, Foley and her team are actively working with five Navy destroyers on demonstrations of the 3D printed overboard discharge scuppers, including: USS Curtis Wilbur (DDG 54), USS Stout (DDG 55), USS Laboon (DDG 58), USS The Sullivans (DDG

Engineer Bill Manning primes an overboard discharge on the hull of USS Kidd (DDG 100) in Everett, Wash., on June 21, before attaching the 3D-printed overboard discharge scupper. (U.S. Navy photo provided by Dr. Maureen Foley)

68) and USS Kidd (DDG 100). The team completed the ship's force training aboard Kidd in June and scheduled the training for the four remaining destroyers later in 2023, with Stout at the end of July and Laboon scheduled for Aug. 23, 2023.

The finished product of the scupper is attached beneath the overboard discharge port on the hull of USS Kidd (DDG 100) in Everett, Wash., on June 21. (U.S. Navy photo provided by Dr. Maureen Foley)

"For how small of a project this is, we have actually gotten a lot of attention from the fleet saying they want it — on average, there are roughly 200 overboard discharges on a Navy destroyer," Foley said. "We have conducted full surveys of these five ships, and we are developing a standard kit based off our idea of what is most problematic with different sized holes. These kits will consist of the VHB tape, primer, 10-20 scuppers and demonstration guidelines for how to install them. We also provide initial training to the Sailors so they know exactly how to use it."

Foley and her team have hopes of this product reaching the entire fleet, and are in talks with the Military Sealift Command and U.S. Coast Guard, who have also expressed an interest.

"This product really applies to every ship in the fleet," Foley said. "They all have overboard discharges, and if this becomes a solution, it would be easy for ships to print the product themselves since they are so low-risk items. The materials we have selected already have national stock numbers for the attachments, so that makes it much easier for the fleet to get the materials. We want to make it as easy as possible for everyone to use."

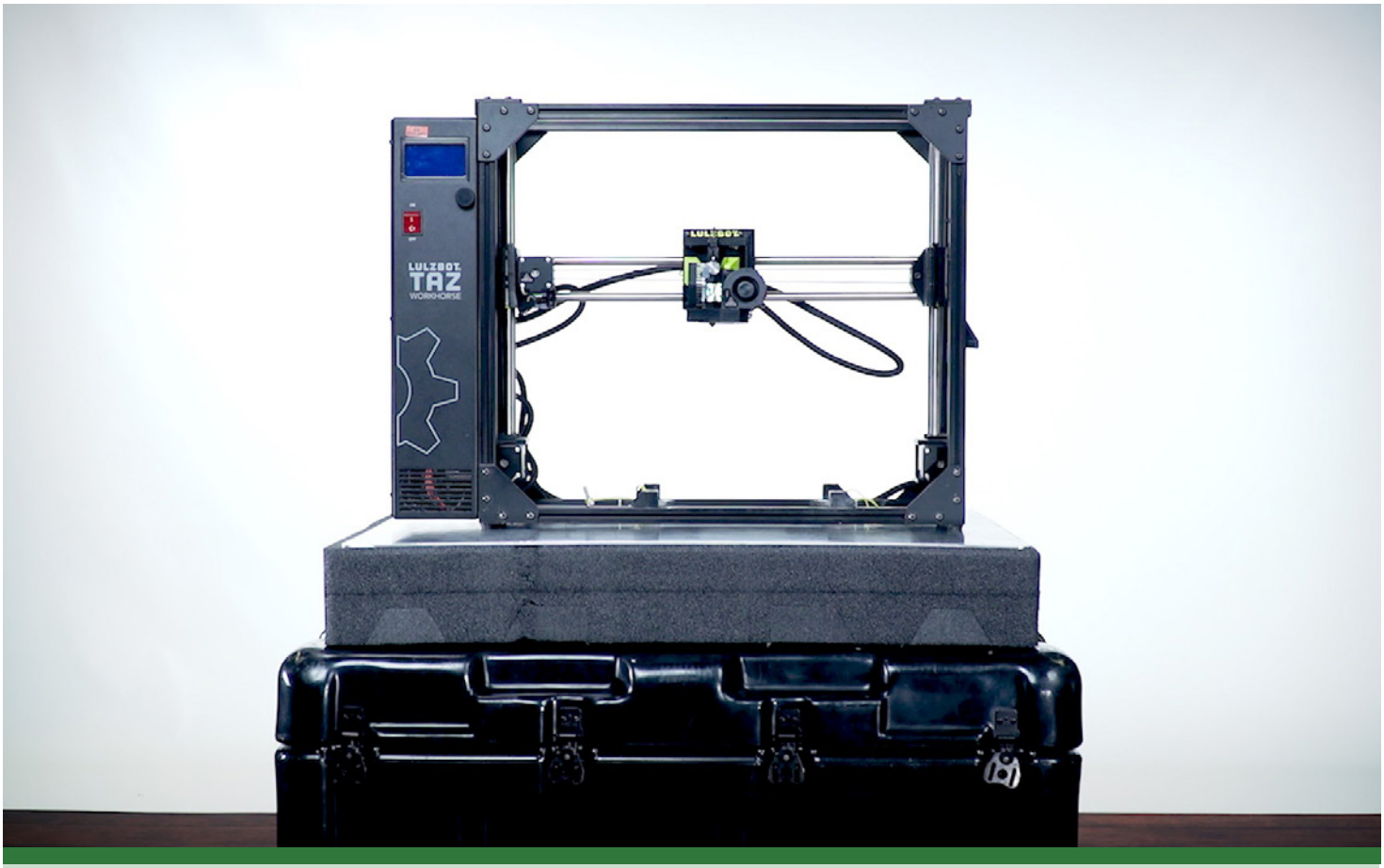
Carderock Collaborates with USMC on Tactical Fabrication Kit

By Todd Hurley, NSWC Carderock Division Public Affairs

In 2022, Naval Surface Warfare Center (NSWC), Carderock Division employees in the Platform Integrity Department and NSWC Crane Division collaborated to provide Expeditionary Fabrication (XFAB) systems to various U.S. Marine Corps bases throughout the world. Now, on the heels of that effort, Carderock is once again partnering with the USMC, this time to provide a Tactical Fabrication (TACFAB) Additive Manufacturing kit.

The XFAB system was developed for deploying to Marines in the field 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. Its contents consist of two small polymer 3D printers, two advanced polymer 3D printers, one large format polymer 3D printer, 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 have the capability to design, reverse engineer and print components all in one location.

TACFAB is a similar product, but is much more widespread, more mobile and more easily deployed. Its primary use is to additively manufacture replacement parts in a quick and inexpensive manner. While the XFAB was designed for distribution exclusively to Marine machinists and welders, the TACFAB is not specific to any military occupational specialty. TACFAB is composed of three separate hard transit cases measuring 3 feet by 2.3 feet by 2 feet, each consisting of various items such as one small polymer



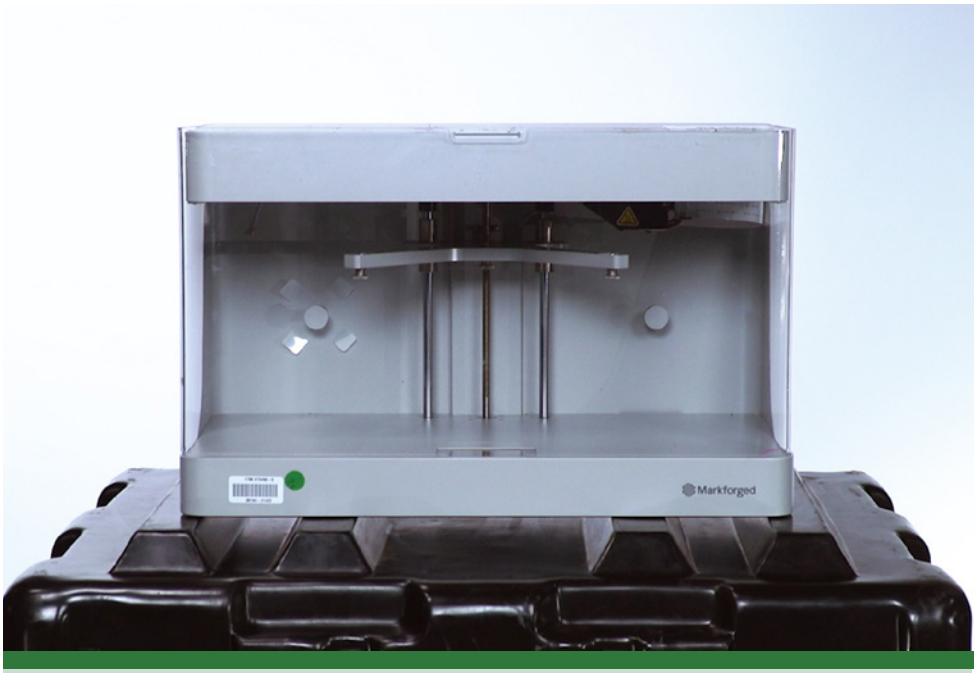
The Markforged MARK II 3D printer is displayed atop of the Tactical Fabrication Additive Manufacturing kit on Feb. 22, 2023, in West Bethesda, Md. Carderock's Visual Information Branch is working alongside the Additive Manufacturing Branch to create a pack-out and set-up video, as well as a various how-to videos to be provided to the Marine Corps instructors. (U.S. Navy photo by Devin Pisner)

3D printer with two rolls of polyethylene terephthalate glycol (PETG) material, one advanced polymer 3D printer with two rolls of material chopped carbon fiber nylon material, one roll each of reinforced fiber material (carbon fiber and Kevlar), a laptop, mouse, general support equipment, such as tape measures, calipers and pliers and software to support the operation.
The Carderock team supporting this collaboration is comprised of members in the Additive Manufacturing Branch, including: Drazen Hadzialic, a technical program manager and USMC team lead, as well as Engineers Angie Han, Brennen Cheung and Ryan Fisher. They are sponsored by USMC Program Manager Supply Maintenance Systems, led by Project Officer Robert Davies.

"TACFAB is essentially three hard transit cases that can fit on the back of a High Mobility Multipurpose Wheeled Vehicle or Joint Light Tactical Vehicle, rather than having to be towed by a larger heavy-duty Logistic Vehicle System Replacement," Cheung said. "It is designed to be deployed as far forward in the field as possible. The original prototype for this was fielded in 2016. We had a limited user experience prototype fielded to a few different Marine Corps bases. We received feedback from them, which then led to us getting funding for this to be a Program of Record in 2021."

Once delivered, the Carderock team will be in charge of training the Advanced Manufacturing Training Center (AMTC) instructors on how to use TACFAB, who will then go on to train other Marines. These AMTC's are located at I Marine Expeditionary Forces (MEF) at Camp Pendleton, California, II MEF at Camp Lejeune, North Carolina, III MEF in Okinawa, Japan and Hawaii. The trainings will consist of classroom instructions, such as equipment pack-out and set-up, equipment operation, including software and maintenance. Additionally, Carderock's Visual Information Branch is working with Hadzialic and his team to create a pack-out and set-up video, as well as a various how-to videos to be provided to the instructors at the ATMC's.

A Tactical Fabrication Additive Manufacturing kit is displayed during the filming of a "Pack-out and Set-up" video on Feb. 22, 2023, in West Bethesda, Md., which will be used as a how-to video for the U.S. Marine Corps. TACFAB is composed of three separate hard transit cases measuring 3 feet by 2.3 feet by 2 feet, each consisting of various items such as one small polymer 3D printer with two rolls of polyethylene terephthalate glycol material, one advanced polymer 3D printer with two rolls of material chopped carbon fiber nylon material, one roll each of reinforced fiber material (carbon fiber and Kevlar), a laptop, mouse, general support equipment, such as tape measures, calipers and pliers and software to support the operation. (U.S. Navy photo by Devin Pisner)



One of the 3D printers that can be found in the Tactical Fabrication Additive Manufacturing kit is displayed sitting atop the TACFAB kit on Feb. 22, 2023, in West Bethesda, Md. Carderock's Visual Information Branch is working alongside the Additive Manufacturing Branch to create a pack-out and set-up video, as well as a various how-to videos to be provided to the Marine Corps instructors. (U.S. Navy photo by Devin Pisner)

Carderock's Dr. John Miesner Receives ASNE Solberg Award

By Todd Hurley, NSWC Carderock Division Public Affairs

Dr. John Miesner, a structural acoustics senior research engineer in Naval Surface Warfare Center, Carderock Division's Structural Acoustics Branch was announced as the recipient of the 2022 American Society of Naval Engineers (ASNE) Solberg Award for research in March. He was officially recognized and received his award at the 2023 Technology Systems and Ships and Combat Systems Symposium in Baltimore, Nov. 30, 2023.

The Solberg Award has been presented annually since 1967 and is given to an individual who has made a significant contribution to naval engineering through personal research during the past three years. The award is named after Rear Adm. Thorvald A. Solberg, who, aside from being the ASNE president in 1949 while concurrently being the third Chief of Naval Research, was known for pursuing basic and applied research, which led to solutions on shipboard problems.

> "WHENEVER I LOOK AT THE LIST OF PREVIOUS RECIPIENTS, THERE ARE SOME EXTRAORDINARY CARDEROCK ENGINEERS THERE, AND I AM GREATLY HONORED TO BE INCLUDED IN THEIR LISTING..

Miesner is the third consecutive Carderock employee to receive the award, following in the footsteps of Jon Stergiou in 2020 and Dr. Jason Anderson in 2021.

"Whenever I look at the list of previous recipients, there are some extraordinary Carderock engineers there, and I am greatly honored to be included in their listing," he said.

Miesner received the award for his work in revolutionizing the design of inertial actuators for the U.S. Navy — something he has been working toward for the past seven years. Inertial actuators allow Navy researchers the opportunity to predict how a ship will respond to vibration sources such as motors, pumps and other rotating equipment.

"Inertial actuators are used on Navy ships for testing, characterization and troubleshooting — we do tests to characterize the ship and to compare to digital models that predict structural acoustic response and acoustic radiation," Miesner said. "We excite the structure in order to measure the response both onboard with accelerometers and off board with acoustic arrays, and then compare that to the digital models for validation and improvement."

Throughout the past seven years, Miesner has received eight patents and has seven pending patent applications, and has designed and built prototypes of several actuators for different application.

"The Acoustic Vibration Lab designs and builds a number of different actuators from very large ones that operate at low-frequency, mid ones that operate at mid-frequency and small ones that operate at high-frequency. The frequency response of an actuator depends greatly on size," he said. "If you want to generate force at low frequency, you need a large amount

Capt. Jesse Black, commanding officer of U.S. Naval Research Lab, presents Dr. John Miesner, a structural acoustics senior research engineer in Naval Surface Warfare Center, Carderock Division's Structural Acoustics Branch, the 2022 American Society of Naval Engineers (ASNE) Solberg Award for research during the 2023 Technology Systems and Ships and Combat Systems Symposium in Baltimore Nov. 30, 2023. (ASNE photo provided)

of mass moving in order to generate the inertial response. The Acoustic Vibration Lab is working to broaden the bandwidth of the actuators in order to have one actuator that performs the function of several. I work mostly in the area of linearization. A linear actuator has a response that is proportional to current or voltage input. Most of my research and design work has been producing linear output with something that is inherently non-linear, such as magnetostrictive material or an electromagnet."

Due to his expertise, Miesner is regularly consulted for various Navy applications. Recently, a problem arose with commercial-off-the-shelf (COTS) actuators used for large-scale model testing; the units were producing high levels of distortion in vibration measurements. In a matter of a couple of weeks, Miesner designed a unique low-cost flexure retrofit for the COTS units that reduced distortion resulting in a successful test campaign.

His mentorship of new and young engineers has helped facilitate the Navy's growth and continued success, which has been his favorite part about this entire process.

"We have some extraordinary junior engineers at Carderock," Miesner said. "When I explain a concept to them and see that light that comes on, seeing that they understand how this can be utilized, why it works the way it does and how it can be used in future designs is a great feeling."

Carderock Changes Command May 12

By Todd Hurley, NSWC Carderock Division Public Affairs

Naval Surface Warfare Center, Carderock Division's outgoing Commanding Officer, Capt. Todd E. Hutchison (left), salutes Carderock's incoming Commanding Officer, Capt. Matthew Tardy (right), during a change-of-command ceremony held in West Bethesda, Md., on May 12, 2023. (U.S. Navy photo by Aaron Thomas)

Capt. Matthew L. Tardy relieved Capt. Todd E. Hutchison as Naval Surface Warfare Center, Carderock Division's Commanding Officer (CO) during a change-of-command ceremony held in West Bethesda, Maryland, on May 12, 2023.

Hutchison, who took command in July 2020 as Carderock's 39th commanding officer, described his three-year tour at Carderock with a single word: "Amazing."

When he first came onboard, the country was in the middle of the COVID-19 pandemic. Hutchison acknowledged the challenges of taking command during that time, but he said getting out and meeting people was still one of his priorities.

"I did not let the pandemic deter me with trying to engage with the workforce in a meaningful way, whether that be dialing up early to Teams calls, staying on late, setting up time to have conversations or mentorships with people to really just get to know them more," Hutchison said.

When the pandemic restrictions lifted a bit, Hutchison scheduled a walk through every Monday of a different space on base, having now been to almost every building at West Bethesda at least once, if not multiple times, and out to all of the detachments, several of them a couple of times.

"I have been asked how I have impacted the strategic direction of a command of nearly 3,000 people that are located in seven different states, and my answer was 'one person at a time,'" he said, adding that he not only had to intentionally think from a strategic command level, but also had to engage at the deck-plate level. "I have really tried to get myself out there as much as I could, and I think that has made a big difference, and the workforce has been extremely receptive."

Hutchison talked about several of the technical accomplishments at Carderock during his time as commanding officer, such as repairing an underwater acoustic measurement system, building a scale model of a part of the new Columbia-class submarine, conducting full-scale ship shock trials for Ford-class carriers and watching the Orion space module launch into space, something Carderock engineers modeled and tested years ago having now come to its destination.

"Pulling all that together, that work literally goes from operations and testing at the ocean's depths, to the surface of the ocean anywhere in the world, to Marine Corps support ashore, to the far side of the moon," Hutchison said.

While the technical accomplishments are a highlight of anyone's career, Hutchison recognized the people in the "world-class"

business side of Carderock and the innovation they tirelessly show, from the Comptroller office to Contracting, Information Technology, Labor and Employee Relations, Corporate Communications, etc.

"Those threads of integrity, innovation and excellence exemplified by the great work they do extend to every department, division, detachment, branch, team and employee in this incredible Carderock organization," Hutchison said.

While he is excited to begin his new position as the Major Program Manager for Surface Ship Modernization, Hutchison said he will be left with many friendships and memories, for which he is very grateful.

"The friendships and bonds I have made at Carderock mean the world to me," he said. "This is a trust and relationship business. As I leave, I will be left with the memories of how closely I got to work with Larry Tarasek, Steve Ouimette, Emily Nash, Dianna Pleasants, BethAnn Flannery, and the list goes on-and-on of people who have contributed to the great work we have done over the past three years, and who were here long before me and will be here after I leave that have continued to do this incredible Carderock work to support the fleet."

His advice to Tardy is to engage the Carderock team at every level.

"Get out there and meet the team. You can see the pride that everybody has in their work, and that is so encouraging," he said. "In this job, you'll not only see the importance of your role in influencing the strategic direction of the command, but also how you interact with employees, listening to and addressing their challenges, and celebrating their successes."

Capt. Todd E. Hutchison (center) stands ready to be relieved by Capt. Matthew R. Tardy (right) as commanding officer of Naval Surface Warfare Center, Carderock Division during the change of command ceremony in West Bethesda, Md., on May 12, 2023. (U.S. Navy photo by Devin Pisner)

Coincidentally, Hutchison will be replacing Tardy as Program Manager of Surface Ship Modernization. He said he looks forward to the opportunity to get ships back in full-operating condition to the fleet commanders who depend on those ships to do our nation's tasking.

"What attracted me to this position is that it is a very fleet facing, direct impact job," Hutchison said. "It is very real, in your face, tangible type work, and I am looking forward to that."

Tardy became the Program Manager of Surface Ship Modernization in 2020, and believes that experience will be beneficial during his time as Carderock's 40th commanding officer.

"As a program manager, recognizing the challenges associated with running the Cruiser Modernization Program gives me a great appreciation for what program managers have to go through in order to execute programs," he said. "Having that experience will help me as the Carderock Commanding Officer as we support the various programs throughout the Navy."

Naval Surface Warfare Center, Carderock Division's Commanding Officers, both past and present, pose together during a change-of-command ceremony held in West Bethesda, Md., on May 12, 2023. From left are Capt. John Preisel, retired Capt. Mark Vandroff, retired, Capt. Matthew Tardy, Capt. Todd E. Hutchison, Capt. Charles Behrle, retired and Capt. Chris Meyer, retired. (U.S. Navy photo by Aaron Thomas)

MASK Gets Needed Repairs

By NSWC Carderock Division Public Affairs

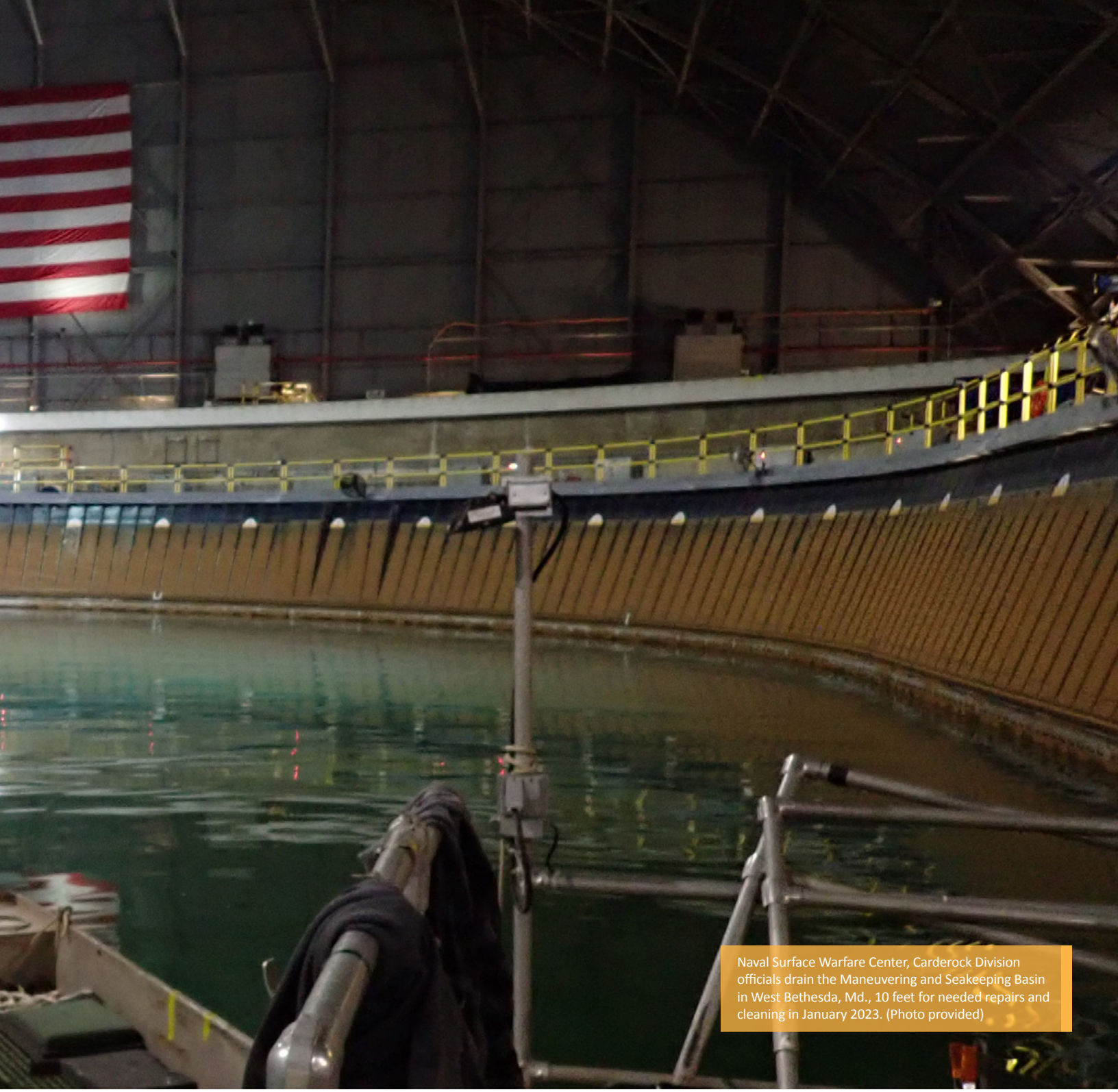
Naval Surface Warfare Center, Carderock Division's Hydromechanics Facilities Engineering and Operations Branch recently spent about three weeks between testing to do some needed repairs and maintenance on the Maneuvering and Seakeeping (MASK) Basin.

"We had a bunch of minor leaks in the gusset, as well as some leaks below the wave maker paddles," Branch Head Keo Amara Chum said. "But first, we had to drop the water in the basin about 10 feet so that we could get to those areas."

Chum said that Carderock's Corporate Operations Department transferred water between basins so they wouldn't be wasting water and having to buy new water to fill it again once they were done. He said they essentially moved some of the water from the MASK Basin to the J Basin via underground pipes and the rest of the water was moved to the Rotating Arm for holding.

Once the water level was dropped, the team had to remove the excess gusset material from the wall at paddle 1 and inspect and troubleshoot ways to take the slack out of the material itself.

"We came up with cutting into the



Naval Surface Warfare Center, Carderock Division officials drain the Maneuvering and Seakeeping Basin in West Bethesda, Md., 10 feet for needed repairs and cleaning in January 2023. (Photo provided)

gusset material to remove the old ripped up material and overlapping the good material," Chum said. "Then Jacob Wilson used a specialized heat gun to weld them together to ensure a strong bond."

They then cut a custom piece of gusset material to go over the seam made by cutting the gusset and then again used the heat gun to weld the custom patch onto the seam to ensure a strong durable repair. Before actually doing this on the wave maker itself, Wilson first did some test runs on bench in the shop to make sure it was going to work.

During the initial inspection of the wave maker after the water was dropped, a rip was found at the bottom of a gusset around paddle 180. Wilson cleaned the ripped section and cut a patch to go over the top of the rip and then heat welded the patch onto the gusset to prevent any leaks from that point. After the patch cooled down, he took silicone sealant and covered the whole patch to ensure there would be no possibilities of leaks coming from that area again.

While the water was low, Steven Moore, Mike Cortese and Wilson were able to inspect and tighten all the bolts attaching the gusset material to the paddles, as

A Naval Surface Warfare Center, Carderock Division employee repairs wave-making panels inside the Manuevering and Seakeeping Basin in West Bethesda, Md., in January 2023. (U.S. Navy photo provided)

well as those at the bottom of the wave maker paddles. Additionally, they torque checked and tightened the main bolts of the hinge plates at the bottom of the paddles. While going around and checking to make sure all the bolts were tight, they were also adding approved polyurethane sealant to any areas that were leaking or lacking required amount of sealant.

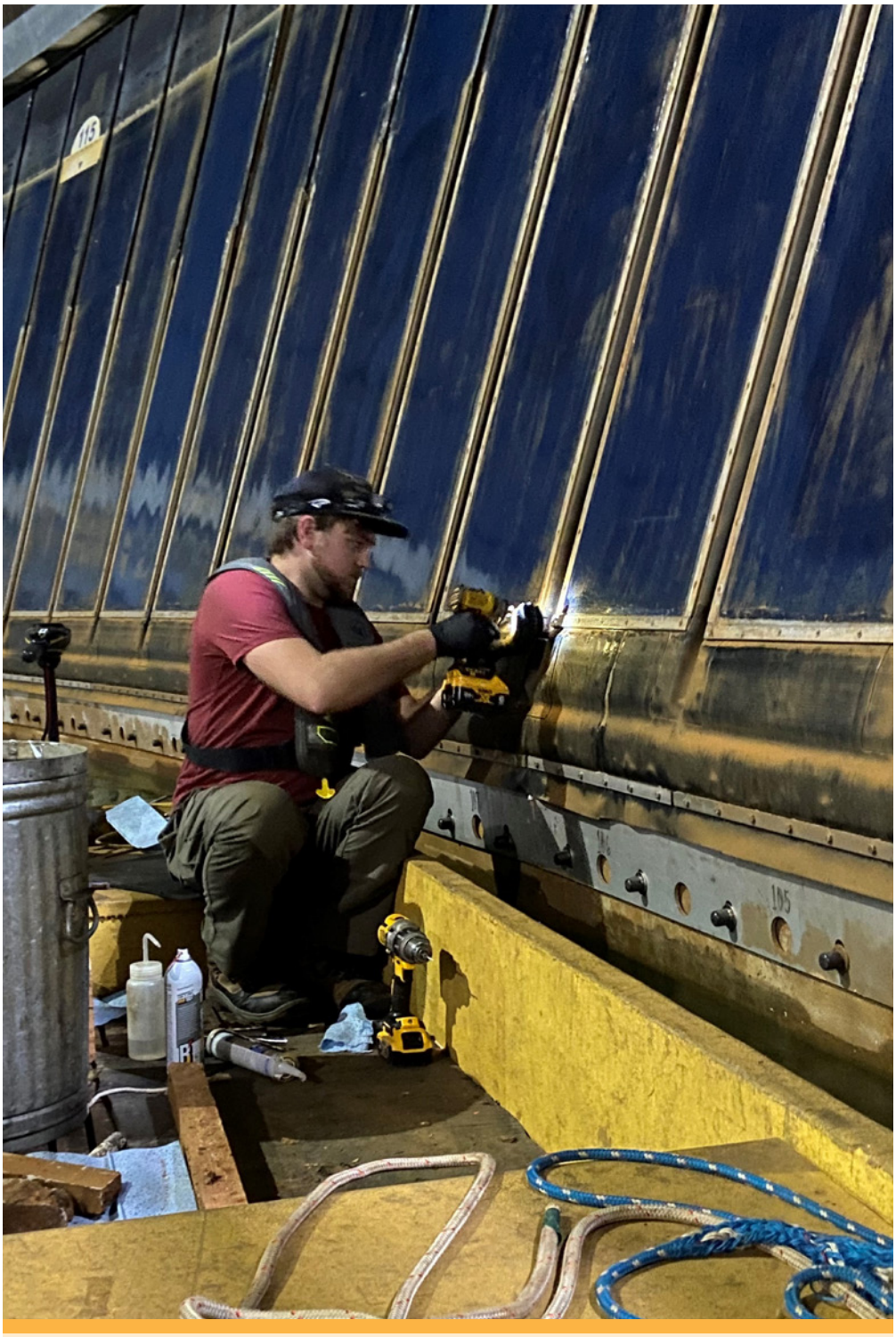
They also went on the inside of the wavemaker shelf and went to the location of documented leaks in between the hinge plates at the bottom of the paddles and took a sealing compound and poured it into the crack to fill it. After filling the basin with water again, all the previous leaks were gone.

They also used some cleaning agent, a mop, a squeegee and a long brush to clean all the residue built up over the past few years on all 216 paddles.

Barnes untangled all the netting around the basin and even repaired some of the broken and loosened netting. He then ran some yellow tape along with the netting to make the netting more visible.

From years of testing, the wave maker had pushed all the trash and debris into the beach area. This included such items as hand tools, zip ties, pieces of material that chipped off from the actual beach and other random debris. The team used the down time while the basin was filling up to also pick up all the debris around the beach area.

Because the water was low, they were also able to fix some leaks in the slip tank. This is the area where normally the test team would put their model into the water and push it out to the MASK basin. Jim Hick from the model shop addressed the leaks around the windows, grinding and sanding the slip tank and then applied some rust converter around those areas to prevent further rusting.



Michael Cortese tightens more than 2000 bolts along the bottom of the wave-maker system in the Maneuvering and Seakeeping Basin in West Bethesda, Md., after the water was drained by 10 feet for needed repairs and cleaning in January 2023. (U.S. Navy photo provided)

Steve Ebner Carriage Dedication

By NSWC Carderock Division Public Affairs

Naval Surface Warfare Center, Carderock Division held a Carriage 2 dedication ceremony in honor of the late Steve Ebner on May 9, 2023, in building 4E at the East End of the David Taylor Model Basin in West Bethesda, Maryland. Ebner, a Carderock employee for nearly 40 years, and Marine, Aviation and Unmanned Systems Division Head, passed away on Feb. 15, 2022, at the age of 61. The dedication ceremony consisted of heartfelt speeches from past and current co-workers of Ebner, including Carderock's Technical Director Larry Tarasek, Mechanical Engineer Phong Nguyen from the Sea-Based Aviation and Aerodynamics Branch, Damien Bretall, Maritime Systems Hydrodynamics Branch Head and Rich Banko, retired Carderock employee.

In attendance were roughly 75 Carderock employees, as well as Ebner's family. As part of the dedication, Banko created two plaques that will hang on Carriage 2 for, as Tarasek put it, "This Model Basin has been here for the last 80 years, and will be here for at least 80 more. Any engineer who works on this carriage will forever be reminded of the memory of Steve." (U.S. Navy photos by Monica McCoy)

First STEM/Recruitment Event at Carderock for Deaf and Hard of Hearing Community

By Tamari Perrineau Palmer, NSWC Carderock Division Public Affairs

RIT and NTID participants in networking sessions to learn more about Carderock career opportunities in West Bethesda, Md., on Nov. 8 2023. Students had the opportunity to interact with various employees from the technical departments to gain valuable insights. (U.S. Navy photo by Tamari Perrineau-Palmer)

Naval Surface Warfare Center, Carderock Division (NSWCCD) recently hosted a tour for students from the Rochester Institute of Technology (RIT) and National Technical Institute for the Deaf (NTID), a college within RIT, to explore potential job and internship opportunities at the command. The group visited several engineering facilities, listened to overviews of each of the technical departments at Carderock and networked. The tour showed the students that the Division is not only a research base, but also a workplace that accommodates Deaf and Hard of Hearing (HoH) employees with interpreting services.

Anthony Madalena, an engineer in Carderock's Future Ship Concepts Branch and an RIT/NTID alumnus, explained that Naval Research Laboratory (NRL) received a grant from the Office of Naval Research (ONR) to support internships for Deaf and HoH students in science, technology, engineering and mathematics (STEM) fields at no cost. NRL has since expanded these opportunities to other activities across the Navy's Warfare Centers.

Last year, NRL hosted the first annual Deaf in Department of Defense Research Symposium.

"The intent was to both present the research that the students have done and to show the career opportunities available in the Navy to entice more Deaf/HoH students to pursue STEM majors at NTID/RIT and Gallaudet, ultimately driving interest in working for the DoD," Madalena said, adding that Gallaudet University, located in Washington, D.C., is focused on the education of the Deaf and Hard of Hearing.

Madalena shared the work he performs at Carderock at the event last year, which generated interest in having NTID/RIT students visit the command this year. NRL and Carderock collaboratively hosted the 2023 Deaf in DoD Research Symposium Nov. 8-9, 2023, in the Washington metropolitan area. This comprised of the tour of NSWCCD in West Bethesda, Maryland, as well as a technical conference at NRL. All sessions were provided in both American Sign Language and English to ensure full access.

"The goal of this event was to expose the next generation of engineers and scientists to the work carried out in the DoD, and to provide them with networking opportunities and connections as they search for co-op and/or full-time employment," Madalena said.

Madalena, Ashlee Floyd, Haley Kirby and Rebekah Knodel took the lead in organizing the tour of Carderock, facilitating networking sessions with leaders from various technical codes, and conducting interview sessions.

"It's great to have students come to see what Carderock does instead of hearing about it so they can get a better experience and idea of what we do here," Human Resource Recruitment Specialist Haley Kirby said.

"It's my first time coming into a federal government environment and seeing how everything works – all the processes, all the programs that are available here," Matthew Myers said, a sophomore student at RIT/NTID. "It was more than I expected. And I like the Model Shop; it's something that I am considering doing. At first, I thought I needed to find something that would match my major, but now that I've heard these stories from Carderock employees that are in a career field that is different from what they majored in, I'm thinking it might not be necessary."

Commanding Officer Capt. Matthew L. Tardy (right) and Capt. Thomas Dickinson (left) speak to students from the Rochester Institute of Technology (RIT) and National Technical Institute for the Deaf (NTID) on Day 1 of the STEM event tour in West Bethesda, Md., on Nov. 8, 2023. The pair discussed the ways Carderock is dedicated to providing equal employment opportunities and answered students' questions about the command. (U.S. Navy photo by Tamari Perrineau-Palmer)

In addition to this visit, Carderock hiring managers had the opportunity to interview potential candidates from RIT/NTID on Dec. 8, 2023. During this hiring event, Deaf/HoH applicants can be considered for employment through the Workforce Recruitment Program or Schedule A direct hiring authority, which gives the federal government permission to hire people with significant disabilities without requiring them to compete against non-disabled jobseekers for those positions. These programs provide avenues for qualified candidates to be hired based on their skills and abilities, ensuring equal employment opportunities for individuals with disabilities.

In total, there are eight Deaf/HoH employees at Carderock, seven of whom are located at headquarters in West Bethesda, Maryland, and one who works at the command's Combatant Craft Division in Little Creek, Virginia.

Currently, there are three full-time sign language interpreters on staff at West Bethesda.

Rebekah Knodel, one of the interpreters from the event and the Lead Sign Language Interpreter, said she hopes the event will be a yearly occurrence.

A Carderock employee gives RIT and NTID students a tour of the Wind Tunnel in West Bethesda, Maryland on Nov. 8 2023. On the tour he showed the students different tools the staff uses and details of what the team does at the command. (U.S. Navy photo by Tamari Perrineau-Palmer)

RIT and NTID students pose alongside Carderock employees at the maneuvering and seakeeping bassist in building 18 in West Bethesda, Maryland on Nov. 8 2023. Jeremy Turner, who led the tour presentation, provided context on the job duties performed daily and historical projects the team has worked on. (U.S. Navy photo by Tamari Perrineau-Palmer)

Carderock Raises Awareness for STEM Internship Opportunities at Summer Boot Camp

By Edvin Hernandez, NSWC Carderock Division Public Affairs

Naval Surface Warfare center, Carderock Division Oceanographer Jeff Campana (right) (Code 852) supports STEM boot campers Cole Scott (left) and Gary Stanley (middle) testing their SeaGlide in Carderock miniature water basin in West Bethesda, Md., in July 2023. (U.S. Navy photo provided by Charlotte George)

Naval Surface Warfare Center, Carderock Division hosted a week-long summer boot camp at its West Bethesda, Maryland, headquarters in July 2023 to raise awareness for science, technology, engineering and mathematics (STEM) internship opportunities available to local high school students. The program, which was planned since before the COVID pandemic, finally became a reality after careful coordination from Carderock's STEM Director Charlotte George, Teaching Institute for Excellence in STEM (TIES) Director for Engineering, Design and Fabrication Toby Bothel and Building Engineering and Science Talent (BEST) President Karen Harper.

"TIES and BEST have been partners in the Department of Defense (DoD) STEM Education Consortium since 2019," Bothel said. "An important mission of DoD STEM is to offer meaningful STEM experiences for students and educators,

while making a connection to STEM professionals at DoD labs. These connections give students a glimpse into the cutting-edge research which DoD civilian scientists and engineers are engaged in. One of the ways that students learn first-hand about these STEM opportunities is by participating in summer internship programs like the Navy's Science and Engineering Apprenticeship Program (SEAP)."

Bothel, who was the command's previous STEM director between 2007-2014 before retiring after 34 years of service, has observed that students are not aware of the civilian STEM career opportunities – whether full-time jobs or internships – available at DoD Research and Development facilities like Carderock. As a result, she and George planned to host Carderock's first-ever STEM boot camp for high school students through the support of an Office of Naval Research (ONR) STEM grant.

"We actually developed the idea right before the pandemic started," George said. "It stalled because of COVID, but when we finally did this event in July, it felt like a career culminating event for me."

High school students from Oxon Hill High School, McKinley Technology High School and Friendship Technology Preparatory High School were welcomed to Carderock July 24-27. During their four-day stay, they engaged in several activities including building their own underwater autonomous robot, SeaGlide. This project allowed students to learn about buoyancy, electrical circuits and electronic sensors, as well as how to build and program a robotic controller. After successful assembly, students were given the opportunity to test their underwater vehicle in Carderock's miniature model basin.

Another activity students engaged in during their STEM boot camp was touring some of Carderock's unique facilities such as the David Taylor Model Basin and Maneuvering and Seakeeping Basin. Teachers who also attended the week-long event became more familiar with the SEAP application process.

"This boot camp not only gave the students an 'inside' glimpse into the on-going research at Carderock and the impressive facilities where the research happens, but it also provided the students with support for their SEAP application," Bothel said. "The School Support Team, made up of teachers, counselors and STEM specialists from each of the three schools who participated, will be meeting with the students to assist them with their internship applications. We worked with a large number of Title One students this year. Our goal was to focus on underrepresented students who had an interest in STEM and make them aware of the opportunities out there for everyone."

During lunch breaks, students were able to network and listen to Carderock's summer interns – high school and college students – talk about their experiences working for the command.

On the last day of the STEM boot camp, the group visited the U.S. Naval Academy in Annapolis, Maryland. They were engaged in STEM activities led by the Academy's STEM team and they had the opportunity to attend the daily Admissions Briefing.

Jaelynn Jackson, a student from McKinley Technology High School, assembles her SeaGlide inside Naval Surface Warfare Center, Carderock Division's Raye Montague Center in West Bethesda, Md., in July 2023. The command hosted a week-long summer boot camp in July 2023 to raise awareness for science, technology, engineering and mathematics internship opportunities available to local high school students. On the last day of the STEM boot camp, the group visited the U.S. Naval Academy in Annapolis, Maryland. (U.S. Navy photo provided by Charlotte George).

"This is the first year of the three-year ONR grant, so we will have the opportunity to continue these boot camps during the summers of 2024 and 2025," Bothel said. "Next year, we plan to hold the boot camps at both Carderock and the Naval Research Laboratory. We are also planning to offer the high school boot camp opportunity to two additional high schools and expand the School Support Teams from each school to include educators from their feeder middle schools."

Carderock Hosts First In-Person Math Contest Since 2019

By Todd Hurley, NSWC Carderock Division Public Affairs

Naval Surface Warfare Center, Carderock Division hosted its Carderock Math Contest (CMC) on May 5, 2023, at its West Bethesda, Maryland, site, the first of these events since 2019 to be held in-person.

The CMC is a mathematics competition for middle school students (grades 6-8) to test their math capabilities for speed, critical thinking and teamwork. Started in 2010, the CMC has run annually. The free contest is a day-long event that featured a MATHCOUNTS-style competition, interactive tours of Carderock's facilities and a presentation aimed at encouraging middle school students' interest in science, technology, engineering and mathematics (STEM)-based career fields.

This years' event featured written exams consisting of an individual sprint round (30 problems in 40 minutes, without the use of calculators), an individual target round (eight problems in 20 minutes, without the use of calculators) and a team round (10 problems in 20 minutes, calculators allowed). There was also a guest presentation by Yusnier Viera, aka The Human Calendar, who students fawned over, asking for his autograph after his speech.

After lunch, the students went on interactive tours of Carderock facilities such as the David Taylor Model Basin, Mechanical Metallurgy Lab, Additive Manufacturing Research Lab, Magnetics Lab, the Wind Tunnel, a Sea Perch and an American Society of Naval Engineers Fleet activity. To conclude the event, a countdown round was held that featured a knock-out competition consisting of 16 students, with the winner being offered to shadow a Carderock engineer sometime in the next year, followed by an award ceremony to close out the event.

Carderock's planning committee who helped prepare the CMC are: Kristin Behrle, Kavi Dotson, Erica Scates, Charlotte George, Art Elefante, Charles Fisher, Ashlee Floyd, Nick Jones, Andy Loh, Ben Medina and Kariann Vander Pol, as well as Chris Mott and Lorne Lenhardt, helped prepare the Maritime Technological Information Center to host the event.

Yusnier Viera, known as "The Human Calendar", gives a guest presentation on mental math to Carderock Math Contest participants during a competition break in West Bethesda, Md., on May 4, 2023. (U.S. Navy photo by Kristin Behrle)

Additionally, numerous Carderock employees volunteered for the event as escorts and proctors, including: Ryan Fisher, Julia Medina, Kevin Augustyn, Dalton Harvey, Addisu Woldetsadik, Abigail Hephner, David Bernard, Michael Woodworth, Rachel Luu, Nathan Howard, Adam Scates, Justin Norkett, Tristan Wright, Norieko Crosland, Lillian Mueller, Catherine Ripley, Chandrasekhar Kannepalli, Moojane Louie, Emeline Kirks, Huynh Luu, Katrina Moore, Kathleen Desmond, Melanie Zajic, Brandon Newsome, William Manning, Courtney Sicinski, Jack Pectol, Drazen Hadzialic, Margaret Zantow, Gobong Choi, Anindita Mukherjee, Emma Schlechter and Dr. Maureen Foley.

The winner of the Carderock Math Contest Countdown Round celebrates as he is declared champion after successfully defeating 15 fellow students in a knock-out round competition in West Bethesda, Md., on May 4, 2023. (U.S. Navy photo by Kristin Behrle)

Carderock Employees Participate in U.S. Navy Young Professionals Q/A Panel

By Todd Hurley, NSWC Carderock Division Public Affairs

Four Naval Surface Warfare Center, Carderock Division employees participated in a U.S. Navy Young Professionals Q/A Panel, co-hosted by Carderock's Capital Tech Bridge and Montgomery College's ignITe Hub, which was held at Montgomery County's Rockville Campus in Maryland on May 2, 2023, and streamed virtually.

IgnITe Hub Director Kimberly Bloch-Rincan gave opening and closing remarks for the panel. The event consisted of an ask-me-anything type event with young professionals working for the U.S. Navy at laboratories in the Maryland, Virginia and Washington, D.C., region. The four Carderock participants consisted of Dr. Mackenzie Perry, a materials engineer in the Welding, Processing and Non-Destructive Evaluation Branch, Brittny Odoms, a multimedia specialist in the Creative Media Branch, Kayla Petrover, an engineer in the Structural Acoustics Branch and Jereme Nereaux, an engineer in the Measurement Systems Development Branch.

"Collaborating on these types of events in such a diverse county helps show people that they too can work at a place like Carderock, no matter who they are or what career path they've chosen, by showcasing a variety of careers and perspectives," Laure Hanyok said, Carderock's Capital Tech Bridge Director and ignITe Hub's first local community partner.
"Hopefully, someone who attends will see themselves in one of our speakers and apply for an internship or a job with Carderock. Additionally, the ignITe Hub helps students and community understand their career path opportunities. By engaging with them, we become one of those avenues for students graduating from Montgomery College, students who attended Montgomery College and went on to get a four-year degree through the ignITe Hub's career path programming and even community members who are looking for a career change."

Naval Surface Warfare Center (NSWC), Carderock Division employees, along with various other Navy agencies located within the Washington, D.C., region, participated in a U.S. Navy Young Professionals Q/A Panel, co-hosted by Carderock's Capital Tech Bridge and Montgomery College's ignITe Hub, which was held at Montgomery County's Rockville Campus in Maryland on May 2, 2023. (U.S. Navy photo by Lauren Hanyok)

The panel covered the background of each of the participants — where they went to school, what they majored in and what they do in their day-to-day job. The panel was moderated by Dr. John Barkyoumb, Carderock's Director of Strategic Relations. Some of the specific questions that Barkyoumb asked during the panel were: What is the best thing about working at your job, how did your college major help or not help prepare you for your current job, what do you wish you had done while in college to help prepare you for your current job, what

Naval Surface Warfare Center (NSWC), Carderock Division employees, along with various other Navy agencies located within the Washington, D.C., region, participated in a U.S. Navy Young Professionals Q/A Panel, co-hosted by Carderock's Capital Tech Bridge and Montgomery College's ignITe Hub, which was held at Montgomery County's Rockville Campus in Maryland on May 2, 2023. From left are: IgnITe Hub Director Kimberly Bloch-Rincan; Kayla Petrover, Carderock engineer; Tarell Taylor, NSWC Indian Head Division scientific and technical information officer; Dr. Mackenzie Perry, Carderock engineer; Brittny Odoms, Carderock multimedia specialist; Shannon Donaldson, Naval Air Systems Command materials engineer; and Dr. John Barkyoumb, Carderock's Director of Strategic Relations. (U.S. Navy photo by Lauren Hanyok)

advice do you have for new STEM professionals joining the career field and what has been the biggest surprise so far in your career.

"It was nice because it was a really diverse experience," Odoms said. "I was the only non-engineer there. They cater mostly toward science, technology, engineering and mathematics (STEM) and people who want to get into STEM, but they also wanted to let the kids in college who are looking for careers know that Carderock and Naval Sea Systems Command are more than just STEM careers. Overall, I think the event went really well. The feedback we got not only from ignITe Hub personnel but also the students joining in online was incredible. My biggest takeaway was my impact. A lot of us talked about imposter syndrome and for whatever reason thinking we don't belong here, maybe because we are too young or because I am a woman, but one of the ignITe hub leaders came up to us afterward and told us that we should be really proud of ourselves and that we are here for a reason and that we have people looking up to us. It was really nice to hear that because it can be difficult to tell yourself that."

USS SEAP Makes First Voyage at Carderock

Naval Surface Warfare Center, Carderock Division Science and Engineering Apprenticeship Program (SEAP) interns float on their newly constructed vessel “USS SEAP,” in West Bethesda, Md., on Aug. 10, 2023. Community Outreach and Student Engagement Coordinator Ashlee Floyd (second from right) challenged SEAP interns to make a boat in less than two hours using corrugated plastic, duct tape, poplar board and expanding foam. Carderock’s on-site fire department supported the students by setting up a temporary pool for interns to test their vessel. (Photo provided by Carderock’s STEM Director Charlotte George)

Carderock Interview Day

Prospective candidates fill out interview questionnaires at Naval Surface Warfare Center, Carderock Division in West Bethesda, Md., on Oct. 13, 2023. Interviewees received an overview of the Warfare Center and were toured around the command before having their interview with one of Carderock's technical departments. (U.S. Navy photo by Travis Troller)

Naval Surface Warfare Center, Carderock Division Commanding Officer Capt. Matthew Tardy and Technical Director Lawrence Tarasek welcome prospective new employees to West Bethesda, Md., on Oct. 13, 2023. Interviewees received an overview of the Warfare Center and were toured around the command before having their interview with one of Carderock's technical departments. (U.S. Navy photo by Travis Troller)

Carderock Employees Attend 2023 Manufacturing Expo and Exhibition at University of Texas Rio Grande Valley

By Todd Hurley, NSWC Carderock Division Public Affairs

Naval Surface Warfare Center, Carderock Division employees Dr. Cynthia Waters, Senior Scientific Technical Manager and Principal for Advanced Manufacturing and Materials, and Dr. Abel Vargas, a mechanical engineer in the Maritime Systems Hydromechanics Branch, attended the 2023 Manufacturing Expo and Exhibition at University of Texas Rio Grande Valley (UTRGV) in Edinburg on Feb. 16-17, 2023.

The event is part of the Department of Defense (DoD) Consortium for Innovative Driven Research/Education Ecosystem for Advanced Manufacturing for the Defense (I-DREAM4D), which was created by the DoD to support the talent needs for military and defense manufacturing operations. The consortium is composed of five higher education institutions, including UTRGV, national research centers, national laboratories, defense manufacturers, local high school districts and community colleges.

The two-day National Manufacturing Expo was attended by high school and middle school children, and was comprised of a symposia featuring guest speakers such as Waters and Heidi Shyu, the Under Secretary of Defense for Research and Engineering, who gave an inspirational speech on science, technology, engineering and mathematics (STEM) opportunities, lab tours consisting of STEM information sessions and a college student career fair.

Carderock's Dr. Cynthia Waters takes the stage at the 2023 Manufacturing Expo and Exhibition at University of Texas Rio Grande Valley in Edinburg on Feb. 16, to speak to participating students about Carderock Division, and to share with them the importance of careers in the field of manufacturing and engineering. (Photo provided by Dr. Cynthia Waters)

"This is the second year we have participated in the event, and I plan on making this an annual event for Carderock going forward," Waters said. "A few years ago, I was tasked by the Office of Naval Research to coordinate a manufacturing engineering education program, which then got connected with I-DREAM4D. They host these events to introduce students to engineering and manufacturing."

Waters attended the event as a guest speaker on day one, and then spoke to a small class of roughly 30 students on day two, discussing what careers look like at Carderock and the work that Carderock does.

"Attending this event is the most fun I have had all year — the energy with the students is very high," Waters said.

Prior to Waters' speech, Shyu spoke and took questions from the high-school students that were tough, real-life questions about work-life balance, bias and identity, which caused Waters to modify her message.

"I was a guest speaker on day one," Waters said. "When I walked out on stage, I asked students, 'What does an engineer look like?' and then I paused. 'It looks like me. It looks like you. Every single one of you has the ability to be an engineer.'"

She felt it was important to share part of her real journey. She told the students about herself, how she grew up on a farm, went to college and got two engineering degrees — bachelor's and master's degree, met and fell in love, got married and started her career.

"And then, 18-months later, I had my first set of twins," she said. "Then, 18-months after that, I had my second set of twins. I continued working part-time as a mother of four. When my youngest twins were middle school age, I went back to school to get my doctorate degree. It was hard, but we are all capable of doing hard things."

Demographically, the ethnic population in Edinburg is nearly 88 percent Hispanic. The event consisted of nearly 800 high school students on day one, and about 500 middle school students on day two.

Special guests of the 2023 Manufacturing Expo and Exhibition at University of Texas Rio Grande Valley (UTRGV) in Edinburg give the UTRGV "V's Up," a single-hand sign representing the Vaqueros community, on Feb. 16, 2023. It is the same "v" sign used in American Sign Language, and according to university staff, represents the true spirit of the Vaqueros students, staff, faculty and the greater community.

From left: Dr. Can Saygin, Sr., UTRGV Vice President of Research; Dr. Archie L. Holmes Jr., Executive Vice Chancellor for Academic Affairs, UT system; Dr. Guy Bailey, UTRGV President; Honorable Heidi Shyu, Under Secretary of Defense for Research and Engineering; Dr. Ala Qubbaj, UTRGV Dean for the College of Engineering and Computer Science; Dr. Cindy Waters, Carderock SSTM for Advanced Manufacturing and Materials; Dr. James Li, Director of I-DREAM4D; and Louie Lopez, DoD STEM, Director. (Photo provided by Dr. Cynthia Waters)

"One of the factors we know for sure that motivates students to study engineering or manufacturing is that they can see themselves in that profession, that they have role models in those positions that look like them," Waters said.

Vargas expounded on that idea.

"Many of these students are looking for an opportunity and someone to believe in," he said. "They need mentors that look like them and have experienced the same struggles that they are encountering. The Hispanic culture prides itself with a strong work ethic, and this attribute enables them to work hard to achieve their goals."

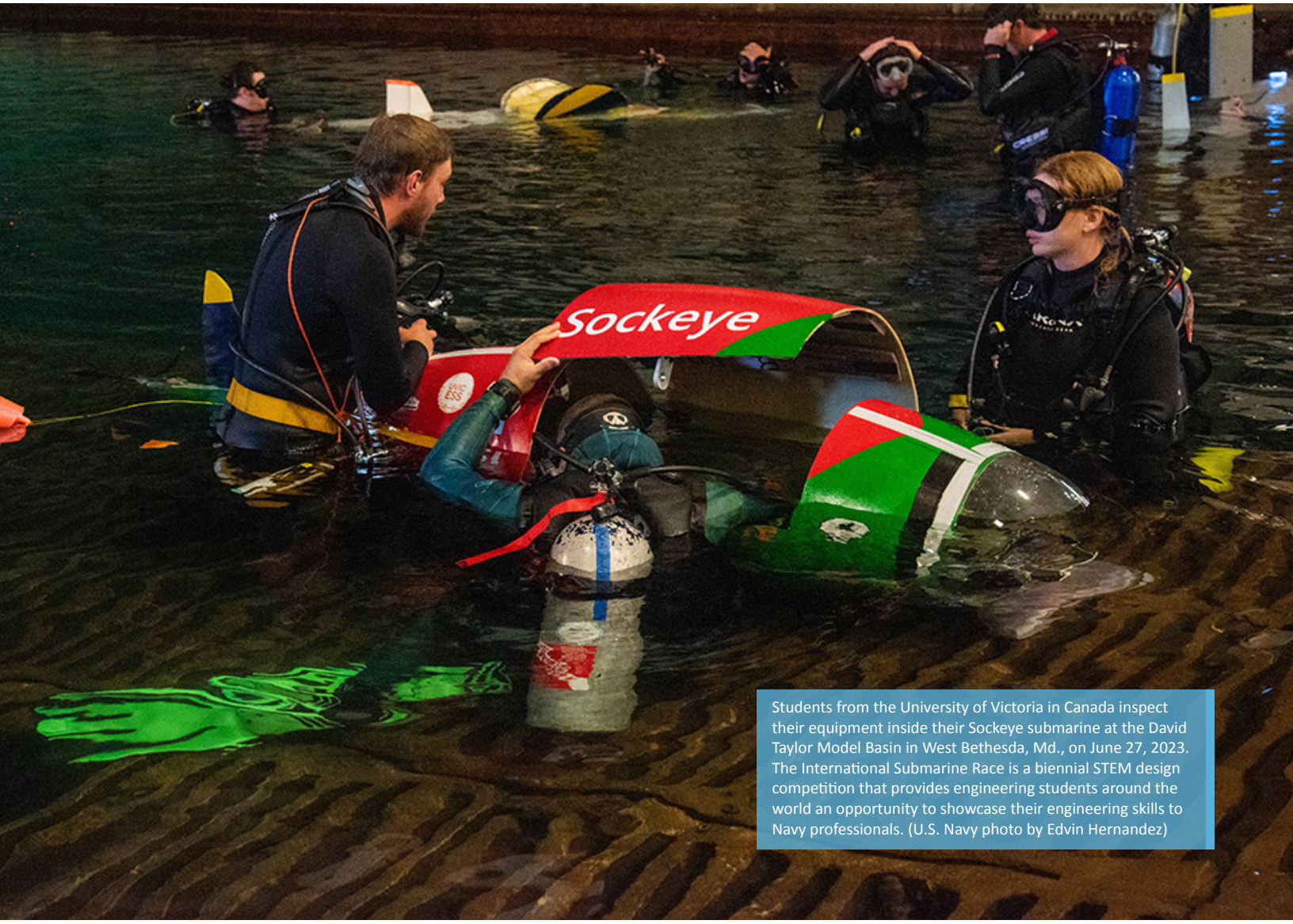
During the event, Vargas had a booth and acted as a recruiter for Carderock and collected resumes. He spoke with several mechanical engineering students, which he recommended for on-site interviews.

"You could feel the energy in the auditorium, and as I looked into the audience, I could see the next generation of engineers and scientists," Vargas said.

Carderock's Dr. Abel Vargas (center) is presented with a certificate of appreciation for his participation in the 2023 Manufacturing Expo from Dr. James Li (left), the Director of I-DREAM4D and Chair of the Manufacturing and Industrial Engineering, and Dr. Ala Qubbaj (right), University of Texas Rio Grande Valley Dean for the College of Engineering and Computer Science, in Edinburg, Texas, from Feb. 16-17, 2023. (Photo provided by Dr. Abel Vargas)

Carderock Hosts 17th International Submarine Race

By Edvin Hernandez, NSWC Carderock Division Public Affairs



Students from the University of Victoria in Canada inspect their equipment inside their Sockeye submarine at the David Taylor Model Basin in West Bethesda, Md., on June 27, 2023. The International Submarine Race is a biennial STEM design competition that provides engineering students around the world an opportunity to showcase their engineering skills to Navy professionals. (U.S. Navy photo by Edvin Hernandez)

Naval Surface Warfare Center, Carderock Division welcomed the return of the International Submarine Race (ISR) to its David Taylor Model Basin in West Bethesda, Maryland, June 26-30, for the first time since before the COVID-19 Pandemic.

Teams from across the United States, Poland, the United Kingdom and Canada arrived at Carderock with their eyes set on one mission: be the fastest human-powered submarine in the competition.

The biennial science, technology, engineering and mathematics (STEM) event allows students to display their talents and problem-solving capabilities in submarine and hull design challenges. All sorts of underwater submarine designs are showcased at the races. Take, for example, Quinn Barone. The 14-year-old Maryland native and his family traversed through the course in The Javelin, a homemade sub shaped like a spaceship.

“The inspiration for this model came from the SR-71 black bird and things I have seen in movies,” Barone said. “I was motivated

The Javelin sits on a cart in front of Naval Surface Warfare Center, Carderock Division's David Taylor Model Basin in West Bethesda, Md., on June 26, 2023. Quin Barone, the creator of the submarine, said his hull design was inspired by the Lockheed SR-71 "Blackbird," a long-range, high altitude, Mach 3+ strategic reconnaissance aircraft. (U.S. Navy photo by Edvin Hernandez)

to build this after reading '20,000 Leagues Under the Sea.' I built my model before knowing about the races – I initially was going to put an electric trolling motor on it and use it as a sports sub to run around Key West in Florida. We made at least one run and it felt like a miracle – it was really exciting."

For Barone, reaching the races was a step in the right direction in learning what is required to be a naval engineer.

"In the future, I plan to go to a marine engineering school," he said. "I have a passion for this and I'm happy to be competing here. We were so close to completing the course a couple times, but came short. It felt great to finally reach the finish line and see our work pay off."

Carderock, which is home to some of the most trusted technical experts within the Department of Defense (DoD), has recruited a portion of its employees from this event.

"Early on in my college degree path, I didn't quite know what I was going to do when I graduated," Carderock's STEM and Outreach Coordinator Charlotte George said. "I spoke to my advisor and asked him what I could do to learn more about what a real engineer actually does. He suggested I work with the school's human-powered submarine club – so I did and joined the team four months before the races in 2009. I jumped into hull development, systems-of-systems development and learning how everything worked together. When I was here as a competitor, a Carderock employee showed me the facilities and what they do here, and I made the connection of how what I learned in class applies to real-world problems. So, I came back as a part of the Naval Research Enterprise Internship Program (NREIP) and eventually became a Carderock employee."

As one of the oldest DoD STEM competitions, ISR advances the opportunities students have with hands-on application in the world of naval engineering. Events like these expose aspiring engineers to careers with the U.S. Navy and DoD enterprise. Carderock internship programs like the Science Engineering Apprenticeship Program (SEAP) and the NREIP program – both of which are ONR sponsored programs – allow students to gain invaluable experience working at a federal research and development center. It also provides the Navy a sneak peek of its future generation of technical experts.

"This week we hosted several hundred high school and college students," Carderock's Commanding Officer Capt. Matthew Tardy said. "We provided them the opportunity to utilize our basin where we hope to inspire them to become the next generation of naval engineers and subject matter experts for the Navy. It's great to see their excitement, progress and achievements at this year's races."

While most of the teams received some kind of award, the Foundation of Underwater Research and Education President Charlie Behrle announced OMER 12, from L'ecole De Technologie Superieure in Canada, as the winner of the overall performance award of the ISR competition on June 30. Team Orca, from the University of Washington, were runners up in this year's competition.

Virginia Tech students enter the water with their human-powered submarine to compete in the International Submarine Race at Naval Surface Warfare Center, Carderock Division in West Bethesda, Md., on June 27, 2023. This biennial STEM design competition provides valuable educational experiences to the best and brightest engineering and science students around the world. (U.S. Navy photo by Edvin Hernandez)

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