NAVAL SURFACE WARFARE CENTER
CRANE DIVISION

NAVSEA
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2022 YEAR IN REVIEW

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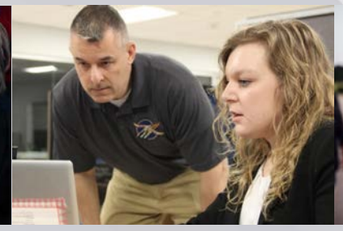



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NSWC CRANE LEADERSHIP

CAPT Duncan McKay
COMMANDING OFFICER

Dr. Angela Lewis, SES
TECHNICAL DIRECTOR

OUR MISSION

Deliver innovative solutions and readiness to the Nation and its Warfighters through application of our Technical Capabilities. Advance all-domain system of systems within the Mission Area of Electronic Warfare, Expeditionary Warfare, and Strategic Missions. Conduct science and technology, research, development, test and evalutation, aquisition and in-service engineering across the Defense life-cycles. Execute other responsibilities as assigned by the Commander, Naval Surface Warfare Center.

REFLECTION & PRIORITIES

We are pleased to present Naval Surface Warfare Center, Crane Division's (NSWC Crane) 2022 Annual Year in Review. This document highlights the accomplishments, challenges, and initiatives undertaken by NSWC Crane over the past year in alignment with the National Defense Strategy (NDS).

The NDS is a critical document that guides the United States' military priorities and strategies. As outlined in the NDS, the priorities of conflict and threats have shifted in the global environment, from the desert to the Pacific. Our National Defense must be able to counter the multi-domain threat and deter aggression posed from the Indo-Pacific region. More than ever, this reinforces the need of a Joint Force that is even more lethal, resilient, agile, and responsive.

One key aspect of this strategy is the need to maintain a technological edge over potential adversaries, particularly in the areas of trusted and assured microelectronics, hypersonics, and integrated mission operations. NSWC Crane plays a crucial role in developing, testing, and evaluating cutting-edge technologies that help the U.S. Navy maintain its military dominance. NSWC Crane's mission is to deliver innovative solutions and readiness to the Nation and its Warfighters through National Technical Leadership in Expeditionary Warfare, Electronic Warfare, and Strategic Missions. The research and development that takes place at NSWC Crane is critical to the continued strength and effectiveness of the military.

EXPEDITIONARY WARFARE: The Expeditionary force is critical and integral to success as an integrated Joint Force and therefore to the deterrence of threats across the globe. NSWC Crane is well positioned to support this integration and interoperability as we provide the largest concentrated technical leadership and expertise to the Expeditionary Mission and Forces across the Undersea and Surface Warfare Centers. This expertise is focused on systems solutions for all domains that enhance detection, decision-making, maneuver, and kinetic and non-kinetic engagement capabilities for the expeditionary warfighter through open architecture designs to integrate multi-platform advanced sensors and specialized weapons systems.

ELECTRONIC WARFARE: NSWC Crane houses the DoD's largest concentration of Electronic Warfare (EW) expertise. With a strong history of full life cycle solutions as well as innovative capabilities, we are well positioned to lead the charges delineated in the National Defense Strategy: strengthen integrated deterrence, campaign forward, and build enduring warfighting advantages. As our warfighting becomes more integrated and complex, our strategies must encompass multi-domain, multi-service, and multi-spectral solutions in order to dominate and provide the electromagnetic spectrum advantage.

STRATEGIC MISSIONS: With a strong heritage that includes more than 60 years supporting Strategic Systems Programs (SSP), more than 40 years supporting the Air Force, and continuoulsy playing a vital role with nuclear modernization programs and trusted microelectronics, NSWC Crane is indispensable to the Nuclear Triad. Strategic Missions encompasses the full range of Department of Defense activities that alter an adversary's will and ability to attack the United States and its interests. In addition, Strategic Missions leadership in Hypersonics technology development and deployment will provide a capable warfighting deterrent against aggression and attacks towards the United States and its allies. NSWC Crane is leading efforts on several Hypersonics activities including development of an Underwater Launch Test capability.

Please enjoy this Year in Review and learning about how NSWC Crane's skilled professionals put technical solutions directly into the hands of the Warfighter, ensuring safer missions and providing the advantage over our adversaries.

CAPT Duncan McKay
COMMANDING OFFICER

DR. Angela Lewis, SES
TECHNICAL DIRECTOR

INNOVATION & ECOSYSTEM ENGAGEMENT

NSWC Crane Annual Buy Indiana Expo to provide businesses opportunity to showcase capabilities

March 2022

CRANE, Ind. –
Naval Surface Warfare Center, Crane Division (NSWC Crane) is holding its 24th Annual Buy Indiana Expo on Tuesday, April 5 from 9 AM to 3 PM EDT in French Lick, Indiana. The 2022 Buy Indiana event is hosted by the Bedford Area Chamber of Commerce and will take place at the French Lick Springs Resort.

Matt Burkett, the Small Business Deputy Director for Small Business Programs at NSWC Crane, says this event is a way to maximize benefits for both businesses across the country and NSWC Crane. For employees, the event provides a way to conduct efficient market research.

"For NSWC Crane and its employees, this event is the main face-to-face business development opportunity of the year to conduct market research of dozens of companies in one day. They get to see what the business landscape looks like locally and regionally and can put a face with a name to further relationships. It is a chance to meet the businesses that support Crane's mission. It is also an opportunity to talk about current and future requirements and bring up areas where we can be supported."

Buy Indiana includes small, medium, and large businesses from all over the state, but also from across the Midwest, the South, and East and West Coast. This year, there will also be several workshops to provide avenues and tips so business representatives can work with NSWC Crane. Burkett says there are a few ways businesses can benefit from Buy Indiana.

"Businesses can engage directly with NSWC Crane, and through the workshops learn how and what we buy and the best ways to work with us," says Burkett. "There's also business to business networking opportunities. Small businesses may network with larger businesses—who may be prime contractors—for potential sub-contracting opportunities. Buy Indiana provides businesses the ability to directly engage with companies currently supporting Crane, which for small businesses could take a lot more time and money to do on their own."

The workshops cover topics so businesses aiming to work with NSWC Crane can learn best practices in various aspects of working with the Navy. These workshops will include content from NSWC Crane Contracting personnel, Indiana Procurement Technical Assistance Center (PTAC), a cybersecurity panel from Purdue Manufacturing Extension Partnership (MEP), and NSTXL.

On Monday, April 4th, the Expo includes a Vendor Packet Pick-up, Booth Setup, Golf Outing at the Donald Ross Golf Course, and the Radius Indiana Welcome Reception. ■

NSWC Crane hosts about 500 at Annual Buy Indiana Expo

April 2022

FRENCH LICK, Ind. –Naval Surface Warfare Center, Crane Division (NSWC Crane) held its 24th Annual Buy Indiana Expo on Tuesday, April 5 in French Lick, Indiana, where 150 businesses were represented and about 500 people were in attendance.

The 2022 Buy Indiana event was hosted by the Bedford Area Chamber of Commerce and took place at the French Lick Springs Resort. Buy Indiana was attended by a wide range of NSWC Crane employees and vendors, including new businesses from the Hoosier State as well as businesses from Montana, Michigan, Florida, Texas, Illinois, Ohio, and Alabama.

Business vendors included technology focus areas such as microelectronics and data science. There were software engineers, software developers, cable manufacturers, machine shops, construction companies, engineering service providers and lending institutions also in attendance at Buy Indiana.

Matt Burkett, the Deputy Director for Small Business Programs at NSWC Crane, says the event was a success.

"The 24th Annual Buy Indiana Expo was a great success for NSWC Crane. The engagement between the many business and government entities was exciting to see," says Burkett. "The vendor feedback has been very positive. The Monday night reception was well attended, which is an unofficial measure of success for me. We look forward to seeing how the engagement continues through avenues such as partnerships, collaborations, connections, or newly integrated capabilities for the warfighter." ■

NSWC Crane to expand presence at WestGate Academy

April 2022

ODON, Ind. – Naval Surface Warfare Center Crane (NSWC Crane), a Navy federal laboratory in southern Indiana, has signed an agreement with Purdue Research Foundation to occupy 14,000 square feet of space at WestGate Academy.

The 15-year lease takes effect in June. The space is envisioned to be used for workforce development and other "front door" capabilities, such as the Small Business Office and Technology Transfer Office.

NSWC Crane's mission includes providing acquisition engineering, in-service engineering and technical support for sensors, electronics, electronic warfare and special warfare weapons.

The 64,000-square-foot WestGate Academy is the region hub of innovation and entrepreneurship connecting an ecosystem that spans from West Lafayette to Jasper and Indianapolis to Evansville and beyond. WestGate Academy resides in the WestGate@Crane Technology Park, which is home to 60 tenant companies and their 875 employees.

Dr. Kyle Werner, NSWC Crane deputy technical director, expressed enthusiasm for this first-of-its-kind agreement.

"It is exciting to imagine the possibilities of what this opportunity will bring over the next decade," Werner said. "This innovative partnership will enhance NSWC Crane's workforce development, excellence and readiness for our current and future workforce."

Capt. Duncan McKay, NSWC Crane commanding officer, said the timing could not be better.

"NSWC Crane and its mission is more valued and relevant now than any time in our history," McKay said. "When threats to our nation and global interests increase, so do demands for our products, expertise and services. Partnerships like this make our mission possible."

Jason Salstrom, director of Purdue@WestGate, said it has been a longtime ambition to bring more Navy personnel into the WestGate Academy.

"Proximity and access are critical to creating opportunity and the social capital necessary for an innovation-driven economy. This agreement addresses these key points," Salstrom said. "We are excited to continue to support a vibrant and growing innovation workforce here at the WestGate Academy."

John Mensch, president of WestGate@Crane Authority, said NSWC Crane is a terrific partner for WestGate.

"From additive manufacturing to model-based system engineering to cybersecurity, Crane has the mission and capacity to be part of driving the Indiana economy forward," Mensch said. "WestGate organizations like ours, Techbridge and the Indiana Innovation Institute work in complementary fashion to grow the economic impact of the Navy's presence in Indiana."

Other prominent tenants at WestGate Academy include the Indiana Economic Development Corp., Indiana Innovation Institute, Indiana University, Navy Tech Bridge, NSWC Crane STEM and large defense contractors. ■

NSWC Crane recognized throughout NAVSEA for awarding 416M to small businesses nationwide

May 2022

CRANE, Ind. – Naval Surface Warfare Center, Crane Division (NSWC Crane) Small Business Program was recognized by the Naval Sea Systems Command (NAVSEA) Small Business Program (SEA 00K) for "contributions toward the NAVSEA Enterprise outstanding Fiscal Year (FY) 21 small business performance," which included a 35M-dollar increase in small business awards from the previous FY.

The achievement letter from NAVSEA continues, "NAVSEA executed $3.9B in prime small business awards, reflecting a 10.5% increase over FY20 achievements. Under the leadership of your Small Business Deputy, Mr. Matthew Burkett, your Command increased overall small business obligations from $381M in FY20 to $416M in FY21 and successfully achieved assigned goals in all of the small business socio-economic categories." (See Figure 1)

NSWC Crane awarded contracts to businesses in 43 states plus the District of Columbia. From FY17 to FY21, the total awarded amount increased each year. Matt Burkett, the Deputy for Small Business at NSWC Crane, says this achievement was a collaborative effort with the contracting and technical teams at NSWC Crane.

"This is the most we've ever done at NSWC Crane and the first time in seven years we've met all our small business goals," says Burkett. "For the past few years, we've set records. It is kind of amazing. We have been able to be successful due to the buy-in we have from the top, down; Command understands building out the ecosystem is a collective effort. The NSWC Crane contracting team did a lot—the amount of work and how we've found ways to move forward is amazing, and we are still pushing forward. Everyone in our ecosystem has been engaging."

The letter also states small businesses are "key contributors as we modernize our Navy to meet the demands of the maritime environment, today and in the future."

Burkett describes how small businesses impact the Navy's mission in several ways. He says NSWC Crane leverages their unique expertise in supply/product-based and service-based business.

"Supply and service businesses play a huge part in mission support," says Burkett. "On the product or supply side of the house, NSWC Crane supports a lot of 'legacy' systems, which many larger businesses are moving away from. Small businesses play a role in creating hard-to-procure parts, which are parts that may need reverse engineering or machining. On the service side, those businesses provide expertise in critical technology areas such as cyber, information technology, and machine learning as well as expertise of software engineers and developers."

In FY21, remote work was a factor in conducting small business engagement.

"Remote work is great, but there are a lot of challenges," says Burkett. "Most or all business was done remotely and business development can be challenging. I try and be as engaging as I can and do as much outreach as I can by traveling as well as setting up virtual Teams meetings—we overcame these challenges and met or exceeded all of our goals."

The Tri-Service Maritime Strategy states that maintaining the advantage at sea while the Navy faces rapidly evolving threats requires modernization. This includes "new platforms, new thinking, and new technologies that enhance distributed naval operations, and develop our people and culture to meet the challenges of a complex security environment," as stated in the strategy document.

In order to maintain the Navy's advantage at sea, Burkett says the expertise of small businesses impact Crane's needs within its mission areas of Expeditionary Warfare, Strategic Missions, and Electronic Warfare—which serve a crucial role in maintaining the Navy's advantage at sea.

"Small businesses provide everything we need to fulfill the mission," says Burkett. "They provide expertise across all mission sets and touch what we're doing across

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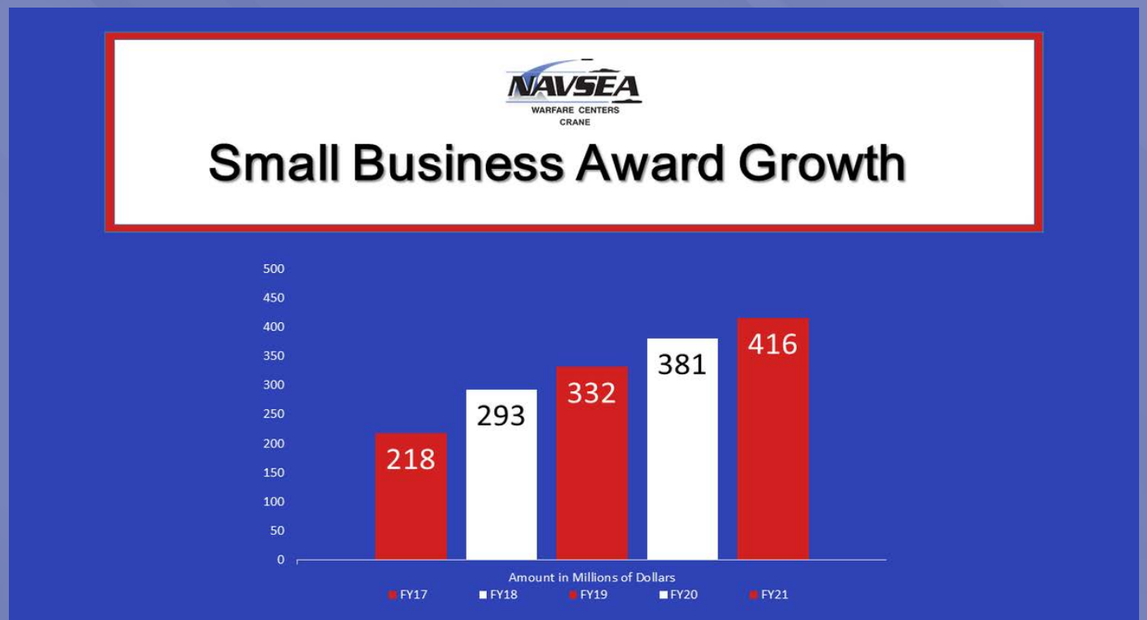

Figure 1: Bar graph showing NSWC Crane Small Business Award growth over several fiscal years. Red and white bars across the x-axis represent different fiscal years, while the y-axis numbers represent award amount in millions of dollars.

command. There is a wide reach as far as capabilities and performance we are getting from small businesses, including successful engagement through acquisition tools such as Other Transaction Authorities (OTAs). Small Businesses include non-traditionals and innovators, who are agile and can move faster than larger businesses."

The Department of Defense defines 'non-traditional' businesses differently than traditional small businesses, where non-traditional businesses may be much smaller and have not worked with the government before.

Burkett says future success relies on strong relationships within the innovation ecosystem, including government partners within the state.

"We've leaned on our State partners such as the Indiana Economic Development Corporation (IEDC) and Indiana Procurement Technical Assistance Center (PTAC)," says Burkett. "With the Governor's defense initiatives and NSWC Crane being the only federal laboratory in Indiana, engagement is critical—especially to meet future Small Business Program goals."

Burkett says there is still room to grow to meet mission needs.

"This achievement highlights the good work being done throughout the ecosystem—it all ties in together to meet the mission. Many people, partners, and organizations laid groundwork from the previous few years to get where we are now. We will continue to have conversations, engage the ecosystem, and find opportunities for small businesses and how they can support the Navy and our Nation."

To learn more about how you may do business with NSWC Crane, you can reach out to Burkett: matthew.j.burkett2.civ@us.navy.mil ■

NSWC Crane hosts biannual Joint Service Night Vision IPT Meeting at WestGate

July 2022

CRANE, Ind. – Naval Surface Warfare Center, Crane Division (NSWC Crane) hosted the 7th Joint Service Night Vision Integrated Process Team (IPT) Meeting. More than 180 people from government and industry attended the biannual event that took place on June 28 and 29 at WestGate Academy in Odon, Indiana.

The Joint Service Night Vision IPT Meeting is facilitated by different organizations within the three service branches: Air Force, Army, and Navy. The goal of the meeting is to discuss developments in night vision (NV) technology and seek new ways to collaborate and partner to support the warfighter.

Dr. Timothy Morgan, a Scientist at NSWC Crane, assisted in organizing the event. Dr. Morgan says many new connections were made between program offices and industry stakeholders that will benefit the warfighter.

"The highlight of the event by far was the night time demos," says Dr. Morgan. "More than 20 vendors showcased a multitude of different devices that educated the art of possible to government stakeholders. Being able to count the number of antlers on a buck at the back of a field from a NV scope was just amazing. The number of folks, more than 100, coming out to engage with industry all the way up until midnight just showed the enthusiasm and importance of this technology in supporting our warfighters."

NSWC Crane is a national technical leader in Expeditionary Warfare as well as fifty years of NV expertise. Dr. Morgan says this expertise is important to meet the needs of the warfighter today.

"Warfighter and mission needs are diverse," says Dr. Morgan. "From pilots to snipers to sailors, all need night vision to accomplish a mission. Accelerating the development of new NV technology is essential to deliver this diverse capability. Collaboration across military, government, and industry is essential to accelerate this progress, which is why Crane hosted this NV IPT.

The event features government presentations and industry's latest technology. Government attendees participated from various organizations and commands: Air Force Special Operations Command (AFSOC), Air Force Research Laboratory (AFRL), Robins Air Force Base (AFB), Army Special Operations Command (ASOC), Naval Air Systems Command (NAVAIR), Naval Sea Systems Command (NAVSEA), Naval Undersea Warfare Center (NUWC), and Defense Technology Security Administration (DTSA). ■

Pictured Left: Dr. Jason Ostanek, Assistant Professor at Purdue Temporary Faculty at NSWC Crane

Pictured Right: Dr. Kyle Crompton, a Chief Engineer at NSWC Crane

Octtober 2022

CRANE, Ind. –
Naval Surface Warfare Center, Crane Division (NSWC Crane) continues its collaboration with Purdue University researchers to establish laboratory testing capability, enhance performance, and improve safety of lithium-ion batteries. Since a Cooperative Research and Development Agreement (CRADA) with Purdue was signed in 2018, the Navy and academic teams have launched a lab for testing, conducted unique research, developed modeling and simulation (M&S) techniques, and published nine academic papers on their efforts.

Dr. Kyle Crompton, a Chief Engineer at NSWC Crane, has led this effort since 2017 to build a lithium-ion experimental cell fabrication and testing lab at Crane and collaborate with Purdue for research. Dr. Crompton was a Department of Defense (DoD) Science, Mathematics, and Research for Transformation (SMART) Scholar who leveraged internal NSWC Crane Naval Innovative Science and Engineering (NISE) funding for several years to form this capability.

"It has been exciting setting up the lab and establishing the relationship with Purdue," says Dr. Crompton. "We've had to take some risks, focus on the long-term vision, and pursue the science. The ultimate goal is to produce new knowledge and new information—where people can grab it and grow from it whether they are in the military, academia, or industry. Not only have we published research, but we have data sets that can be leveraged in a public repository."

Lithium-ion batteries power everyday technologies, from personal electronic devices like cell phones and electric toothbrushes—to larger technologies such as electric vehicles (EVs), large power grid sources, and backup batteries for buildings and facilities. Lithium-ion batteries are popular mobile energy resources due to being lightweight, high energy density, and rechargeable.

NSWC Crane has more than 60 years of history of supporting energy storage systems. For instance, the Airborne and Space Energy Systems Branch, where Dr. Crompton was previously the manager, has capabilities such as system engineering and test and evaluation for aircraft, satellite, and spacecraft energy storage. This includes battery engineering for military systems like fighter jets and missiles.

The U.S. Navy requires rigorous testing of these batteries before their use on DoD systems to ensure full functionality and safety. This rigorous testing process for high-powered lithium-ion batteries can be costly and hazardous.

"Lithium-ion batteries have higher energy density, can store more energy per mass of the battery with up to five times storage capability than legacy batteries—it's lighter and smaller which is a big advantage," says Dr. Crompton. "However, with more energy comes a safety challenge."

Dr. Crompton says thermal runaway is the main safety concern of lithium-ion batteries.

"It can happen when lithium-ion batteries are abused, and cause a rapid fire or explosion," says Dr. Crompton. "Mitigation of this safety concern is currently based on extensive testing and containment engineering. Our idea has been to develop and validate a model that can take the place of some testing and therefore, save time and cost. Through the CRADA with Purdue, we've made substantial progress building a detailed 3D model that can simulate thermal runaway of lithium-ion batteries. This is has been a lofty goal, with a lot more research and development still needed. In about 4 years' time though, we have made a lot of progress."

He says Purdue and NSWC Crane have complementary capabilities for this experimentation and simulation-based research.

"The collaboration has been mutually beneficial; Purdue has modeling and theory expertise and NSWC Crane has unique laboratory testing capability," says Dr. Crompton.

Dr. Jason Ostanek, an assistant professor at Purdue University and temporary faculty member at NSWC Crane, leads the collaborative research from Purdue's perspective. He works in the Applied Thermo-Fluids Laboratory with students on a wide variety of projects. Prior to his work at Purdue, Dr. Ostanek was an employee at NSWC Philadelphia Division for several years. He says individual battery cells, when operated within their specified parameters, are not likely to catch fire.

"The reputation of the lithium ion battery is that they catch fire," says Dr. Ostanek. "In reality, the failure rate of individual cells is one in tens of millions. Batteries for Navy platforms, like ships, are much larger, consist of thousands of individual cells connected to one another. In these larger systems, the chances of failure increase, first because there are more points of failure, but second because it is more difficult to maintain every individual battery cell within its specified operating parameters. It is standard process that these large battery systems have to go through a certification process before they are fielded. Only after a battery passes this process can it be used in the fleet; that process is extremely costly, and is time consuming. For instance, if you were to certify a cell phone battery—testing would be quick, easy, and if the battery was destroyed in testing it's not a big deal. That's where this project comes into play."

Dr. Ostanek says the Purdue team is modeling the physics of battery failures.

"There's a lot of research and data available on single cell batteries that we can check our modeling against—but there's far less data available when you have multiple battery cells similar to what the Navy uses,—," says Dr. Ostanek. "There are many variables and it is much more complicated. The computer simulation needs a lot of inputs: battery geometry, dimensions, arrangement of different materials, and amount of heat the battery creates in a failure."

Dr. Ostanek says there are several challenges to this effort that provides valuable research output.

"Battery failures come with messy thermophysical processes that result in a lot of variability in the outcome of a failure—you could experiment ten times and get a spectrum of answers," says Dr. Ostanek. "It takes time to develop theory, models, interpret results, program and make it run quickly. We're modeling gas generation, venting, and combustion of those gases, which nobody has done before with battery modules. With these advances, we're closer to capturing the variability observed in experimental testing. If we continue to build capability, capture the key physical process, then our models will have greater predictive capability and may someday help supplement the certification process."

Dr. Crompton says these research efforts feed into the knowledge base for lithium-ion battery performance and safety.

"Our basic and applied research can help get future batteries safely and reliably to DoD platforms safely," says Dr. Crompton. "It feeds into providing general capability, reliability, and improved workforce knowledge level. Going forward we want to continue developing the general modeling capability, but are also start to pull value from the models developed so far by using them to solve problems from narrower, more specific aspects of lithium-ion battery safety. ■

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NSWC Crane Intellectual Property serves as foundation for startups in regional pitch competition

July 2022

CRANE, Ind. –
Naval Surface Warfare Center, Crane Division (NSWC Crane) Intellectual Property (IP) was used by entrepreneurs in Radius Indiana's third annual Crane IP Defense Innovation Pitch Competition on Tuesday, June 28, 2022. Five teams competed for three positions and included cash prizes totaling $12,000 dollars.

Annie Bullock, NSWC Crane Technology Transfer Director (acting), says the event was exciting to see in the region.

"This year's Pitch Competition was an impressive demonstration by local entrepreneurs and small businesses displaying how they could use NSWC Crane intellectual property! We are so excited to have the opportunity to work with these teams, build relationships between our lab and industry, and to help foster innovation and economic growth in the Indiana Uplands. The teams who participated are continuing to work with our scientists and engineers to refine their ideas and build partnerships for collaboration," says Bullock.

The Crane IP Defense Innovation Pitch Competition was organized through a collaborative effort of Radius Indiana Economic Development, NSWC Crane, Indiana Innovation Institute (IN3), The Dimension Mill, Indiana Small Business Development Center (ISBDC), and Elevate Ventures. Entrepreneurs, inventors, and other innovators pitched their business proposals to Indiana defense and economic development industry leaders during the Crane IP Pitch Competition. NSWC Crane's Rapid Response Licensing Program, which started as a response to COVID-19, is offered for the public to create business activity and commercialization. The pitch competition was based on the Rapid Response Licensing Program and was free for participants.

Three of the five participating teams came from the PROPELS Accelerator, one team is an NSIN Foundry Participant, and the other team was a regional small business and NSIN Foundry alum. The PROPELS Accelerator is a six week program that started this April to help entrepreneurs through the startup development process and was hosted by The Mill. At the end of the PROPELS Accelerator, participants were encouraged to pitch at the Crane IP Defense Innovation Pitch Competition. ■

WINNING TEAMS

1st place:

$6,000 PRIZE

Kupros, from of Loogootee, Indiana. Chief Executive Officer Ian Ramsdell presented.

2nd place:

$4,000 PRIZE

Blazing Audio, an NSIN Foundry team with David Charlot presented.

3rd place:

$2,000 PRIZE

Hubert Goodman, a PROPELS Accelerator participant from Fishers, Indiana.

Learn more about NSWC Crane's complete IP portfolio at www.techlinkcenter.org

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AWARDS

NSWC Crane department director awarded for leadership in Expeditionary Warfare

January 2022

CRANE, Ind. –
A Naval Surface Warfare Center, Crane Division (NSWC Crane) Department Director was awarded the Department of the Navy (DoN) Meritorious Civilian Service Award (MCSA), which is the third highest award a Navy civilian can receive.

Patricia Herndon, the Department Director for Special Warfare and Expeditionary Systems Department at NSWC Crane, received the MCSA for her "outstanding performance" in her Department leadership role from July 2015 to August 2021.

Herndon, who also serves as a Senior Scientist & Technical Manager (SSTM), says the award represents the efforts of many employees.

"It is an honor to be recognized for the significant changes, growth, products delivered, and support we've provided," says Herndon. "It takes a team. I can provide leadership and support, but it's the managers and people on the deck plate that make it work. I can set goals and guidelines, but it's the commitment of the team that has enabled the achievement of the accomplishments over the last six years' work."

The award citation states that Herndon "demonstrated exceptional leadership and technical knowledge in the development of the Department's strategic plan, technical thrust areas, and an increase of 330 percent in the research and development workload."

Herndon says the research and development (R&D) workload increase involved identifying areas the Department could provide improvements to the Warfighter's capabilities.

"The challenge to division managers was to identify areas in Expeditionary that had technical gaps where we could advance warfighter capabilities," says Herndon. "We were looking ahead and trying to modernize the Department of Defense (DoD) for the next generation fight, the great power competition. In order to compete, we had to improve warfighter capability and technology. We looked at ourselves more holistically and what we provide across the kill chain—the Expeditionary warfighter needs capabilities at his fingertips."

The award also states Herndon "achieved a 96 percent customer satisfaction rating", improved from an 80 percent rating when she started in the role in 2015. She "developed the Mission Engineering for Battalion Fires; Counter Unmanned Aerial Systems (CUAS) Marine Air Defense Integrated System; a CUAS Swarm program; High Energy Storage Module for shipboard power requirements; and I-Stalker capabilities. [She] established a new Dual Masters of Science in Defense Engineering and Technology with a concentration in Expeditionary Warfare degree program in partnership with Cranfield University in the United Kingdom and Purdue University in Indiana."

Herndon received her Bachelor's Degree from Purdue University in Chemical Engineering. During college, she participated in the Cooperative Engineering Education Program working at NSWC Crane. Herndon served in many technical and management roles at NSWC Crane, and has also completed an assignment at PEO Integrated Warfare Systems prior to returning to Crane and assuming the Department Director position in 2015.

"The key to great customer success is great communication," says Herndon. "You have to be lock step with the customer and ensure they know the risks. During my time as a program manager, I learned what PMs were looking for—as Department Director I can help our team understand what the customer is looking for and understand their challenges."

The AN/SAY-3 Sensor System, or I-Stalker program, is a critical situational awareness system for Navy ships. It provides adds clarity in observation and identification of contacts or other maritime features on the visual horizon and elimination of blind spots.

The Naval Innovative Science and Engineering (NISE) 219 program provides funding for Basic & Applied Research, Technology Transition, Workforce Development, and Laboratory Revitalization within the Department of Defense (DoD) laboratories to grow internal technical capabilities of the workforce and build critical infrastructure. Herndon says I-Stalker, which replaced an older technology for the fleet, began as an R&D project.

"It started as NISE 219 funding, a multiple sensor system for shipboard situational awareness," says Herndon. "The fleet liked it; it wasn't a program of record. Aircraft carrier Commanders realized the need for 360 degree situational awareness—the I-Stalker system started as a prototype to enhance navigation and identify threats, and now it is an official program of record."

In 2019, the Dual Master's Degree in Defense Engineering and Technology with a concentration in Expeditionary Warfare was established by Purdue University and Cranfield University, a university based from the United Kingdom. This tailored degree program was a unique approach to a workforce development need to train highly technical and specialized skills to expeditionary employees.

"The program is able to increase the knowledge of the workforce that is applicable to the type of work they provide the warfighter," says Herndon. "Typically, a student wouldn't work on defense-related technology in college. This program provides that applicable experience. It also is a nice way to get a technically rigorous degree while working full-time, as the program fits the needs of employees' schedules."

Herndon explains that new programs are necessary to meet evolving needs of threats.

"We've had to do these programs, such as I-Stalker, because the fight is changing," says Herndon. "In order for our forces to be supported, it requires our ingenuity as well as leveraging NISE 219 funds. The next generation of threats requires us to think ahead and leapfrog technology gaps."

Herndon says continuing to adapt is a crucial component to the Expeditionary mission.

"We've looked at our six strategic thrust areas in expeditionary and we've identified the technical skills we need to meet the coming threats and challenges. It's critical that we continue to find ways to be better than our peer adversaries, continue to educate the workforce, and continue to advance in technology areas so the warfighter gets solutions as quickly as possible." ■

NSWC Crane recruiter recognized across DoD as outstanding employee with disability

March 2022

CRANE, Ind. –
A Naval Surface Warfare Center, Crane Division (NSWC Crane) recruiter received a Secretary of Defense (SecDef) Award for Outstanding Department of Defense (DoD) Employees and Service Members with Disabilities. Therron Thomas received the 2021 award as one of five for the Department of the Navy (DoN). The award honors the accomplishments of civilian employees and service members with disabilities who have made significant contributions to the Department's mission and represent core values.

According to the United States Census Bureau 2019 American Community Survey, the disabled population in the U.S. is about 12.7 percent. According to the National Center for Posttraumatic Stress Disorder (PTSD), about six percent of the U.S. population will have PTSD at some point in their lives and about 15 million adults have it during a given year.

Thomas is considered disabled and has PTSD—he has spent much of his time advocating for others who have disabilities. Thomas says, receiving this award is an honor.

"Just because someone has a passion for something and they are doing something outstanding, doesn't mean they realize it," says Thomas. "I don't do this for the recognition. It's humbling, encouraging, and it means I'm doing the right thing. I'm going to keep spending the time and I'll wake up and keep doing it tomorrow. I do it because people deserve the effort. I am in a position as a recruiter to be a voice for others with disabilities and give them exposure to our managers that will reveal their talent with focus on their and abilities and strengths."

He says his experience in the Army further motivates him as a recruiter.

"Certainly, I love working with people, sharing the message of Crane, raising awareness of disabilities, and bringing talented people to Crane," says Thomas. "When I was in Iraq in '06, there was one device that kept us safe as soldiers. I learned Crane produces the same device during my onboarding. Now, as an NSWC Crane recruiter, I know every one of those people I bring into the workforce make a difference."

The award package for Thomas mentions his passion for encouraging and informing people with disabilities for working for the federal government. He works with managers to make sure they have visibility of these candidates from the Workforce Recruitment Program, colleges and universities, affinity groups, veteran groups, and community sources.

Thomas notes the stigma commonly held by the public about people with disabilities.

"When people hear 'disability,' many have already formed an opinion. I have an invisible disability, so people don't look at me and see me as disabled. The stigma is that the minute you reveal you're disabled, people believe you aren't as capable—but that just isn't true. It's my passion to make sure people with disabilities are treated just as people and that they have the same opportunities as anyone else."

Thomas initiated the first NSWC Crane Employee Support Group for veterans, has been a guest speaker on multiple employee panels focused on PTSD and disabilities, and worked with the Equal Employment Opportunity Office and Personnel Security Office to lead a panel to assure employees that PTSD does not result in security clearance loss.

He says there is a stigma with PTSD. Figure 2: Data according to the United States Census Bureau 2019 American Community Survey and National Center for PTSD.

"There's a belief that if they admit they have PTSD, people think there are repercussions. That is simply false; conduct resulting from a disability can have repercussions but not

Figure 2

Figure 1: Therron Thomas with his Secretary of Defense (SecDef.) Award for Outstanding Department of Defense (DoD) Employees and Service Members with Disabilities.This year, Thomas will have served 38 years in the United States Government; he has 30 years of service in the military and almost eight years of service as an NSWC Crane civilian. The last five years he has worked as a recruiter.

simply have the disability. If more people admitted they had it and got help, we'd get the truth out to people it impacted the most. If someone breaks their leg, they would go to a doctor and no one would blame them. If someone has PTSD, they should also go to a doctor."

Thomas also serves the community—his nomination package lists his efforts to lead change to "Indiana State Code resulting in the addition of a parking placard specifically for Hoosier disabled veterans," assisted gathering "monetary donations for a monument and bronze veteran marker for an unmarked grave of a homeless disabled Hoosier veteran," and has "connected with a service animal group called Paws-Ability to bring additional free service animals to those in need."

Thomas says adding the placard for Hoosier disabled veterans started when he saw something similar in a different state.

"I created a flow chart and thought, wouldn't it be cool if we had this," says Thomas. "I put it on Facebook and it received recognition. I sent it to state legislation and two years later—the placard allows the same rights as a disabled license plate."

Thomas says his passion is engrained in what he does personally and professionally.

"People with disabilities are underrepresented—but should be afforded the same opportunities as anyone to share their talents and use their efforts. It's like the old starfish story, where a boy is throwing starfish from the shore back into the ocean. When asked if he can make a difference when there are so many starfish he replied, I just made a difference to that one." ■

NSWC Crane employee recognized for using emerging technologies to manage data, processes across NAVSEA

March 2022

CRANE, Ind. –
A Naval Surface Warfare Center, Crane Division (NSWC Crane) employee was awarded the Department of the Navy (DoN) Meritorious Civilian Service Award (MCSA), which is the third highest award a Navy civilian can receive.

Steven Owens, a Hotline Investigator at NSWC Crane, received the MCSA for his "significant contributions" in his role while on special detail to the Naval Sea Systems Command (NAVSEA) Inspector General (IG) from June 2019 to June 2021.

NSWC Crane is one of the activities within NAVSEA, which is an organization that includes more than 85,000 civilian and military personnel in 34 activities located across the United States and Asia. Owens spent over two years as a part time detail to NAVSEA IG Inspection Program in Washington, D.C. His primary role there was to assist in the redesign and deployment of the new inspection card system used by NAVSEA IG and the commands they inspect.

Owens says this award, which recognizes his efforts during his detail in D.C., is meaningful. He says the impact spans across the entire NAVSEA Enterprise, including all 10 Surface and Undersea Warfare Centers.

"I feel very humble and appreciate the recognition from NAVSEA IG," says Owens. "My goal was to modernize and gain efficiencies in functions, specifically the Inspection process, which can be very taxing sometimes to individual commands. If I can help improve their process, it helps us at the local level. Since the inspection process can be somewhat disruptive to commands, any ideas I can share to minimize the impact to command was my goal. I helped with the standardization of the process so people have a clear understanding of what needs to be provided. It means a lot to be recognized for these contributions."

The NAVSEA IG conducts inspections at its activities every few years to ensure command alignment to programs, make sure commands have controls in place for operation, set compliance areas, support the workforce, and mitigate risks. These inspections focus on the business operations of commands.

The award citation states that Owens' "technical expertise, insight, initiative, and hard work resulted in the NAVSEA IG having an innovative, highly effective, and compliance-oriented Command Inspection Program. [He] integrated emerging technologies with data integrity improvements resulting in a highly capable post-inspection tracking system. Transferring and validating over 1300 records of non-compliance, [he] improved post-inspection work at 32 NAVSEA subordinate commands while creating a metrics dashboard informing all levels of NAVSEA leadership regarding the timely closure of findings."

His involvement in the Command Inspection Program improves the previous system.

"The new system allows for better tracking and correlation of information across the enterprise to understand potential systemic issues in various compliance areas. You can learn what the issues maybe in specific programs through the data being captured on inspection cards. The importance of mining this data and having a way to combine it allows for Inspector leads to see across the enterprise."

Owens started his civil service career in 2010 as a staff employee to the NSWC Crane Human Resource Director. Before working at NSWC Crane, Owens served several years in the military in the U.S. Marine Corps and U.S. Army. Owens spent 12 years working at Toyota, where he learned to be highly efficient and has applied that to his roles at NSWC Crane.

>> *NSWC Crane employee...*

"I had to be an efficiency monster," says Owens. "Every second counts on the production line; anytime you gain efficiencies, over time they all add up to be major efficiency gains. At NSWC Crane, everyone contributes to support the warfighter— we want to work smarter, not harder. This helps us do better and go faster."

The inspection process includes a card system to monitor progress. Owens says his unique background in both the technical aspects and the inspection program itself helped him make significant improvements to this system, which include removing the element of human error.

"Because of my background and understanding of the tool, we used called SharePoint to create the Inspection POAM 2.0 tool," says Owens, "I was able to make the new system have better tracking across the enterprise and various compliance areas. The new system allows users to use data to understand if there are systemic issues or individual command issues. The new system also provides the lead inspector a way to identify and mitigate systemic problems easier. The new system allows data to be viewed visually, all the information gets transferred, and there's less hand-entry data."

To transition to the new system, Owens had to clean a lot of the data. Owens says efficiencies were enhanced with the design of the new system.

"The new system helps with data integrity, with more capabilities from the background of the system that wasn't previously available. We maximized the use of commercially available tools to increase efficiency—charts are automatically generated and updated in the background on Sharepoint. A future goal is to have a business tool in the program that would be used more broadly to put data visualization charts on the main page of the system that are interactive and show real-time data, so inspectors and command can dig into that data and see what is behind the numbers. Before with the old system, it was a much more tedious process to retrieve the information you wanted—and you had to pull out records and do correlation and compilation yourself."

The award citation also states, "Fostering a culture of compliance across the NAVSEA enterprise, [he] created a Users' Guide for inspectors to follow and were solely responsible for the construction of a database enabling NAVSEA IG personnel to maintain the accuracy and data integrity of this inspection card system."

Owens created two different user guides for the new system: one for inspectors and one for administrators. He also completed video tutorials to ease learning of the new system.

"What we've implemented in the 2.0 system provided a much cleaner, user-friendly system not only for the inspectors, but for the commands. The data is more reliable and easier to use. A lot of the built-in features that ensure data integrity and automatically populated based on selections made, where previously it was entered in manually. There's a domino effect where commands gain time back." ■

NSWC Crane engineer recognized in Navy for rapid hypersonics battery development

April 2022

CRANE, Ind. –
A Naval Surface Warfare Center, Crane Division (NSWC Crane) engineer was awarded the Department of the Navy (DoN) Meritorious Civilian Service Award (MCSA), which is the third highest award a Navy civilian can receive.

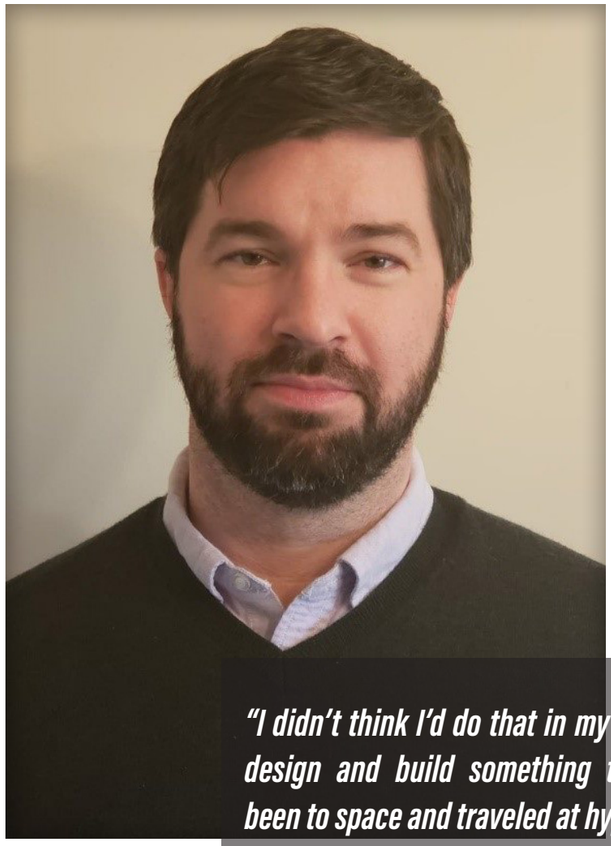
Benjamin Roth, an Engineer at NSWC Crane, received the MCSA for his "outstanding performance as the Navy Hypersonic Program Project Engineer and Power and Energy Systems Division Project Representative" from September of 2016 to June of 2021.

His award citation reads "Roth successfully led a team to redesign, prototype, build, test, and deliver the battery that flew in the first Flight Experiment for the Navy Hypersonic program in an unprecedented five months...As a Subject Matter Expert in missile batteries, [his] dedication, expert leadership, calm focus, and ability to unite the key players was essential to achieving this seemingly impossible goal."

Roth says accomplishing this delivery of battery technology for the first hypersonic test, which successfully launched a few years ago, was challenging.

"This award is a culmination of the team's efforts," says Roth. "As the lead engineer, I managed the design efforts and worked with our industry and Navy partners. I also identified resources, potential pitfalls, and managed risks as we progressed. We were asked to create the primary design; I've been fortunate to find expertise and support at NSWC Crane. It was certainly a challenge to meet these emergent needs as the project continued through COVID-19 restrictions—but they reworked the designs, had really solid work ethic, and were very accommodating and helpful. It took a lot of hard work but we got the job done."

Roth started his career in the manufacturing industry in Indiana, and didn't know about Crane until a friend shared more information.



"I didn't think I'd do that in my career—design and build something that had been to space and traveled at hypersonic speeds." -Benjamin Roth, NSWC Crane

"I applied and started at NSWC Crane 18 years ago and have specialized in power systems technology ever since. I have worked many years in a similar role in standard missile technology with five different missile variants that helped me prepare for this hypersonics initiative."

Roth says that he didn't anticipate building a battery that would be used for hypersonic technology.

"Initially, the battery experts at NSWC Crane had more of an assisting role in development, but our expertise was called on to redesign, prototype, and test the battery," says Roth. "We didn't start that process from ground zero, and it was a challenge to identify the root cause of the issue and develop a design change on schedule. I didn't think I'd do that in my career—design and build something that had been to space and traveled at hypersonic speeds."

Roth and the rest of the NSWC Crane team conducted testing for several years to produce batteries for the missiles. The brief timeline of five months prior to the successful hypersonic test, Roth says, required many hours, weekends, and holidays.

The award citation reads "[He] worked with the Strategic Systems Programs Office to develop an acquisition strategy for a primary reserve battery that met requirements for tactical deployment at less than 1/7th the cost of the battery used for the first and second Flight Experiments."

He says developing the acquisition strategy was also challenging.

"To meet the needs of mission required a rapid prototyping effort; we had to move quickly," says Roth. "A traditional approach would be if the government leveraged the industrial base to design and deliver, but due to the uncertainty in the requirements, we had to be flexible. The new approach meant we found the resources at Crane. We had to develop a brand-new design and be adaptive to changes as we went. Crane became a design agent and identified which requirements to transition to industry."

Hypersonic technology has the capability of flying at speeds greater than five times the speed of sound, or Mach 5, are highly maneuverable, and operate at varying altitudes. Hypersonics are included in the National Defense Strategy as a rapidly advancing and crucial technology that is changing the character of war.

"Hypersonics has been an important investment to the Department of Defense and has several strategic advantages that previous technology didn't," says Roth. "Other countries are competing to develop these same technologies. The success of the Flight Experiments have given the United States a viable path forward in hypersonics." ■

NSWC Crane employee recognized for Maritime Electromagnetic Warfare leadership

April 2022

CRANE, Ind. –
A Naval Surface Warfare Center, Crane Division (NSWC Crane) employee was awarded the Department of the Navy (DoN) Meritorious Civilian Service Award (MCSA), which is the third highest award a Navy civilian can receive.

Doug Crowe, the Maritime Electromagnetic Warfare Systems Division Manager (retired) received the MCSA for his "exemplary leadership" in this role from March 2019 through March 2022.

Crowe says this award represents the great work from the NSWC Crane team to meet the needs of Electromagnetic Warfare (EW) in the Navy.

"The team consists of Maritime EW Systems Division, our partners in contracts, as well as the EW Science and Technology (S&T) Division," says Crowe. "We always stand ready to support the Fleet at all times. We have people available to the Fleet 24/7."

Figure 1: Photograph of Doug CroweCrowe started at NSWC Crane in 1983 and has worked in leadership roles across its mission areas. He says Crane has provided him with many learning opportunities.

"NSWC Crane is a fantastic organization providing many critical technical systems to meet current and future needs of the warfighter," says Crowe. "Our culture and people here are just wonderful. It also provides a very challenging environment and challenges you to grow. You'll see the difference you're making and that's exciting."

The award citation states his "exemplary leadership and mission focus enabled the Fleet Introduction and Implementation of the new Surface Electronic Warfare (EW) Improvement Program AN/SLQ-32(V)6 and AN/SLQ-32(V)7 systems. [He] helped ensure the rapid integration of emerging technologies in Anti-ship Missile Defense and EW Situational Awareness. [He] provided vital

game-changing capabilities for non-kinetic electronic support and electronic attack options to the fleet."

Since the early 2000s, there was an effort to update the need to monitor and control the Electromagnetic Environment (EME), including modernizing the AN/SLQ-32(V) system. The Navy Surface Electronic Warfare Improvement Program (SEWIP) was established as an acquisition program with the intent to incrementally update the Electronic Support (ES) and Electronic Attack Fleet capabilities through a block upgrade program.

The first Block upgrade provided enhanced EW capabilities to ship combat systems including improved anti-ship missile defense, counter targeting, and counter surveillance. The second Block provides enhanced ES capability, through an upgraded ES antenna, ES receiver, and an open combat system interface for the AN/SLQ-32. The third Block upgrade will provide Electronic Attack (EA) capability improvements, and Block 4 is an upgrade planned in the future to upgrade electro-optic and infrared capabilities to the AN/SLQ-32 (V) system.

The AN/SLQ-32, commonly referred to as "Slick 32", is situational awareness technology that is onboard more than two hundred ships all over the world. Versions 1 through 5 of the "Slick-32" are considered 'legacy' technology. Crowe says upgrading to Versions 6 and 7 was a challenging process, with the NSWC Crane team being heavily involved. Learn more about NSWC Crane's support to the AN/SLQ-32 system here. Figure 2: Doug Crowe receiving his MCSA from CAPT McKay in ceremony

"Both were monumental efforts," says Crowe. "There are still more than 100 systems in the Fleet that are legacy systems, and our team works to ensure they are fully mission capable before deployment. The team services the legacy and new versions, providing onboard technical assistance and 24/7 distance support."

The award citation continues: "[He] led the Fleet Support Branch to provide Distance Support to the fleet with over 9,000 phone calls, chats, and emails; 13 On-board Technical Assists; 15 installation System Operation Verification Tests; and five Science and Technology At Sea Test Events resulting in a cost avoidance of 13 million dollars."

The five Science and Technology At Sea Test Events refers to the Live Virtual Constructive (LVC) initiative. LVC is a form of modeling and simulation (M&S) testing for military systems.

"The LVC program allows us to simulate updates virtually instead of having ships and airplanes conduct 'live' testing at sea," says Crowe. "This has been an effort for five or six years and is still ongoing. This initiative has provided us with millions in cost savings."

Crowe says the efforts of the NSWC Crane EW team has allowed significant capability to the Fleet.

"The team has provided huge technology that is important to the Fleet in the EW realm. They made the Fleet more capable in EW. It gives me pride being part of a very passionate, hard-working team. This award recognizes the team and all the hard work that they did." ■

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NSWC Crane engineer travels to Hoosier state to build engineering career

May 2022

CRANE, Ind. – Naval Surface Warfare Center, Crane Division (NSWC Crane) employee Andres Narciso was born in New York, but grew up in Manila, Philippines. He returned to United States to attend Rose-Hulman Institute of Technology (RHIT) due to its small size and reputation for engineering. There, he learned about NSWC Crane.

"Crane is definitely very different from what I'm used to growing up, but I enjoy the new experiences and perspectives," said Narciso.

Narciso works for the Expeditionary Mission Area supporting small arms weapons systems. He said he did not know much about weapons systems when he started, but he has grown to appreciate the field due to the passionate community behind it where people devote their lives to the work.

"My background is in physics, so I was not expecting to work in small arms," said Narciso. "But, I have developed an appreciation of how multi-disciplinary weapons are. Chemistry, materials, manufacturing, kinematics, and the human factor – they all have to go right for the system to work. It leads to very interesting problems, which, to my surprise, occasionally involves my physics background."

He also enjoys the technical rigor of the role, which he sees as one of his keys to success.

"As the subject matter experts, we keep the technical rigor in the process," said Narciso. "Communication is also important. Ultimately, we need to translate the research, development, testing and evaluating (RDT&E) we do into answers that everyone can understand since engineers, operators, and the program office, in effect, speak different languages."

Narciso said his favorite part of the job is new equipment training.

"I get to go to different armories across the country and teach armorers and operators how to use and service the weapons" said Narciso. "I think it's meaningful, and I enjoy interacting with the armorers and operators. It helps me take perspective of what I do."

Armorers do maintenance work on small arms including lubrication, inspection, parts replacement, and kit conversion, among other tasks. Narciso said the relationship with armorers is important because if issues arise, they are likely the first ones to see it.

He said meeting with end users reminds him of the mission behind the work.

"The work can become abstract sometimes, so meeting with users reminds me of the tangible impact we have." ■

Two NSWC Crane employees receive DON Meritorious Civilian Service Awards

July 2022

CRANE, Ind. –
Two Naval Surface Warfare Center, Crane Division (NSWC Crane) employees were recognized with Department of the Navy (DON) Meritorious Civilian Service Awards (MCSA). John LeFevre and John Schofield both received the award, which is the third highest Navy civilian award.

LeFevre received the award for "exceptionally meritorious service" while serving as a deputy branch head for the ordnance management branch at the Office of the Chief of Naval Operations (OPNAV) N4L1. His role involved developing and implementing policy for arms, ammunition and explosives safety and physical security to ensure fleet readiness.

LeFevre's citation says his tenure in role was marked by "unparalleled burst of productivity directly attributed to his leadership, enthusiasm, and team-building skills." LeFevre ensured his branch's continued success after his promotion from the branch by creating in-depth processes for business rules and updating obsolete instructions critical to the integrity of his program.

A letter from VADM R. L. Williamson reads, "By his dynamic direction, keen judgement, and loyal devotion to duty, Mr. LeFevre reflected great credit upon himself and upheld the highest traditions of the United States Naval Service."

LeFevre

Schofield

Schofield is a division chief engineer at NSWC Crane supporting the Electronic Warfare mission area. He acts as the technical lead for the DoD-wide initiative to complete the Radar Supplier Resiliency (RSR) plan. Strengthening the US Radar Industrial Base (RIB) is a Department of Defense (DoD) priority.

Schofield was instrumental in plans to bolster the Radar Industrial Base (RIB) for the United States (U.S.). Strengthening the US RIB is a Department of Defense (DoD) priority, and the Industrial Base Analysis & Sustainment Program (IBAS) Program within the Office of the Deputy Assistant Secretary of Defense for Industrial Policy (IndPol), partnered with NSWC Crane subject matter experts (SMEs) to lead the DoD-wide initiative to complete the Radar Supplier Resiliency (RSR) plan. Schofield has been NSWC Crane's technical lead on the project since 2019.

His award citation reads, "Through his substantial contributions to [NSWC] Crane Division, the Office of the Secretary of Defense, and the United States Navy, Mr. Schofield has distinguished himself within the Electromagnetic Spectrum Operations Community. He is most deserving of the recognition afforded by this award."

Three NSWC Crane employees recognized with DON Civilian Service Achievement Medals

June 2022

Three Naval Surface Warfare Center, Crane Division (NSWC Crane) employees were recognized with Department of the Navy (DON) Civilian Service Achievement Medals (CSAM), which is the fifth highest award a Navy civilian can receive.

Michael Konerman, a technical warrant holder (TWH) at NSWC Crane, received the award for his essential contributions in completing the SEA 05E Explosive Ordnance Engineering FY20 Technical Health Assessment. Konerman provided leadership and guidance as the most experienced member of a team that completed the 196-page technical health assessment over a period of two years. Konerman led the team that provided their expert opinions of the current state, risks for the future, and recommendations for improvements in their respective technical areas.

His award citation reads, "[Konerman] is a key member of the NAVSEA 05E team. As the most experienced TWH in the group, his advice and counsel have been invaluable. He has a keen awareness of the issues that are important to the fleet...He has been instrumental in helping the team achieve better rigor and alignment with technical authority principles."

Mark Schaefer, a division Chief Engineer (CHENG) at NSWC Crane, received the CSAM for "professional achievement and superior performance of his duties" according to his award citation. It states Schaefer provided exceptional technical expertise and supports multiple critical Radar and Electromagnetic Warfare systems.

It reads, "Mr. Schaefer's prioritization of his mission...is evidence of his commitment to our national security, his appreciation for the warfighters in harms' way, and his ideal of selfless service."

NSWC Crane Electronic Technician Randall Raines also received the DON CSAM. Raines has worked for NSWC Crane for more than 37 years, dedicating his entire career to service. During the height of COVID-19, Raines volunteered to lead a night shift group to maintain social distancing and meet schedules. This split schedule enabled the team to meet all schedules with on-time deliveries.

His award citation reads, "Mr. Raines is a dedicated individual with great passion for his work. His commitment to the mission is vital to the organization and to the sailors protecting our freedom." ■

NSWC Crane holds 2022 Command Awards Ceremony

July 2022

CRANE, Ind. –
Naval Surface Warfare Center, Crane Division (NSWC Crane) held its annual Command Awards ceremony on July 28, 2022. More than 30 employees were awarded for their hard work, expertise, and contributions to the federal laboratory's mission.

"We are thrilled to be able to recognize our employees in this meaningful way," said Dr. Angie Lewis (SES), NSWC Crane technical director. "Our team consistently delivers in pursuit of our nation's defense, and this ceremony is an opportunity to show our appreciation."

NSWC Crane conducted a call for nominations, and held selection panels to review and rate nominations to determine the winners of each category. Several other awards were distributed from partner organization Federally Employed Women (FEW).

"NSWC Crane employees are some of the first called when the Navy or the nation has a defense need," said NSWC Crane Commanding Officer CAPT Duncan McKay. "This event is a chance to recognize and share those stories of employees going above and beyond to support the warfighter."

NSWC CRANE AWARDS:

Career Achievement Award
Barbara Strahley
Erika White

Business Excellence Award
Mandy Hearn

Horizon Award
Mitchel Holland
Sarah Schwemmin

Diversity and Inclusion Award
Samantha Koutsares

Collaboration Excellence Award
Amanda Miller
Christian Schuler

Strategic Measures and Targets Award
Electromagnetic Warfare Science and Technology Division

Outstanding Leadership Award
Robert Walker
Sandy Zehr

Outstanding Innovation Award
Human Resources Information Systems Team: Tony Ranard and Brandon Shuld
Igniter Design Team: Jalon Leonard, Daniel Neff, Noah Callahan, Alan Schaefer

Service Excellence Award (Business/Customer Support)
Deborah Leighty

Service Excellence Award (Product Support)
Loren Seal

Service Excellence Award (Scientist/Engineer)
Jonathon Gregory

Service Excellence Award (Supervisor)
Heidi Slaubaugh

Service Excellence Award (Technician)
Joseph Shreves

Career Competency Development Program Award (Level 1)
Kyle Ciarrone

Career Competency Development Program Award (Level 2)
Nicole Talbot

ADDITIONAL AWARDS:

Leader of the Year (FEW)
Sandra Clark

NSWC Crane Business Director Receives DoN Civilian Service Commendation Medal

September 2022

CRANE, Ind. –
Naval Surface Warfare Center, Crane Division's (NSWC Crane) Business Director Dane Speer received the Department of the Navy (DoN) Civilian Service Commendation Medal. The CSCM is the fourth highest civilian award in the Navy. Speer received the award for "professional achievement in his superior performance as Acting Department Head, Acting Deputy Department Head, and Acting Business Director at Naval Surface Warfare Center, Crane Division" according to the citation.

"I am very honored and thankful to be recognized with this medal-recognition," said Speer. "It is truly humbling to work with so many great people who daily make a decisive impact to some of Nation's most technical DoD initiatives."

As Business Director, Speer oversees strategic functions such as workload planning and assessment, Technical Capabilities Health Assessment, strategic and corporate business planning, investment portfolios, hiring plans, and other various metrics. The Offices of Lead Customer Advocate and Strategic Planning, among other programs report to Mr. Speer. He also advises NSWC Crane's Technical Director and Division Commanding Officer on the Command's overall health and alignment to mission.

His citation reads, "His leadership, dedication, preparedness, and mentoring empowered employees in new roles, delivered exceptional products and services...and provided necessary continuity for strategic and tactical operations."

Speer has a Master of Business Administration from Indiana Wesleyan University (1988), Bachelor Degree in Finance and Business Administration from Indiana State University (2012), and a Certificate in Public Management from Indiana University (2012).

NSWC Crane facilities branch manager receives DODEmployee/ Service Member Annual Disability Award

October 14, 2022

CRANE, Ind. –
A Naval Surface Warfare Center, Crane Division (NSWC Crane) acting branch manager and facilities strategic planner received the Department of Defense (DoD) Employee/Service Member Annual Disability Award this year. Engineer Allen Naugle, Lt Col, USAF, BSC (retired) received the award for "...significant contributions to the Department's mission and best demonstrates the core values of their respective DoD Components."

The award "...honors the accomplishments of civilian employees and Service members with disabilities."

"[Receiving this award] shows the value the Department of Defense places on diversity and inclusion, including how we treat disabled persons as an employer," said Naugle. "The DoD should strive to be the leader, since the military force, simply by the nature of its operations, contributes more than our fair share of disabled persons to the total. In my 40 years of association with the DoD, I've seen the department go from mild annoyance through tacit acceptance to our current stance of seeking out disabled persons to come and add value to our mission. We've come a long way, and we've got a long way to go. As a coworker of mine was wont to say, 'We're better today than we were yesterday, and we'll be better tomorrow than we are today.' The truth is I'm just one piece of the overall effort—recognizing me is a surrogate for recognizing the thousands of like-minded military servants who pointedly embrace diversity, inclusion, equity, and belonging."

Naugle has worked at NSWC Crane for four years and has worked a combined 25 years for the federal government either with the military or civilian employment. In his 21 years as an Air Force Officer, Naugle received almost two dozen awards for his service, including six Meritorious Service medals and three Air Force Commendation medals.

His award citation reads, "Mr. Allen Naugle has been a true leader of people, a force for strong ethical behavior, a friend to diversity and inclusion efforts, and a mentor to those junior to him for 21 years as an Air Force Officer, a government civilian employee working in the Navy for three years, and as a member of the private sector workforce as well. In all walks of life he is an exemplary individual."

In his three years at NSWC Crane, Naugle has worked to improve the lives of individuals with disabilities. He is part of his department's Diversity Leadership Council and frequently champions universal design, a design concept which prioritizes infrastructure that works for individuals with disabilities, like wider hallways and handles able to be turned without grip strength.

Naugle also collaborated with the facilities engineering team to develop a state-of-the-art (SOTA) "max-flex" building design concept. The design allows for a single design and site adapting at a much lower cost with minimal changes required in floor plan designs, and allowing for rapidly reconfigurable space to be quickly built and easily maintained no matter the mission. This concept has been mirrored by other warfare centers.

"[I am passionate about universal design and adaptive spaces because] in short, because it matters," said Naugle. "The research to-date is conclusive—diverse teams equal better, higher-value-add outcomes. We also have an obligation to those who need an assist to enable their achievement of equitable outcomes. It pains me to see infrastructure and spaces that either inadvertently exclude, or as I'm sometimes angered to see, designed in an exclusionary manner. The tweaks—and let's be honest, they're tweaks, not major design elements—needed to make a space inclusive and easily adaptable to anyone, are not a significant cost driver. Fortunately, I see a tipping point in our culture coming, to where society will require such design elements. We'll collectively shun spaces that aren't fully inclusive. Like I said, it matters. Period." ■

VISITORS


Brigadier General David L. Odom, USMC Director, Expeditionary Warfare


Mr. John Meyers (SES), Executive Director, Naval Air Warfare Center Training Systems Division (NAWCTSD)

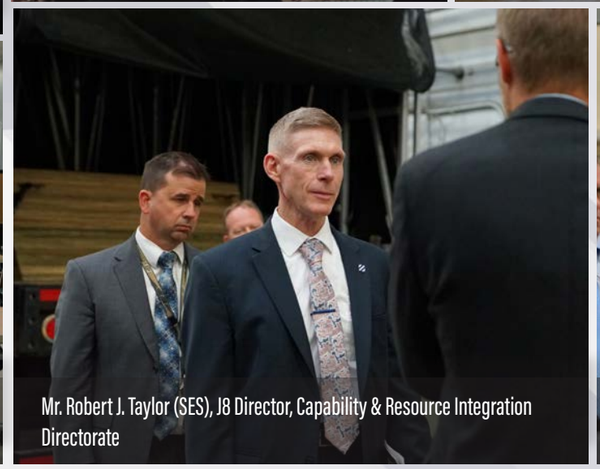

COL Stacy Walser, AFNWC/NX, NXE - Systems Engineering & Integration Division Chief, Hill AFB


Mr. Robert J. Taylor (SES), J8 Director, Capability & Resource Integration Directorate


RDML Kevin Byrne, Commander, NAVSEA Surface and Undersea Warfare Centers


Dr. Jag Pamulapati, Acting Deputy Director for Research, Technology and Laboratories (RT&L)


Dr. Steven G. Wax, Principal Deputy, Director of Defense Research and Engineering for Research and Technology and Director of Joint Hypersonic Transition Office


Mr. Robert J. Taylor (SES), J8 Director, Capability & Resource Integration Directorate


Representative Jim Banks, IN-3rd Congressional District Visit


SUBBEC Ribbon Cutting


NIWC PAC (PMW-120)


Indiana University

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VISITORS


Bill McNavage


Purdue University


Indiana General Assembly


Thor's Hammer


Thor's Hammer

Governor Eric Holcomb

VADM Bill Galinis, Commander, NAVSEA

Westgate Ground Breaking with Governor Eric Holcomb and VADM Bill Galinis


VADM Bill Galinis, Commander, NAVSEA


Governor Eric Holcomb

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INTEGRATED DETERRENCE

"Integrated deterrence entails developing and combining our strengths to maximum effect, by working seamlessly across warfighting domains, theaters, the spectrum of conflict, other instruments of U.S. national power, and our unmatched network of Alliances and partnerships. Integrated deterrence is enabled by combat-credible forces, backstopped by a safe, secure, and effective nuclear deterrent."

– NDS Factsheet, 2022, p. 2

NSWC Crane employee serves public health overseeing $900M portfolio as U.S. expands vaccine and therapeutic manufacturing supply chain

December 2022

CRANE, Ind. – A Naval Surface Warfare Center, Crane Division (NSWC Crane) employee is serving on a detail overseeing a $900 million portfolio to expand the U.S. vaccine and therapeutic manufacturing supply chain. Over the past two years, these investments and partnerships with industry have developed into the construction of new manufacturing facilities across the country to develop future vaccine and therapeutic capabilities.

NSWC Crane employee Heather Baladi started serving on detail for this initiative in 2021 and is now the Program Officer for the vials portfolio—which includes six multi-million dollar vials manufacturing capacity expansion projects. The detail is in support of the U.S. Department of Health and Human Services public health mission. The vials portfolio is one of many of the public health missions aimed at expanding the American vaccine and therapeutic industrial base. All of the projects under this capacity expansion effort total a $2.3 billion economic impact across 20 communities in 12 states.

"I thoroughly enjoy being part of this team and I feel lucky to have a part in this important mission," says Baladi. "I've learned a lot about what it takes to manufacture vaccines and therapeutics. I've also really enjoyed working with people across the country and seeing my direct contributions to this effort."

The Department of Defense's (DoD) Joint Program Executive Office for Chemical, Biological, Radiological and Nuclear Defense (JPEO-CBRND) and the Army Contracting Command were leveraged to assist the Biomedical Advanced Research and Development Authority, which is

an office in the U.S. Department of Health and Human Services (HHS), who were tasked in 2020 to ensure that every COVID-19 vaccine, therapeutic, and test kit were bought, packaged, and delivered to the Nation.

The JPEO-CBRND has a special Joint Assisted Acquisition (JA2) team, established by the May 2021 memorandum of understanding between DoD and HHS, which supports the continued contracting and acquisition expertise needed for the Nation's ongoing mission to fight the coronavirus, including partnerships with the Federal COVID-19 Response interagency team, academia and the American industrial base. The JPEO-CBRND JA2 team is on a mission to support our Nation through innovative contracting at the speed of relevance, securing vaccine doses to meet evolving need, ensuring supply chain resiliency for medical countermeasure development and establishing an enduring pandemic response infrastructure.

Baladi says prior to 2021, the mission was primarily reactionary to provide an immediate response during the earliest waves of the pandemic.

"By 2021, the U.S. needed to move beyond being reactive and pivot to being proactive. The U.S. needed to learn from the pandemic and get prepared to respond to future public health emergencies," says Baladi. "In order to be proactive, the U.S. needed to expand its domestic industrial base. Pre-pandemic, much of the industry that manufactured and packaged vaccines and therapeutics was done overseas.

We learned during the pandemic that global manufacturing and trade was severely constrained. This effort strengthens the domestic industrial base and will reduce future U.S. reliance on foreign manufacturing."

The Navy sent representatives from across the Warfare Centers to assist the JPEO-CBRND with their proactive response effort to expand the industrial base.

Baladi received the Armed Forces Civilian Service Medal for contributions to National COVID-19 response from the JPEO-CBRND for her role in this effort in 2021. She says these efforts are investments in the U.S. economy as well as public health.

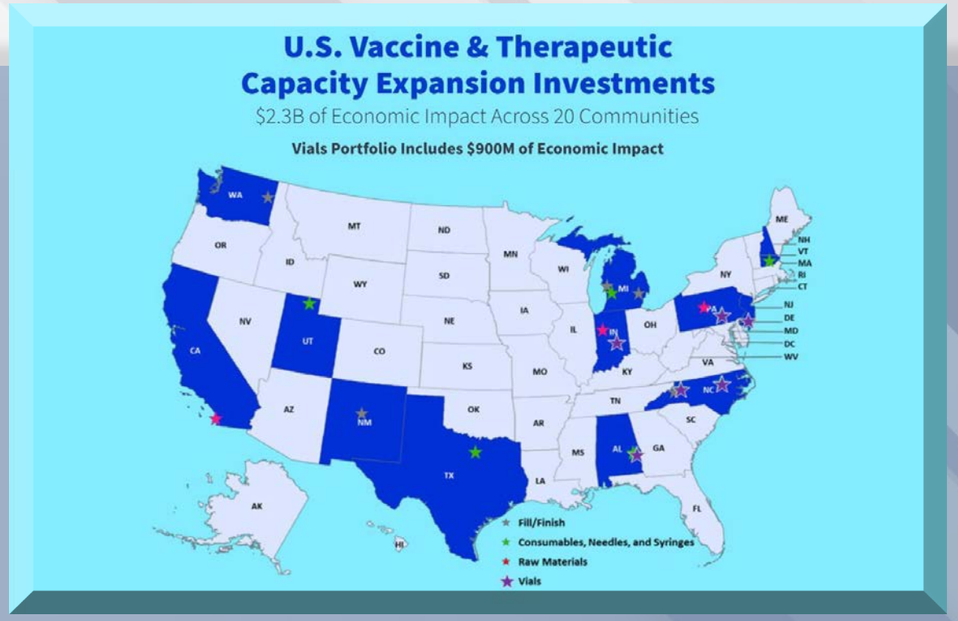
"We're building partnerships and investing in industry to do what they do best," says Baladi. "For instance, one of the construction efforts in my portfolio is being built in Fishers, Indiana. Having these capacities available will allow the U.S. to surge and respond to a future public health emergency. A lot of companies that were manufacturing and packaging critical medications before the pandemic, responded by shifting priorities to make the COVID-19 vaccine and/or therapeutics during the pandemic. With surge capacity in place, companies in the future should be able to do both—not just during pandemic response, but if there is an endemic or other public health emergency. HHS will be able to actuate these agreements and tools that have been put in place as a part of this effort."

Baladi says some may be surprised to know the DoD provided help to a public health mission.

"The DoD was leveraged because it has the structure in place to provide assistance," says Baladi. "Though the Nation's public health is not a typical DoD mission, we are set up in a way to help. These investments will directly benefit public health as well as the local economies where the efforts take place."

Baladi adds this experience has been unique compared to her experience in the DoD.

"I've never been so close to what is happening in the news," says Baladi. "Not everyone gets to see the direct impact of their efforts...I helped negotiate an award and saw it publicized not long after the agreement was signed. It's been a privilege to work on this mission alongside other government agencies to achieve a higher level goal. It is amazing to see what we can accomplish when people come together for a common purpose. I'm honored to have been selected to be part of it." ■



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NSWC Crane leveraged NISE funds to prioritize hypersonic and digital engineering technology

February 2022

CRANE, Ind. –

Naval Surface Warfare Center, Crane Division (NSWC Crane) leveraged Naval Innovative Science & Engineering (NISE) funding to develop critical Department of the Navy (DoN) and Department of Defense (DoD) technology areas of hypersonics and digital engineering. NSWC Crane scientists and engineers (S&Es) showcased their FY21 efforts in the annual NISE End-of-Year Showcase. The combination in-person and virtual event took place at the High Velocity Innovation Center (HiVe) last fall.

The NISE program is one of the largest internal funding sources available for S&Es, fostering creativity and exploring the latest science and technology (S&T).

Brant Ackerman, Director of the NISE Program at NSWC Crane, says the showcase serves as a foundation for technology research and development (R&D) critical to meet the needs of the future warfighter.

"The End-of-Year Showcase gives innovators a platform to show their work," says Ackerman. "Innovators present cutting-edge technology that has the potential to transition into other S&T funding to continue developing the research or transition into warfighter hands."

The NISE program provides a way to conduct innovative basic and applied research, transition technologies into operational use, develop the workforce, recruit and retain highly skilled S&Es, and purchase state-of-the-art labs and equipment. About 13% of NSWC Crane's workforce have participated in NISE projects, including people from each mission area: Expeditionary Warfare, Strategic Missions, and Electronic Warfare.

Ackerman says the showcase is also a time to reflect on how the program has evolved at Crane.

"The NISE program helps Crane focus its research on its strategic thrust areas, allows us to collaborate with researchers from other DoD activities, universities, and private industry, and also demonstrate technology through prototyping and warfighting exercises," says Ackerman. "NISE allows us to improve Navy systems and grow our S&T footprint. NSWC Crane is growing and has one of the largest NISE programs in the NAVSEA Warfare Centers."

Hypersonics

Ackerman says that there were several technology areas researched using NISE funding this year, but two stand out.

"NSWC Crane innovators had four projects in hypersonics and more than 20 related to digital engineering," says Ackerman. "Both of these areas are a high priority for the Navy and areas where Crane is growing its workforce and strategic capabilities."

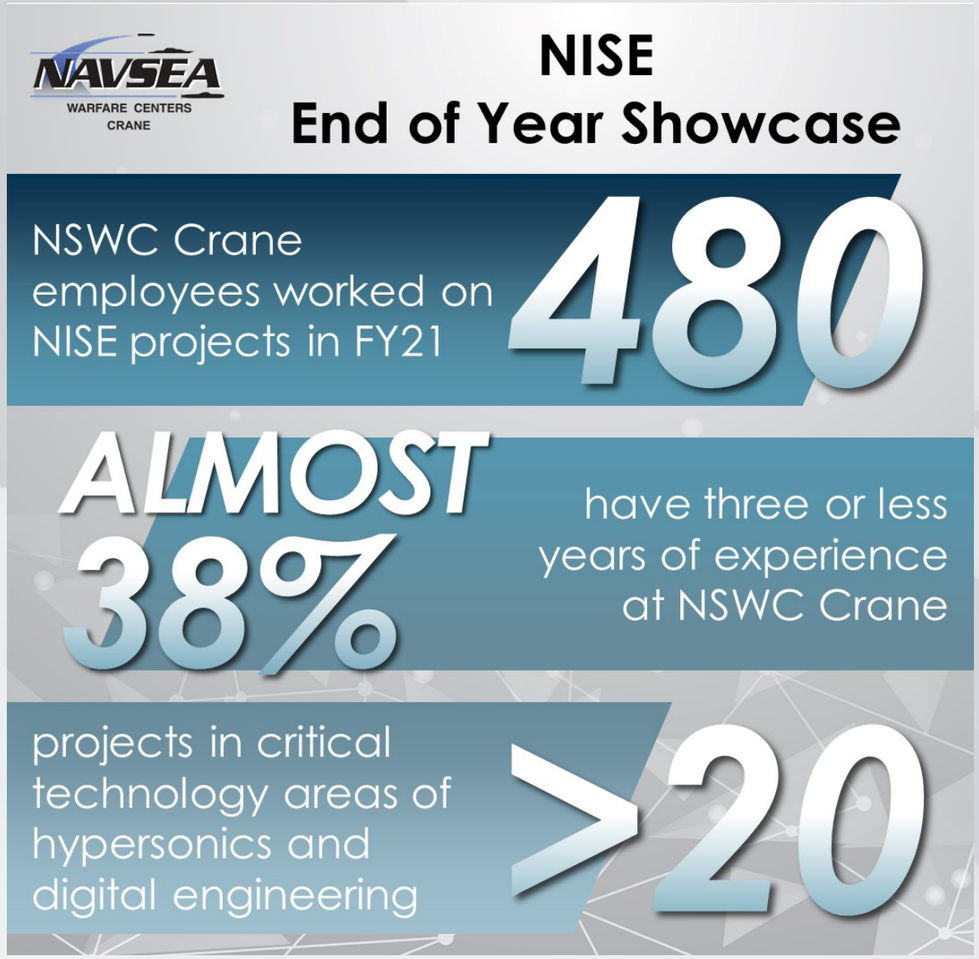
Hypersonic weapons are one of the DoD's highest priorities. NSWC Crane is home to the Joint Hypersonics Transition Office (JHTO) Systems Engineering Field Activity. Through this office, government, industry, and academia can collaborate to further this technology area, with NISE helping to fund participation by NSWC Crane S&Es. NSWC Crane has a team of more than 300 people working to advance hypersonic technologies and accompanying enabling capabilities.

"Crane is going to be a leader in hypersonics for years to come," Ackerman stated.

MTEF and Tesseract

The new hypersonics Missile Test and Engineering Facility (MTEF) is being built using FY21 NISE Lab Revitalization funds. Marie Rose, an Engineer at NSWC Crane, provide an update on a related project, Tesseract, at the showcase. Rose says it is a workforce development (WFD) project for hypersonic technology.

"Tesseract is a WFD project to get a group of engineers more familiar with hypersonics dynamics as the workload will flow into hardware in the loop (HwIL) modeling and simulation that will ultimately be done in the MTEF," says Rose. "In order to appropriately model, test, and evaluate HwIL configurations of guidance, navigation, and control (GNC) systems, knowledge of the algorithms behind GNC is required as we reach an era of controllable hypersonic missiles. As Crane's role in hypersonics grows to include independent validation and verification of GNC hardware in the MTEF, personnel with a working knowledge of optimized GNC algorithms, as they relate to trajectory generation, is imperative."



Hypersonic Antenna Cover Material Selection

Another NISE project, Hypersonic Antenna Cover Material Selection, focused on evaluating alternative materials for radomes. Dr. Jessica Sargent, an Engineer at NSWC Crane, led the project and says the team collaborated across Crane on this initiative.

"Our analysis combines Crane's expertise in Electronic Warfare with hypersonic R&D," says Dr. Sargent. "This and follow-on efforts will assist the Navy/DoD in designing superior hypersonic systems with improved antenna shielding and performance. The ultimate goal of this project is to improve antenna protection and allow for high fidelity communications on hypersonic vehicles."

Digital Engineering

Digital Engineering is an umbrella field that includes many rapidly developing areas. NSWC Crane S&Es are working on many digital engineering projects such as Model-Based System Engineering (SysML-based Descriptive Models), Model Based Engineering (Product & Performance Based Models), Digital Product Support and Logistics, Software Factory (Includes DevSecOps), and Data Analytics (Includes Artificial Intelligence & Machine Learning).

One of NSWC Crane's successful technology transitions, which is another component of the NISE program, is the Live, Virtual, Constructive (LVC) initiative. LVC is a form of modeling and simulation (M&S) testing for military systems. Read more here about NSWC Crane spearheading nearly a decade of EW LVC testing for the Navy, and here about Crane's LVC lead, Dr. Jay Marble recognized, for his efforts by the DoN.

Systems Interoperability and Evaluation Methods

Sean Suehr, an Operations Research Scientist at NSWC Crane, co-led a Digital Engineering NISE project called Systems Interoperability and Evaluation Methods. Suehr says the project's significance to the Warfighter is providing a tool to support quantitative approaches to mission planning and CONOPS development.

"Analytics for Systems Interoperability and Evaluation Methods is a proof of concept approach at utilizing digital engineering tools, such as Cameo, Python, and graph theory for modeling and analyzing the interconnectivity of systems utilized to complete different portions of the process," says Suehr. "It also provides quantitative values on the different process configurations based on systems utilized in mission planning."

Suehr says the project is relevant to Crane's mission of leading electronic warfare (EW) development.

"It also looks at the interoperability of systems intended to support coordination," says Suehr. "Moreover, the effort aligns with Digital Engineering as the intent is to use physics simulation based on parametric modeling of comms and EW systems to understand the underlying telecommunications network of fielded systems."

He says the project has real-world applications and has been enjoyable to work on.

"The team was inspired to work on a project that has applicability to support warfighters and ultimately make them more effective and safe in contested environments," says Suehr.

Cameo Hyperlinks

Another Digital Engineering NISE project is called Cameo Hyperlinks. Jarod England, a Computer Scientist at NSWC Crane, says the project aimed to integrate Cameo Systems Modeler model data with external server data.

"We aimed to create plugins that may be installed into Cameo Systems Modeler to embed a web browser into Cameo Systems Modeler and explored how Cameo Systems Modeler may hyperlink model elements to external locations," says England. "We also created a test instance of server software called OpenMBEE and successfully changed the Open Source plugin for Cameo Systems Modeler to pass wincertstore certificates for CAC authentication and work around the NTLM reverse proxy."

England says Cameo Hyperlinks gives an overview of software tools and ways to integrate MBSE Data.

"We go into detail on available tools, problems with setting up MBSE, how those problems may be resolved, and enhanced capabilities of the Cameo Systems Modeler," he says.

England says he is excited to have a sharable plugin.

"I'm also excited to have a solution for bringing external data into Cameo Systems Modeler and for when a properly integrated Digital Environment is implemented," he says. "We have step-by-step details about how to create Cameo Systems Modeler plugins, how to install MBSE tools at NSWC Crane, details and lessons learned about problems we faced, and some of the challenges with implementing and integrating MBSE tools."

Workforce Development & Technology Transition

The NISE program is not only a funding source for WC S&T programs, but it is also an integral component of NSWC Crane's workforce development. Ackerman says many NSWC Crane employees get involved in the program over the course of their career.

"Of the 480 employees that have worked on NISE projects in FY21," says Ackerman, "180 have three or less years of experience at Crane. This is significant because of the perspective the NISE program gives our employees. Thinking of future threats and how we can equip the warfighter with technology to keep them safe requires innovative problem solving, strategic thinking, and space to test, evaluate, research, and develop the next generation of critical solutions." ■

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NSWC Crane experts participate in AOC's annual Electromagnetic Warfare conference

May 2022

CRANE, Ind. – Naval Surface Warfare Center, Crane Division (NSWC Crane) Electromagnetic Warfare (EW) experts participated in the Association of Old Crows (AOC) EW Capability Gaps and Enabling Technologies 2022 Conference, which took place in WestGate@Crane Technology Park on May 10-11.

Figure 1: Conference participants engage in conversation.

The conference brought together EW professionals from the military, government, industry, and academic fields to discuss issues related to achieving Force Level EW and Electromagnetic Spectrum Operations (EMSO) capabilities across the Services. Force Level EW was the 2022 conference theme and included technical panels and speakers addressing EW and EMSO requirements and emerging technologies necessary to support joint warfighting and achieve an enduring advantage in the electromagnetic spectrum.

Stacey Mervyn, the Chief Strategist for Spectrum Warfare Systems Department at NSWC Crane, is the AOC Conference chair. Mervyn says the event provides a forum for critical topics to be shared and discussed with the EW community.

"Through this venue, we raised the awareness of EW challenges and capabilities gaps across the services," says Mervyn. "We brought together senior-level leaders from across the Department of Defense and private industry to discuss EW warfighting needs. Bringing the right people together creates a collaborative forum to help us think about where EW needs to go and innovative solutions we need to pursue to achieve Force Level EW."

Government and military leaders across the Department of Defense discussed the essential role of EW and EMSO in Joint All-Domain Command and Control (JADC2), Joint Long-Range Fires, Information Advantage, and how innovative technologies such as Artificial Intelligence/Machine Learning, Advanced Modeling and Simulation and Open Systems Architectures are needed to advance collaborative and agile solutions to persistent gaps in our joint warfighting capabilities.

Vice Admiral Sean Buck, the Superintendent of the United States Naval Academy (USNA), was a keynote speaker at the conference. Vice Adm. Buck discussed how midshipmen are learning critical concepts to meet future fleet needs.

"I'm thrilled to have had the opportunity to speak to a community of practitioners and experts on how we're preparing the next generation of naval officers for the challenges and opportunities presented by EMSO and EW," says Vice Adm. Buck. "At the U.S. Naval Academy, through classroom instruction and project based learning, our midshipmen are learning how the electromagnetic spectrum touches every aspect of warfare today so that they can leverage the spectrum for dominance in any battlespace in the future."

Brian Hinkley, the President-elect of AOC, says Vice Admiral Sean Buck spoke to the importance of the future Navy leadership development.

"VADM Sean Buck's opening keynote address set the perfect stage to advocate for a strong EW and Cyber capability," says Hinkley. "VADM Buck gave us an encouraging look at what the U. S. Naval Academy is doing through rigorous engineering curriculum to prepare our next generation of naval leaders. VADM Buck detailed how the curriculum allows midshipmen to fully comprehend the physics of the new EMS battlespace and to ultimately fight and win in increasingly complex electromagnetic spectrum operating environments (EMOE)."

Hinkley says the conference was a success.

"The AOC and NSWC Crane EW Capability Gaps and Enabling Technologies conference proved once again how critical it is to follow NSWC Crane's Spectrum Warfare Systems Department's motto, 'Control the Spectrum, Control the Fight,'" says Hinkley. "As evident in current world events, the ability to conduct effective EMSO is a game changer to the outcome of the battle."

The Chief of Naval Operations Navigation Plan states the importance of the electromagnetic spectrum to ensure American security, including how the Navy is allocating more resources to EW systems that improve defensive strength. It states, "For the first time in a generation, the seas are contested. We must stand ready to control them at the time and place of our choosing. Sea control provides the Joint Force freedom to maneuver and strike, protects friendly shipping, and denies use of the sea to our adversaries. In our digital age, it also means fighting our adversaries in space, cyberspace, and along the electromagnetic (EM) spectrum. Successful modern sea control demands the all-domain power of our Navy and the Joint Force."

Mervyn says the conference creates a unique opportunity to discuss enabling EW technologies and solutions for the warfighter.

Presenters showcase projects at the AOC Conference.

Vice Admiral Sean Buck visits NSWC Crane to learn more about its capabilities.

"What is unique about this conference is not only the expertise we bring in from industry, military, and government, but we hold the event at the classified level," says Mervyn. "NSWC Crane is a recognized leader in EW and the conference provides the opportunity to have discussions at the necessary levels to better understand the EW capability gaps, have meaningful discussions, and have collaborative discussions around rapidly evolving challenges."

Hinkley says the AOC is a growing organization addressing the needs of the evolving EW environment.

"The AOC, the premier professional EW organization, continues to grow national and international membership as more people begin to understand the imperative of decisive advantage in the electromagnetic spectrum for both commercial and military applications," says Hinkley. "The International AOC is extremely proud of our close supporting relationships with key EW stakeholders across the world, and specifically of collaborating with NSWC Crane to deliver one of our most highly anticipated EW conferences year after year for over a decade now."

Mervyn says meeting future threats requires spectrum expertise.

"As we see in the CNO's NAVPLAN guidance, National Defense Strategy, and the EMS Superiority Strategy, the Electromagnetic Spectrum superiority and dominance is paramount to successful military operations," says Mervyn. "Force Level EW is focused on the integration of EW and EMSO capabilities across the armed services platforms and systems in all domains and integrated with kinetic and non-kinetic capabilities. It is imperative that the US Navy's EW capability is integrated and interoperable with the other services to achieve Joint Warfighting Concepts such as Joint All-Domain Command and Control (JADC2), Joint Long Range Fires and Information Advantage. This year's conference was designed around these central themes. The speakers did an outstanding job conveying to the audience the challenges that need to be addressed and enabling technologies that we need to leverage more rapidly. It is incumbent upon all of us, as leaders in EW, to work together and solve the hard EW and Electromagnetic Spectrum Operations problems and to put the best capabilities into the hands of the young men and women who serve our nation." ■

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NSWC Crane Midwest Tech Bridge supports Hypersonics Innovation Conference

May 2022

Dayton, OH. – Naval Surface Warfare Center, Crane Division's (NSWC Crane) NavalX Midwest Tech Bridge (MTB) supported the first-ever Hypersonics Innovation Conference with Strategic Systems Programs (SSP), which is developing the Navy's Conventional Prompt Strike (CPS) hypersonic missile. The purpose of the conference was to emphasize the pressing need to advance U.S. hypersonic technologies and leverage these technologies to achieve U.S. national security goals.

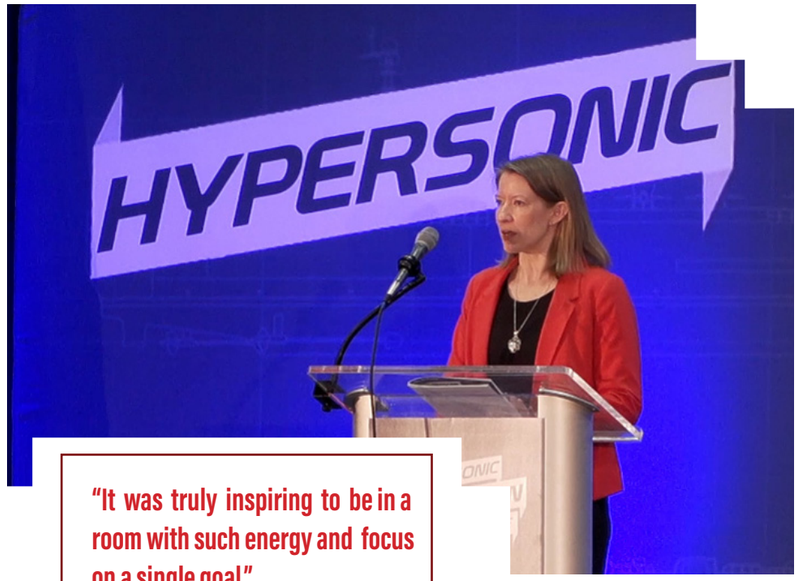
"This event came at a critical time for our country. The message throughout the conference was clear: The hypersonics community must come together and be innovative in our approach to developing advanced systems," said Sarah Armstrong, Director of the Joint Hypersonics Transition Office Systems Engineering Field Activity. "Across the board, we must be open to new partnerships, new methods, and new ideas. It was truly inspiring to be in a room with such energy and focus on a single goal."

The NavalX Midwest Tech works with partners to foster collaboration among universities, industry, small businesses and non-profits to accelerate technology to the warfighter in areas including trusted microelectronics, hypersonics, and electro-optics. SSP is responsible for executing CPS program which is focused on hypersonic missile prototyping for sea-based launch platform integration by the mid-2020s.

"Working in partnership with SSP, the Air Force Institute of Technology (AFIT), Defense Strategies Institute (DSI), National Security Technology Accelerator (NSTXL), Indiana Innovation Institute (IN3) and other ecosystem partners to create this inaugural event was an honor," said MTB Director Anne Fields. "Supporting an event of this magnitude that connected essential ecosystem players and continued the advancement of hypersonic capabilities to ensure global security is the heart and soul of what the NavalX Midwest Tech Bridge was made to do."

The three-day event was a town-hall style forum with attendees from government, military, industry, industry and academia. Panels explored emerging technological advancements, standards, and technical requirements needed to overcome to capitalize on the expanding role of hypersonic weapons within the global security environment.

"It was great to get everyone together to talk about some of the Navy's toughest technical challenges when it comes to the fielding and deployment of hypersonic missile technology," said NSWC Crane Technical Director Dr. Angie Lewis, SES. "It has been wonderful to have our employees back together in person having tough conversations with academia, industry and nontraditional partners. We are using this time to look for opportunities to accelerate development, and most importantly, the deployment of hypersonic technology into the hands ´Warfighters."



"It was truly inspiring to be in a room with such energy and focus on a single goal."
-Dr. Sarah Armstrong

NSWC Crane is a hub for hypersonics innovation and collaboration. In 2021, The Office of the Secretary of Defense (OSD) established JHTO SEFA at NSWC Crane in order to leverage the growing capabilities in hypersonics technologies of government, industry, and academic partners, including Indiana's three Tier 1 research universities.

"The Hypersonics Innovation Conference represents some of the nation's top talent convened to solve one of our Nation's toughest challenges," said Jarad King, NSWC Crane's acting Director of Engagement. "NSWC Crane is proud, along with a vibrant innovation ecosystem, to provide national leadership and technical stewardship of the Hypersonics mission." ■

"It was great to get everyone together to talk about some of the Navy's toughest technical challenges..."
-Dr. Angie Lewis, SES

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NSWC Crane holds ribbon cutting for Navy submarine testing facility, celebrates 25 years of submarine support

July 2022

CRANE, Ind. – Naval Surface Warfare Center, Crane Division (NSWC Crane) held a ribbon cutting ceremony for a unique submarine testing facility for the U.S. Navy on July 21 on the installation. The Submarine Battery Evaluation Center (SUBBEC) test facility was built to better test and evaluate Submarine batteries. The first test and evaluation of cells using SUBBEC is anticipated to take place this fall.

NSWC Crane has served as the In Service Engineering Agent (ISEA) for underwater vehicle batteries dating back to the 1980s and includes engineering support such as battery design, manufacturing, and testing. In 1996, the Submarine Main Storage Battery (MSB) ISEA moved to NSWC Crane. The ribbon cutting event will also be NSWC Crane's 25th anniversary of the submarine main storage battery ISEA supporting the submarine fleet.

The Program Office for Submarine Main Storage Batteries (PMS 392) funded SUBBEC. Captain Garrett Burkholder, the Program Manager for PMS 392, says SUBBEC provides crucial capability to the fleet.

"Simply put, our nation's submarines cannot operate without a main storage battery that provides adequate, predictable performance," says Capt. Burkholder. "The work done by NSWC Crane as the battery ISEA is critically important to our ability to sustain submarine operations. Completion of the SUBBEC facility illustrates NAVSEA's ongoing commitment to operating world class laboratory facilities, and represents a quantum leap in our submarine battery test facilities by providing a unique capability to operate a complete submarine main storage battery in a lab environment."

The U.S. Navy has a need for dependable power systems, which requires testing and evaluation of batteries. SUBBEC will provide full scale submarine battery and energy storage testing and modeling capabilities unique to the Navy. SUBBEC better evaluates design or profile changes prior to implementation of profile changes to the Fleet. SUBBEC testing will improve the Navy's ability to predict, control, and mitigate low capacity batteries.

Bryan Parker, the Submarine Battery Engineering Manager (EM) at NSWC Crane supporting the Battery Technical Warrant Holder (TWH) at Naval Sea Systems Command (NAVSEA) Headquarters, says SUBBEC provides significant cost savings to the Navy.

"Before, testing required it to be manned, which is costly," says Parker. "With SUBBEC, we can test submarine batteries and operate the testing 24/7 without constant management. We can run years of testing without huge cost to the program."

Trent Frady, the Supervisor for the Undersea Power and Energy Systems Branch at NSWC Crane, says SUBBEC provides technically rigorous battery testing.

"Not only can it be testing 24/7, 365, but also, the test facility provides the capability to test a full battery string," says Frady, "Usually, testing facilities test six to twelve battery cells, but with SUBBEC, we can test up to 256 cells at the same time. This means we no longer have to extrapolate from the results of six to twelve cells what a full battery is doing capability-wise. This provides a technical rigor capability increase that was missing before and ensures we have the best battery profiles going to the Fleet."

SUBBEC supports both NSWC Crane mission areas of Expeditionary Warfare and Strategic Missions.

EMN1(SS) Jonathan Galusky, a Process Supervisor at NSWC Crane, is an active duty sailor serving as an engineering technician in the battery laboratory.

"SUBBEC provides a new capability for our group here at Power and Energy Systems Division at NSWC Crane to evaluate a full scale submarine storage battery," says Galusky. "Our team works hard to ensure that the testing that will take place here directly benefits sailors as well as improve the operational capability of our submarine platforms."

Parker says being part of establishing this capability is meaningful to him.

"For me it's significant to provide the Fleet the best battery possible—we get to impact the Fleet directly," says Parker. "The submarines are there providing strategic defense. We take great pride in testing these batteries and providing this capability to the Fleet."

Frady says the implementation of SUBBEC provides the warfighter with added capability.

"The ultimate impact is to support the warfighter—that's the first thing on everyone's mind," says Frady. "Nowhere else in the U.S. does the Navy have a next generation test system used to evaluate next generation submarines—with SUBBEC we'll be supporting the warfighter today and tomorrow." ■

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CAMPAIGNING

"Campaigning will strengthen deterrence and enable us to gain advantages against the full range of competitors' coercive actions. The United States will operate forces, synchronize broader Department efforts, and align Department activities with other instruments of national power, to undermine acute forms of competitor coercion, complicate competitors' military preparations, and develop our own warfighting capabilities together with Allies and partners."

– NDS Factsheet, 2022, p. 2

NSWC Crane, Oregon State University, IU collaborate on machine learning research project

February 2022

CRANE, Ind. –
Naval Surface Warfare Center, Crane Division (NSWC Crane) is collaborating on a Naval Engineering Education Consortium (NEEC) funded project with students from Indiana University (IU) and Oregon State University (OSU).

"This program offers a great opportunity to recruit students and faculty to work on Crane projects and give insights on research we're doing," said Tyler Fitzsimmons, an engineer at NSWC Crane. "Without being directly involved in our projects, it can be difficult to understand Crane and Navy problems from the outside. Through these two to three year NEEC efforts, it allows us to work with students that would be good fit for NSWC Crane programs."

NEEC was created by Naval Sea Systems Command (NAVSEA) and is executed by the Warfare Centers. Its purpose is to develop and attract talented new professionals into the broad technical fields associated with current and future U.S. Navy ships and submarines by partnering with universities conducting cutting-edge research in areas of interest to the Navy. In 2020, the program awarded more than 50 grants to U.S. universities, bringing professors and students together with scientists and engineers at each of the 10 Warfare Center Divisions to explore solutions to the Navy's most pressing technological challenges.

Fitzsimmons and students from IU and OSU have been working on the project since 2018. The basis of the effort is to understand the effects of adversarial learning through artificial intelligence and machine learning, using a visualization approach. Fitzsimmons said the goal is to take something that is usually theoretical and mathematical into something visual and easy to understand.

"For example, an enemy could try to manipulate your algorithm and make it do something bad. Instead of classifying cats and dogs, they make it only identify dogs, or change the algorithm to make it less effective. The goal of our project is not only to understand that process, but also make it visual so end users can look at the algorithm and see that someone is trying to manipulate it. We also want to have a way to defend against it."

Fitzsimmons said the key piece of the process is to create trust in the algorithms.

"If we can detect and defend, then our end users can trust these algorithms that they might have seen as a black box. The visualization part if this project enables trust because it will let end users known when someone is manipulating it. The indicator could be something simple, like a blinking light."

A black box is a problem, concept, or piece of equipment that it is not known how it was made, how it works, or how to repair it.

Jarrod Hollis, a student at OSU, is part of the team working on the project. His PhD work is funded through the program.

"Working on this project has helped keep what I've learned in perspective. Since there are direct applications from my courses, it keeps the concepts locked in my head. It goes back and forth – using university learning on project, and then applying project learning to my coursework."

Hollis said having regular meetings with the Crane scientists and engineers is helpful for guiding the project.

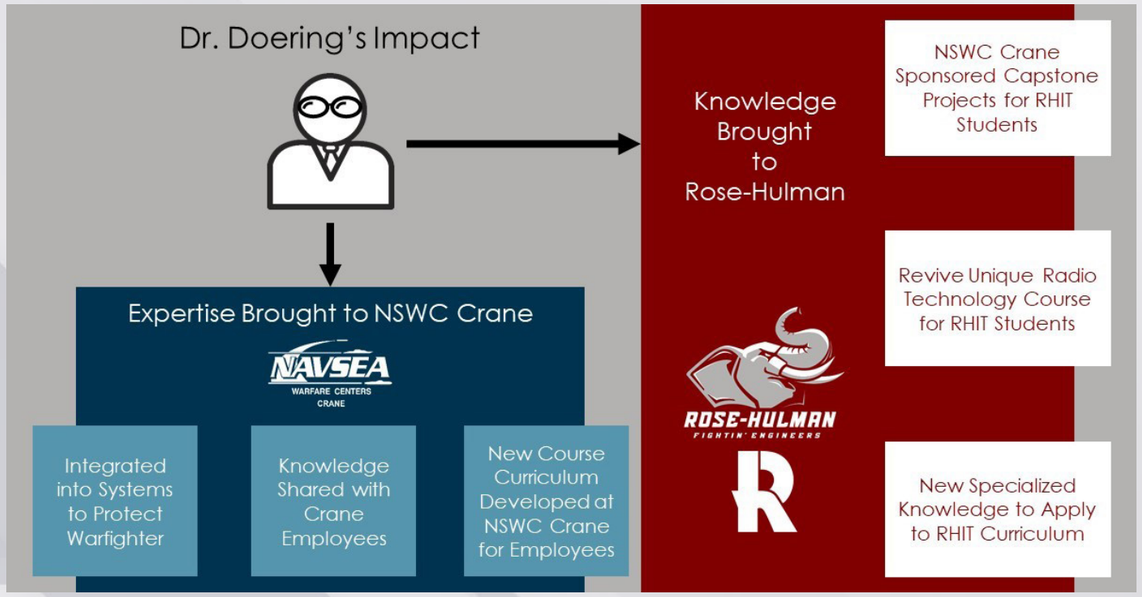
"We get feedback from Tyler and Dr. Robert [Templeman], and the questions they ask when we present our work help guide the direction we're going," said Hollis. "We're academic researchers, so we're interested in the topic for the sake of the topic – they frame it in a way that is practically applicable. It's a perspective we wouldn't easily get without this program."

Fitzsimmons said he has been impressed with the students, and would definitely apply for NEEC funding again when he has another applicable research question.

"Both IU and Oregon State have done an excellent job of producing novel research and been very engaged. They have met all the milestones and have been great at coming up with solutions outside of the box. It has been mutually beneficial for Crane and universities."

■

NSWC Crane collaborates with Rose-Hulman professor to expand niche radio technology capability for the warfighter



March 2022

CRANE, Ind. – A group of Naval Surface Warfare Center, Crane Division (NSWC Crane) employees were visiting Rose-Hulman Institute of Technology (RHIT) in Terre Haute, Indiana for an undergraduate career fair a few years ago. RHIT, a nationally-recognized science, technology, engineering, and math (STEM) university, is less than two hours away from NSWC Crane. The career fair sparked a chance encounter that brought a unique capability to the fleet.

Garry Wieneke, who was the Deputy Division Manager for Expeditionary Electronic Warfare (EW) at NSWC Crane at the time, was part of the group that attended that career fair. Along with meeting students who might be interested in working at NSWC Crane, Wieneke was introduced to a RHIT professor named Dr. Edward Doering.

Dr. Doering, Professor of Electrical and Computer Engineering (ECE), has been a member of the Rose-Hulman faculty since 1994. He says that he regularly attends the career fairs to visit with former students and was pleased to meet Wieneke at the spring 2019 career fair.

"I had some vague knowledge about Crane before meeting Garry," says Dr. Doering, "but had no idea about the Electronic Warfare and Digital Signal Processing work conducted at NSWC Crane. Quite a number of Rose-Hulman graduates work at Crane, too, and I was pleased to meet many of my former students after onboarding. I was quite impressed as I learned more about the scope and variety of activities performed at Crane."

According to his recommendation letters for temporary faculty employment, Dr. Doering is a renowned expert in signal processing, digital system design with field-programmable gate arrays (FPGAs), and electronics. Wieneke, who is now the Corporate Operations Department Deputy Director at NSWC Crane, is a RHIT alum himself and says Dr. Doering's expertise is both unique and in a critical technology area.


Dr. Edward Doering

"Dr. Doering is an expert in Digital Signal Processing (DSP) technology," says Wieneke. "DSP is a key technology area for NSWC Crane. After Dr. Doering learned about our mission, he was interested in working with us."

Dr. Doering completed a six-month sabbatical at Crane and continued contributions as temporary faculty member. A NSWC Crane faculty appointment provides an avenue for faculty members of accredited colleges or universities to work with NSWC Crane employees on scientific or special projects.

Dr. Doering says his time at Crane has been a valuable experience.

"With the technical work going on at Crane, I started applying my knowledge in DSP as I came to work on specific projects," says Dr. Doering. "I also gained a whole new understanding of what it means to focus on keeping the warfighter safe and helping them to achieve their mission. It is very satisfying to contribute to this effort."

Digital Signal Processing (DSP) & Software Defined Radio (SDR) Technology

DSP is a core component of today's information technology. Dr. Doering says this involves digitizing signals that can be manipulated

>> NSWC Crane collaborates...

NSWC Crane Personnel meet with Dr. Doering

with mathematical algorithms on a computer, FPGA, or embedded DSP microprocessor.

According to Dr. Doering's Software Defined Radio course description, SDR technology is characterized by its flexibility. It continues, "Simply modifying software can completely change the radio's functionality." The course addresses what an SDR designer does to build a complete digital radio.

Many military computer systems are based on radio frequency technology. Historically, radio technology is purpose-built such as the AM/FM radio in an automobile.

"That's what it was built for—and that's it," says Dr. Doering. "It is not flexible, not programmable. Prior to SDR technology, different military radios had different standards, and a dedicated unit would be required for each standard with no interoperability between them. However, SDR technology is based on a completely generic hardware device that connects the radio frequency (RF) world to the DSP world, and once the signal is in the DSP world you can implement many different standards on the same radio system with ease."

SDR technology allows older systems to communicate easily with newer systems.

"SDR brings flexibility to do different modulations. SDR by comparison is much more inexpensive, flexible, and time saving compared to other technology that allows older and newer systems to communicate," says Dr. Doering.

Where niche knowledge meets the mission

Dr. Doering now works full-time in the summer and as temporary faculty the rest of the year. His time as an employee has developed into many spin-off projects and initiatives—both at Crane and at RHIT.

Tom Talbert is the Chief Engineer for Expeditionary Electronic Warfare Systems Division. He says Crane has benefitted from Dr. Doering's expertise in several ways.

"During his sabbatical, he got a lot done," says Talbert. "After seeing what we do, he took the time to design a three-day software defined radio course for Crane employees. He has made a great partnership for Crane; his expert knowledge in DSP contributes to enhancing techniques that defeat threats. He has passed that knowledge on to employees where they were able to get improvements integrated into weapon systems improving our ability to defeat threats."

Talbert says this area of expertise is crucial to meet warfighter needs in the Fleet.

"This area of expertise is important to the mission because we need to have fielded systems that can defeat emerging threats," says Talbert. "EW threats rapidly evolve and in order to stay ahead of future threats, Navy systems need to integrate the latest RF defeat techniques. Software Defined Radio systems can incorporate these techniques; effectively changing their functionality as soon as the new technique is uploaded into the system."

Dr. Doering says the course at Crane is curriculum in development.

"The workshop at Crane focused on SDR technology," says Dr. Doering. "I've put together curriculum on the course and wanted the class to be hands-on so that employees have devices they can work with. It will basically be SDR 101."

Wieneke says Dr. Doering brought knowledge back to Rose-Hulman, where the newly developed SDR course helps expose students to real-world EW challenges.

"He resurrected an older class at RHIT and put a new spin on things," says Wieneke. "NSWC Crane has also been able to sponsor multiple senior design projects—a student's capstone engineering project. The capstone projects include commercial hardware integration. "

The resurrected class was a 400-level class called "Software Defined Radio." Dr. Doering teaches courses in DSP, among other classes, and says there was interest in getting the class revised.

The Drone Augmented Reality Team (DART)

"The work I did with Crane—I brought that back to Rose for the revised course," says Dr. Doering. "Without the Crane experience, I wouldn't have had the knowledge to teach the class." Dr. Doering says that he also took inspiration from his technical mentor Tim Vance, Chief Engineer, now retired. "During his final presentation to the division Tim Vance encouraged everyone to get their amateur radio license," Dr. Doering recalls, "and I got mine three weeks later. Now I teach the SDR class with a big amateur radio spin on the projects. My experience at Crane has shaped what I do at Rose—I can bring new ideas to the classroom."

Dr. Doering says the updated RHIT SDR course gives students a more hands-on experience with communication systems.

"It extends what they learn and gives them a practical application," says Dr. Doering. "It's fascinating to do wireless communication—sending data from one radio to another without a visible connection…students can say, 'I made this and it actually works.' The course helps them get experience with current technology. SDR technology is of ongoing interest and is the basis of what is going on in wireless communications—it is developing and continues to evolve and change."

Wieneke says partnerships like this are beneficial for both institutions and their missions.

"This is a perfect example of how getting professors on part-time is not only good for Crane, but for universities and industries as well," says Wieneke. "NSWC Crane continues to use the temporary faculty program to benefit our mission areas."

Dr. Doering says the collaboration has been an opportunity to learn and contribute.

"The experience has provided me with personal and professional growth," says Dr. Doering. "I'm teaching a class that I would not be able to teach otherwise. I feel very satisfied that I've made a good contribution to the mission. I haven't been doing busy work; I've really been involved in projects bringing success to the warfighter. It is satisfying to contribute to the mission at Crane." ■

NSWC Crane hosts 2022 Microelectronics Integrity Meeting to strengthen future access to trusted systems

August 2022

CRANE, Ind. –
Naval Surface Warfare Center, Crane Division (NSWC Crane) hosted the 2022 Microelectronics Integrity Meeting (MIM) in Indianapolis, Indiana on August 9-10. More than 450 participants from government, military, industry, and academia attended the forum themed "Trust: Future Access and Capabilities."

This annual event features keynote speaker presentations and panel discussions on topics such as rapid prototyping of assured microelectronics, engaging the external ecosystem, Hardware Assurance (HwA), next steps for transitioning newer technologies, and identifying and addressing production challenges.

Pictured below: Brian Stuffle (center) receives appreciation plaque from Mark Thomas (left) and Dr. Kyle Werner (right)Brian Stuffle, the Global Deterrence and Defense Department Chief Strategist at NSWC Crane, is the co-lead in organizing the MIM. This is the seventh event, and Stuffle has been involved in organizing the MIM since the inaugural meeting. He says he is excited about the 2022 MIM.

"We are thrilled to have a full-sized event this year," says Stuffle. "The MIM has grown since the beginning in size as well as interest in critical topics of radiation hardened microelectronics and supply chain integrity. The MIM is not just about discussing the challenges associated with Trusted Microelectronics. It has evolved into a forum where potential solutions are discussed to solve the problems that the nation faces with access to critical technologies and supply chain integrity."

Trusted and Assured Microelectronics (T&AM) provide the foundation for modern computing, communications, and infrastructure. Increasingly, production of semiconductor technology has shifted-to international companies—which creates concern for the DoD. The Office of Secretary of Defense (OSD) for Research and Engineering T&AM program addresses these concerns.

Stuffle says recent events have brought the significance of trusted microelectronics to the forefront of many people's minds—including the impact outside the DoD.

"If you think about the pandemic and recent supply chain issues with microelectronics—especially how that has affected the automobile industry and how long people have to wait to get hands on electronics in cars," says Stuffle. "The semiconductor industry is highly globalized with key parts of the supply chain dominated by overseas players. Continued outsourcing threatens not only assured access, but also the Nation's place of relevance in microelectronics manufacturing. The United States is currently vulnerable to microelectronics supply chain disruptions, whether from a pandemic, sanctions, or conflicts. The Nation needs a comprehensive national strategy for microelectronics to ensure our security and economic prosperity, and the MIM provides a forum for microelectronics experts to address these threats and achieve a national strategy in Trusted Microelectronics. This meeting will coincide with NSWC Crane's leadership role for the Navy and DoD in the T&AM Program for the OSD, which is a program designed to improve DoD microelectronics evaluation capabilities and develop commercial standards to make trusted parts a competitive advantage and will ultimately demonstrate and transition an alternative approach to the Trusted Foundry model."

Stuffle says the event brings together experts across the nation for a common purpose. Dr. Kyle Werner, NSWC Crane Deputy Technical Director, speaks

"The event supports the Navy and DoD—as well as industry and academia partners—to work in cooperation to improve the nation's strategic nuclear deterrent high reliability systems by finding collaborative areas to work in trusted microelectronics," says Stuffle. "We will discuss and explain the collaborative efforts with the Navy, Air Force, and Missile Defense Agency in reducing the overall cost and risk of maintaining our strategic deterrent and to showcase the value of the work. There are potential efficiencies and common work in research, development, and production, particularly as we look at areas in industry where skills sustainment is of significant importance. Now is also the time to look at resource and component commonality, where applicable. The focus of the MIM is ensuring future access and capabilities in trusted microelectronics; we want to know what are we doing to develop a national strategy in trusted microelectronics in our technology as well as the supply chain to field it reliably and timely."

Dr. Julie Shaff, the Technology Transfer (T2) Agreements Administrator and the NavalX Midwest Tech Bridge Deputy Director at NSWC Crane, was on a panel discussion featuring the external ecosystem and defense innovation enablers. She says engaging the ecosystem—which is made up of researchers, students, academic institutions, military, entrepreneurs, industry, and more—ultimately advances capability for the warfighter.

"Engaging the external ecosystem enables NSWC Crane to fur-

ther fulfill its mission and give the Warfighter a competitive advantage," says Dr. Shaff. "We incorporate defense innovation enablers such as T2 to spin in and spin out technology. T2 has several mechanisms we incorporate with our ecosystem partners that allow us share lab space, resources, expertise, and more to further advance technology in the DoD."

Stuffle says the event is designed to be interactive to encourage the exchange of ideas with experts in this field.

"Creating this forum is important because our ability to identify threats and potential solutions is key to future success," says Stuffle. "This forum, one of the premiere microelectronics events, provides a unique opportunity to talk about these challenges, our different ideas to tackle them, and lessons learned to make sure there are viable solutions and a national strategy for trusted microelectronics. The event has built-in opportunities for engagement so the experts in attendance can discuss these topics. A key part of the MIM is that it is interactive. The development of these communities of interest and collaboration would be difficult, if not impossible, without the ability to share information in this meeting format in a personal and interactive manner."

Keynote speakers include Anthony Hawkins, the Structures, Controls and Flight Unit Head at Strategic Systems Programs (SSP) and Dr. Bill McNavage, the Program Examiner for the Defense Investments Branch, of the Office of Management and Budget. Another key speaker was David Roberts, the Executive Vice President of Entrepreneurship and Innovation for the Indiana Economic Development Corporation (IEDC).

Dr. McNavage says the recently passed Creating Helpful Incentives to Produce Semiconductors (CHIPS) and Science Act can be leveraged alongside previous investments and initiatives.Dr. Bill "The Department of Defense has broad and deep equities in

Dr. Julie Shaff (left) moderates a panel with Mark Thomas (right)

semiconductor manufacturing, research and development, and workforce ecosystems." says Dr. McNavage. "As we move forward in the implementation of the recently passed CHIPS and Science Act of 2022, it is important to not lose sight of how much the Department has already accomplished with their semiconductor investments. There is an opportunity to treat and employ CHIPS funding as a force multiplier to already planned - or to be realized - agency investments. Getting a CHIPS appropriation was the easy part. Now figuring out how to implement, partner, integrate, and interface, across all stakeholders, is really the exciting challenge and opportunity ahead."

Many discussion themes for the 2022 MIM align with the OSD for Research and Engineering T&AM program: access to state of the art (SOTA) commercial technology, data-driven quantifiable assurance, the DoD's unique needs, and creating a resilient and robust pipeline. Another important topic for the MIM is nuclear modernization.

Stuffle says the MIM addresses these challenges and brings the national microelectronics community together to meet future challenges.

2022 MIM in Indianapolis"NSWC Crane is providing national leadership in these crucial areas," says Stuffle. "In our panels we are looking forward to new technology development. We will also discuss what Crane is doing to help the nation meet demand for trusted and assured microelectronics testing for the strategic application," says Stuffle. "In the near future, the nation's nuclear deterrence program and converging modernization will require infrastructure for testing—we'll need strategic radiation-hardened electronics."

Stuffle explains how current discussions at the MIM help meet future challenges.

"The Nation needs to ensure that it has access to critical radiation-hardened and trusted microelectronics technologies to field the DoD's strategic system platforms," says Stuffle. "Without these technologies, the Nation's Nuclear Deterrent capability is at risk. The Navy and the DoD also need to understand challenges associated with potential microelectronics supply chain threats and the infiltration of the supply chain with counterfeit devices. The MIM provides a unique forum for government and industry experts in microelectronics to discuss key challenges associated with trusted microelectronics to share ideas and lessons learned; it ensures that the DoD has viable solutions to current and future supply chain and trust threats." ■

McNavage speaks at the 2022 MIM

NSWC Crane leads unique experimentation for small Electromagnetic Warfare unmanned platforms

September 2022

CRANE, Ind. –
"We created a 'fog of war' environment," says Sondra Laughlin, the Deputy Project Lead for Silent Swarm at NSWC Crane, "and ran sessions multiple times where organizations worked together to accomplish tasks within this environment.

Laughlin says Silent Swarm is not your standard Department of Defense (DoD) experimentation event.

"We would run sessions to test resilient communications and then run sessions trying to break their communications, for example," says Laughlin. "Then the next run would build up to a dozen technologies acting in partnership to meet a goal. We wanted to see the technology in action in a less-than-pristine environment but in collaboration with each other."

NSWC Crane led a technology experimentation event bringing in more than 150 Electromagnetic Warfare (EW) subject matter experts (SMEs) from industry, academia, and civilian and military personnel. The inaugural Silent Swarm was a two week-long event this August and took place at the National All-Domain Warfighting Center (NADWC) in Michigan. Participants tested more than 17 EW technologies which were employed on small multi-domain unmanned systems (UxS).

Laughlin explains the Silent Swarm team built room for failure into the event experimentation environment.

"We encouraged them to try something they've never tried before and that we embraced learning from failure," says Laughlin. "For instance, there was a radio technology and we wanted to play with one portion of its capability in a way they hadn't been able to test before; many technologies hadn't been tested on water or unmanned platforms before. We wanted to participants to show us what they do best, but then try something new. Our SMEs would provide constructive feedback, and participants could alter their code or tactics in the next iteration. Ultimately, the environment we created helps learning to happen more quickly."

Rob Gamberg, the Project Lead for Silent Swarm, has led the event from ideation to experimentation.

"It started as a small, unmanned table top exercise in December of 2021, focusing on kinetic warfare," says Gamberg. "We started bringing in more EW capabilities and saw it had significant impact—so we thought, 'If it works well in a wargame, how can we bring it out into the battlefield?'"

Silent Swarm was sponsored by the Office of the Under Secretary of Defense for Research and Engineering, Integrated Sensing and Cyber (OUSD R&E (IS&C)). The NADWC environment allows for a variety of testing across all five warfighting domains: land, air, maritime, cyber, and space. Silent Swarm also had military and civilian EW experts onsite across the Air Force, Army, Marine Corps, and Navy to provide direct feedback to industry about the operational challenges warfighters face.

Gamberg says Silent Swarm provided a rapid learning environment for attendees.

"Silent Swarm provided the experimentation event, venue, and spectrum environment for initiatives to experiment with their capability, deliver EW, and a leverage our team of assessors who were great resources for operational and technical expertise," says Gamberg. "They could provide valuable insight into how the tech was performing and how it could be better. Participants were working together, adjusting capabilities, and attacking the next problem set. We really encouraged people to stretch their comfort zone—the environment was a tremendous opportunity to accelerate development and capabilities. You had what would have been nine months of development packed into three hours at Silent Swarm. From start to finish—we created an event where people could explore and experiment which gets us better capabilities."

For EW capability, Gamberg says they recognized the standard technology acquisition process can be slow.

"We recognized we needed to use all the tools available to us to achieve superiority in the spectrum—and the standard programs of record, which could take 10, 15, or 20 years, won't get us where we need to be," says Gamberg. "Ultimately, we're accelerating the developmental timeline and putting companies in a better place for a real, fielded capability."

Gamberg says one key aspect of Silent Swarm that accelerated the rate of learning was the use of Modeling and Simulation (M&S). NSWC Crane had several M&S SMEs onsite to run experiments using software.

"M&S was the crown jewel of success for reducing risk at Silent Swarm," says Gamberg. "NSWC Crane's M&S team was integrated into the live event; they developed new techniques onsite. They ran hundreds and hundreds of experiments which helped participants step into the live executions with more knowledge. They provided the quick ability to run a test and help teams come up with a game plan before they wasted time and energy testing on the range."

Laughlin says the M&S team was creative in working with the participants.

"They continued to show value, share data with the participants, and provide a service to them," says Laughlin. "They provided risk buy down on the fly, helped participants troubleshoot challenges, and created a greater depth of understanding for participants. They brought technical rigor to the fog of war, which is a really challenging thing to do—we could not have been successful without them."

Silent Swarm is planned on continuing next summer as a large-scale event, but there are plans for smaller-scale events to take place throughout the next year.

"We're continuing to learn and grow," says Gamberg. "We have a great team and efficient planning process. I'm excited for this team and for what Silent Swarm holds moving forward." ■

NSWC Crane, NIWC Pacific rapidly prototype software defined radio technology for Marines

November 2022

"This impacts all of the future of the Marine Corps on the battlefield. The small, fast, and light units that need to shoot, move, and communicate…their ability to do all three is vital to the mission. This is a problem that needs to be solved," says Sgt. Christopher Kock.

Sgt. Kock, 1st ANGLICO, I MIG, I MEF, has experienced challenges conducting operations when he needs to quickly understand the electromagnetic environment—such as understanding when there may be malicious attempts to jam his communications. Sgt. Kock, along with several other Marines from the east and west coasts, was invited to spend a week at a Navy laboratory in landlocked Indiana to work directly with technical experts to find a solution.

Sgt. Kock says participating in this week-long, rapid prototyping event was a new experience.

"I haven't witnessed something like this in the Department of Defense before," says Sgt. Kock. "Boots on the ground giving direct feedback to the great minds that think of these systems—this is something I didn't know existed."

Warfighter Driven Challenge: Software Defined Radio

Naval Surface Warfare Center, Crane Division (NSWC Crane) hosted this Warfighter Driven Challenge (WDC) which brings scientists, engineers, and warfighters together to work on a problem statement directly from the field. The WDC took place in April and brought together subject matter experts (SMEs) from Naval Information Warfare Center (NIWC) Pacific and NSWC Crane—as well as warfighters from I Marine Expeditionary Force (MEF) and II MEF in the U.S. Marine Corps. The event was funded by the Office of Naval Research Global (ONRG) TechSolutions program and took place at NSWC Crane's High Velocity Innovation Center (HiVe), which is designed as a flexible space to facilitate collaboration.

NSWC Crane has conducted many WDC events over the last five years, with this WDC focused on creating a solution to a communications systems-related problem that infantry Marines regularly face in the field. The problem statement submitted to ONRG TechSolutions described the need for technology that could "quickly sense the electromagnetic environment and identify congested or contested communications."

Having a reliable tool to provide this information allows warfighters on the front lines to make rapid and rational decisions. CWO2 Jonathon Krahnke, a Marine from II MEF with 17 years of service, says he was excited to see the problem tackled during the event.

"Once I read through the problem statement and saw a group of experts intent on addressing the challenges that the ground tactical user experiences—I was excited," says CWO2 Krahnke. "I was more impressed with the brainpower in the room and how they tackled the problem…then seeing a working prototype with our thoughts

implemented…I was impressed."

The typical process to develop and acquire technology for the warfighter could take several years—and material solutions often emerge after the needs of the Fleet have changed due to rapidly evolving threats or the technology becoming obsolete. The warfighter is also often removed from the technology development process—which could lead to the technology not meeting the specific needs of the Fleet.

CWO2 Dustin Schuitt has 15 years of experience in the Marine Corps and traveled to Crane from his home station at II MEF, Camp LeJeune, North Carolina. CWO2 Schuitt participated in this WDC and says the available avenues to find solutions can be challenging.

"We don't typically do this with civilian engineers—within the military we can identify a problem and possible solution, but it is difficult getting funds to build solutions," says CWO2 Schuitt. "So we ask, what's next? When we reach out to have a problem solved that we face during the mission, the process of building out a solution can take years. Once we get the system, it's outdated. What we need is something fielded and tested as soon as possible. The procurement process is expensive and solutions end up having too many capabilities—we need a system that is focused on a need, which keeps it low cost."

The WDC is a NSWC Crane-developed intensive week-long process that brings in both the end user and technology experts in order to co-develop prototype solutions. Trained facilitators at NSWC Crane guide teams through an iterative process which includes refining the problem and brainstorming a wide array of solutions. This was the 12th WDC, two of which were virtual events due to the COVID-19 pandemic. So far, 20 total prototypes have been developed, 7 patent applications or invention disclosures have been created, and more than 150 Naval Research and Development Establishment (NR&DE) SMEs have been involved from five different Warfare Centers. More than 50 warfighters from about 20 commands have participated and seven projects have been funded for follow-on efforts.

The problem statement for this WDC event was submitted to ONR through the TechSolutions program, which is designed to take requests for solutions directly from the operating forces. The request for solutions describes the current scenario where Marines need assured communications in degraded communications environments, describing the immediate need as "the ability to rapidly sense, visualize, and make decisions about the electromagnetic environment is a critical step to identifying and responding to electromagnetic interference (EMI), jamming, or network conges-

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tion." This WDC focused on using low-cost, commercial off-the-shelf (COTS) software defined radio (SDR) technology to get to a solution that would be affordable enough to get out to the Fleet in large numbers.

CWO2 Schuitt served as an expert to provide warfighter perspective in communications technology.

"We've been talking about this problem in the Marine Corps for years now," says CWO2 Schuitt. "Trying

to find a solution is very important to us."

Adam Parsley, a Chief Engineer on the Expeditionary Warfare Department staff at NSWC Crane, is one of the WDC facilitators. Parsley says having SMEs from different areas of expertise is critical to finding an optimal solution in such a short amount of time.

"It is helpful to have a mashup of users with SMEs—a variety of technical knowledge and experience that can bring different solutions to the table," says Parsley. "This particular problem set is crucial to the Marines at the forward edge, as they tell us that minutes saved in decision making and better awareness of the spectrum can mean the difference between life and death."

SDR technology is flexible and programmable, enabling users to implement many different standards on the same radio system much more easily. Read more about SDR technology and NSWC Crane's involvement here.

By bringing the end user and technical SMEs together, a rapid and tailored tool is developed to meet specific warfighter requirements. Parsley says part of the process includes gaining awareness of the problem set.

"One of the most important facets of these events is that the technical SMEs gain an understanding of how the warfighter operates on the ground," says Parsley, "which is often lost to the engineer or scientist through the traditional acquisition process. When we civilians are able to look at the problem set from the Marine's perspective, we receive valuable, nuanced information that we can turn on immediately in designing and building prototype solutions. Everyone wants to get to the hardware solution as soon as possible, but there's a little bit of process that the WDC process takes us through to make sure we're getting what this group of Marines really wants, and not some predetermined solution that an engineer built in isolation in a lab. The WDC team had the first prototype working with some demonstrable capability working by the third day of the event."

NIWC Pacific and NSWC Crane develop a prototype to detect EMI

CWO2 Schuitt says WDC was a worthwhile process.

"The experience has been great at Crane," says CWO2 Schuitt. "First, we identified the problem and then refined the details. It was great to find people who want to find a solution and want to solve the problem."

Once the group identified the primary threshold and objectives of the capability, they decided how they were going to work on the problem and organized themselves into three teams. The first team worked on answering the immediate question, 'Are we getting energy in the frequencies of interest?' The second team, which included engineers from NIWC Pacific, worked on a solution that would detect a more sophisticated threat which may include more complex jamming. The third team focused on the user interface and building redundant and easy-to-read indicators with a screen so users can better interpret the data.

CWO2 Krahnke says it was a great experience to work with people who had the mission in mind.

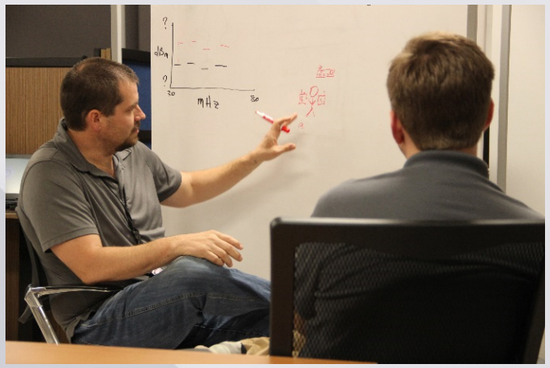
"When I've talked to the team here and ask them questions—they are excited to talk about their work and how to make it effective and affordable," says CWO2 Krahnke. "Everyone here has been willing to take five minutes to talk to me and get it right."

The first team leveraged existing knowledge to develop a prototype that would be able to simply read if there was energy nearby, including developing prototyped hardware and software. Jeff Miller, an Electronics Technician at NSWC Crane, works in the Electromagnetic Warfare mission area at Crane.

"We knew coming into WDC that it was an RF-related problem," says Miller. "Once WDC began and we read the problem statement, we knew we were kind familiar with their issues. There are Programs of Record that have similar solutions, but they are big, bulky, and have more capability and cost than an infantryman would need. We had something we might be able to tailor to this need."

Erika White, the Loki Director at NSWC Crane, talks about the Loki Effects team participating in this WDC and the Loki mission.

"Loki is a disruptive capability cell akin to a skunkworks that challenges the traditional view of Electromagnetic Warfare (EW) by providing solutions to leapfrog our adversaries," says White. "Loki focuses on offense vice defense with an emphasis on weaponizing the electromagnetic spectrum. The inclu-



sion of Loki in the WDC is a wonderful opportunity for the Loki team to not only better understand the operational environment and needs but also to introduce the impact of disruptive non-kinetic effects to the battlespace."

Timothy Ringwald, a Loki Effects Technician at NSWC Crane, was part of the first team.

"We were thinking, what do we have that fits the need? There's no need to reinvent the wheel," says

Ringwald. "During the process, the Marines may see something they are missing and could gain new knowledge about other potential applications."

Katie Parkes, the Loki Effects Lead Engineer at NSWC Crane, was also on the first team. She says WDC is a valuable way to hear about how the warfighter would use the technology in practice.

"It's good to have many perspectives with a lot of different knowledge in the room," says Parkes. "Having the warfighter in the room helps us understand the challenges the warfighter experiences, antennae types they carry or don't carry, and what we can do to fix the problems. We typically have

limited exposure to them—and it's not a direct process. For the Marines, they don't know what to ask for if they aren't connected to us—their ideas evolved over the week too."

The second team worked on developing more robust software which could implemented with Team 1's prototype. Thomas Buetow, a Radio Frequency (RF) Applications Engineer at NSWC Crane, worked on developing a jam-detection algorithm.

"We asked, 'How do we know we are being jammed?'—we were focused on making sure the prototype doesn't show false positives and false negatives," says Buetow. "It's important to not have false positives so that a jam-detection is accurate and people pay attention to it. If the device always says you're being jammed, the warfighter loses confidence. We worked with the warfighters to determine

the percentage of bias needed that would result in unacceptable communications."

Greg Fleizach, an Engineer at NIWC Pacific, was on Team 2 and assisted in creating a robust algorithm.

"It is fantastic to have the undivided attention of warfighters during the problem definition and prototyping phase," says Fleizach. "To hear their perspective and specific pain points, and then being able to immediately ask follow up questions is huge. It is really invaluable to be able to shorten the feedback cycle so dramatically. It was interesting to work toward a common language since we are coming at the same concepts from different directions. The Marines in this event have tactical expertise and practical knowledge that you can't read about in a textbook. I think my digital signal processing and RF experience was helpful in defining the problem and focusing on potential solutions. It's a pleasure to work alongside experts from a wide array of fields and organizations that need to be involved to make a working prototype."

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Nicholas Montgomery, an Engineer at NSWC Crane, was on the third team working on the user-interface.

"The prototype was developed with lights at the top, traffic light-style," says Montgomery. "That is useful for the warfighter to determine at a glance if he is being jammed. What we are doing is developing a screen that provides more information. The light gives immediate information; the screen provides more information, such as values, the type of jam taking place, and explains why you have the light."

Rondia Mack, an Engineer at NSWC Crane, worked with Montgomery on the third team.

"The screen looks like a computer monitor," says Mack. "It has familiarity to the user, like a phone screen."

Being able to detect malicious jamming or simple interference on the spectrum is a challenge many Marines face.

"There are thousands- of RF emitters on the modern battlespace, especially as we talk about the future and operations in the littorals and near urban areas," says Parsley. "Understanding the electromagnetic domain, at a glance, and at the most forward deployed unit is crucial to both future and current operations."

By the end of the week, the team developed the PMP (Propagation-Interference Monitoring Platform) prototype. The PMP prototype can toggle between frequencies and identifies electromagnetic interference above a specific threshold. LED lights on the prototype light up to signal frequency recognized above the noise floor threshold. The LCD screen provides more in-depth details about the detected frequency that can be programmed and stores data that can be downloaded at a different time.

"I've never been to an event like this," says CWO2 Krahnke. "I'm super thankful to be here and work through the problem; everyone here was professional. Having the ability to network at WDC with the SMEs has been beneficial. The technical experts created a level-setting environment, which was fantastic. More people need to know about what Crane is capable of doing; more people need to know how to use the capability at Crane. Seeing the other projects people are working on and the future applications of the networking portion—I plan to stay in contact."

The Office of Naval Research TechSolutions program at WDC

ONRG TechSolutions is a program that allows sailors and marines to directly submit challenges they face in the fleet and find solutions. Tami Relph, the Deputy Director for ONRG TechSolutions, says it was interesting to see how the week transpired.

"This Warfighter Driven Challenge really embodies ONRG TechSolutions mission, connecting the warfighter with technical experts to rapidly produce prototype solutions," says Relph. "It was very exciting to watch this process unfold from Day 1, where the problem space was beginning to be explored and understood, through initial prototype development over the next few days, to an actual prototype on-hand by Day 5. As the week progressed, the WDC clearly showed the value of bringing warfighters and technical experts into the same room to discuss a specific problem set and then generate a prototype solution real-time."

Relph says WDC has been an important avenue to finding a solution to this challenge.

"This event is important to TechSolutions, not only to develop a much-needed prototype solution for the Marines that can quickly sense the electromagnetic environment and identify congested or contested communications, but also to see how we can use or adapt Warfighter Driven Challenges to enhance the TechSolutions program and get the right solutions to the warfighter faster," says Relph.

For more information on ONRG TechSolutions, visit this website.

Out of the lab and into the field

In July 2022, several WDC participants traveled to Camp Lejeune in North Carolina to test the PMP prototype at a II MEF Hide-and-Seek-Exercise (HSX). The ONRG TechSolutions Director, Jason Payne, attended the event along with Parsley, Ringwald, and Parkes.

"TechSolutions' mission is to understand warfighter technology needs and to have a solution provider deliver a prototype within 12 months. In this case, the NSWC Crane team delivered in half that time and delivered not just a prototype, but a parts list and software package for Marines to recreate their own prototype, wherever and whenever they need it," said Payne. "By enabling these warfighters and technologists to mix it up at WDC for a week, Marines now carry new knowledge and capability forward and into the field."

An additional capability was added to the PMP in the few days leading up to the HSX event – the ability to use a directional antenna to interrogate a certain sector. This addition proved invaluable to the Marines as they performed Own-Force Monitoring (OFM).

"We were eyed somewhat suspiciously as a bunch of civilians walking into the landing zone that was the exercise venue," says Parsley. "But we were warmly welcomed by Marines once it became clear that we were bringing a capability to the field that hadn't existed before. The PMP became an instant "toy" for the Marines to try out, useful not only in detecting EMI and potential jamming, but also as a tool for OFM, that is, understanding the spectrum emissions emanating from the Marines themselves."

Parsley adds that the PMP is not yet a field-able capability.

"But it's a start, and it's a low cost capability that the Marines could probably even build themselves," says Parsley.

The NSWC Crane WDC team also met with the 2nd Intelligence Battalion. Parsley says the Marines in the shop were shown the COTS components, design, and layout of the prototype PMP.

"We agreed that the Marines in the shop could easily recreate the capability if given the list of components and brief instructions on how to assemble it," says Parsley. "The final component is the software that the Crane team developed. Plans are in place to run a trial by which this novel tech transition process of going straight to the warfighter, puts a prototype capability in the hands of Marines for them to experiment further with, both the refine requirements and to prove out how low-cost, COTS technology can be leveraged quickly for warfighting needs." ■

BUILDING ENDURING ADVANTAGES

"Building enduring advantages for the future Joint Force involves undertaking reforms to accelerate force development, getting the technology we need more quickly, and making investments in the extraordinary people of the Department, who remain our most valuable resource."

-NDS Factsheet, 2022, p. 2

NSWC Crane places in HACKtheMACHINE Unmanned, leverages prize challenge to develop cybersecurity workforce pipeline

January 2022

CRANE, Ind. –
Technically diverse teams from Naval Surface Warfare Center, Crane Division (NSWC Crane) competed and placed third and fifth in a virtual technology prize challenge. NSWC Crane competed against teams across the country in HACKtheMACHINE from The Dimension Mill coworking and entrepreneurship center in Bloomington, Indiana on November 16-19.

Dr. Nate Husted, a Chief Scientist for Cyber and Electromagnetic Technologies at NSWC Crane, participated on the third-place team.

"Our success is certainly something that wouldn't have been possible without the junior team members," says Dr. Husted. "Many of those folks brought us the win with their excitement and enthusiasm. The students put most of the points on the board—they were scrappy, passionate about the topic, and have great skills."

HACKtheMACHINE is a technology prize challenge that focuses on discovery and teambuilding between the U.S. Navy, industry, and academia to create solutions and capabilities for the Fleet. Sponsored by the Office of Naval Research (ONR), this

challenge offered three tracks for teams to compete—each track focused on different technology: Hack the Pilot (Cyber), Detective Bot (AI/ML & Data Science), and Top Model (MBSE).

NSWC Crane had twenty people on two teams competing, including team members ranging from Chief Scientists to college students. Employees who participated represented Crane's three mission areas as well as its Information Technology Department. The team that placed third competed in the cybersecurity track, Hack the Pilot.

Dr. Austin Roach, a scientist at NSWC Crane, has participated in HACKtheMACHINE events since NSWC Crane started participating in 2018. Dr. Roach says that the first year they didn't

know what to expect from the challenge.

"We've learned that by increasing the technical diversity of the teams, we are well prepared to tackle the challenge," says Dr. Roach. "People bring different backgrounds and expertise, like in hardware and software security, so even though we encounter new systems we can come together, be productive, and be successful."

Dr. Husted says the success shows NSWC Crane has a workforce with cyber skills.

"This shows Crane has clear cyber domain capabilities," says Dr. Husted. "People look at the news and they see other organizations relating to cyber security—they may not think 'Crane.' It's not just about compliance-checking. We have great cyber capability and talent and the skillset used here is the skillset needed in the future to perform cyber-related test and evaluation. Crane is ready to provide future cyber needs for the Navy."

For this Unmanned challenge, NSWC Crane used Naval Innovative Science & Engineering (NISE) 219 funding to support participation. Nicholas Amadio, an Electronics Engineer at NSWC Crane, organized the NISE 219 funding and was the Principal Investigator (PI) for the NSWC Crane teams to compete in HACKtheMACHINE. Amadio says this event provided team members with valuable perspective they can bring to their efforts supporting the warfighter.

"Cybersecurity touches all technical areas and it was valuable for participants to get their hands on something they are able to 'hack,'" says Amadio. "An adversary is doing that at all times. This event helps people understand that it is important to follow and execute cybersecurity processes."

The National Defense Strategy states the importance of cyberspace as a warfighting domain, stating investments are critical for "cyber defense, resilience, and the continued integration of cyber capabilities into the full spectrum of military operations."

Dr. Robert Templeman, a Senior Scientific Technical Manager (SSTM) for NSWC Crane and Naval Sea Systems Command (NAVSEA) Distinguished Engineer for Cybersecurity, participated in the event. Dr. Templeman says the challenge was more realistic and more like real-world challenges—it was also a great fit with NSWC Crane's technical expertise.

"One track challenge was a bug bounty—they said to find the bugs in the commercial drone system, but were there zero, one, or 100?" says Dr. Templeman. "We were able to dive into the challenge which reflects how we would attack a real-world problem. If we want to secure all the systems we support, our team needs to see different perspectives and ways to do things."

The challenge tracks covered high-priority technology areas for the Navy. Hack the Pilot was a Maritime Cybersecurity challenge to test a simulated autopilot system for an unmanned vehicle. Detective Bot was a challenge to develop data science, artificial intelligence (AI), and machine learning (ML) tools to sort benign or malicious data. Top Model was a challenge to create model-based definitions of requirements that can be tested against system models in unmanned mission simulations.

Dr. Roach says the structure of the event creates interest in some of the Fleet's biggest challenges.

"The Navy wants secure systems," says Dr. Roach. "The event is a good way to introduce people to these systems and build communities of interest around them."

NSWC Crane competed in the first HACKtheMACHINE challenge in Seattle in 2018 and placed fourth in the cyber track in the 2019 event. Amadio says the event is an opportunity to develop the workforce and network with military, academia, and industry.

"Networking and mentoring are tangible outcomes from the event," says Amadio. "Connecting with military commands is mutually beneficial to share knowledge. The event helps students see that the Navy has interesting problems to solve. Also, the event helps employees who may not always see the end results of their day jobs designing for cybersecurity and securing systems."

Dr. Templeman says the event provided teams several opportunities.

"The greatest benefit is workforce and professional development," says Dr. Templeman. "A lot of training is not very engaging; there's no future application of knowledge. The training here is immersive and powerful. Every single person learned something."

Dr. Templeman adds the event is great at cultivating an innovative workforce.

"Participating also has a positive benefit on our culture," says Dr. Templeman. "It was a good and fun way to bust out of our comfort zones, work with others through mentoring, establish professional relationships, and extremely rewarding for the teams. Removing barriers and giving people access to these opportunities are important; we have good people who we need to let them do these sorts of things."

Dr. Husted says more events like HACKtheMACHINE are a great way to engage the workforce and external organizations.

"I'd love to see the Navy create more activities like this—you have an SSTM sitting in the same room as chief engineers and junior employees...all collaborating, communicating, and building a community all in one place," says Dr. Husted. "It's a way to learn and grow in ways you otherwise might not be able to." ■

March 2022

NSWC Crane to Offer Navy Technology for Commercial Applications

BLOOMINGTON, Ind. –
Naval Surface Warfare Center Crane Division (NSWC Crane), in collaboration with The Mill, Dioltas and the Defense Entrepreneurs Forum (DEF) announced the launch of the PROPELS Accelerator. PROPELS offers teams of academics, entrepreneurs and small businesses an exciting opportunity to commercialize patented government technology.

"Employees at NSWC Crane have invented some amazing technology, and while it's great for the Navy, we believe that there are other use opportunities that can be explored," explained Jenna Dix, Director of Technology Transfer at NSWC Crane. "We're excited to see what kind of commercial applications can come from government-created tech."

The new program will kick off with a Tech Expo at the Mill on April 14. NSWC Crane scientists will present the tech–what it is and how it's being used by the Navy. Some examples of government-invented technology that will be showcased include: long-range heat detection, machine learning for "cleaning" data, assistive devices for low-light emergency response, and drone tracking technology.

Participants will then select one of the showcased technologies and develop a commercialization plan for a new product or platform during the six-week PROPELS Accelerator program that runs from May 4 through June 17.

"The Mill's mission is to launch and accelerate startups," said Pat East, Executive Director of The Mill, "and the technology at Crane provides an exceptional opportunity for entrepreneurs. PROPELS bridges the gap between cutting-edge innovators in the public and private sectors."

Supporting the accelerator program are Dioltas, a defense-disruptive technologies consultancy, and the Defense Entrepreneurs Forum, a non-profit organization that promotes innovation in the national security community.

"This is exactly the type of event that will help introduce the Navy and its tremendous research and development capabilities to entrepreneurs looking for great new technologies," said Mike Dodd, Dioltas Advisory Board Chairman. "We applaud NSWC Crane for their proactive approach to connecting with the business community."

"At DEF we strive to break down barriers that often keep the government closed off from commercial entities," said Heath Murray, Bloomington DEF Agora Lead. "PROPELS is the kind of event that not only breaks down those barriers, but also plants the seed for many future connections between entrepreneurs and the Navy."

At the conclusion of the event, participants will be invited to pitch their ideas and compete for prizes at the Radius Indiana Crane Intellectual Property (IP) Defense Innovation competition.

Learn more here about the PROPELS Accelerator.

Register here for a March 28 virtual informational session.

Register here for the April 14 in-person Tech Expo at The Mill.

The deadline to apply to participate in the 6-week PROPELS Accelerator is April 22.

The events are free, and complimentary hors d'oeuvres and drinks will be provided at the Tech Expo.

MEDIA CONTACTS:

Pat East, Executive Director of the Mill, pat@dimensionmill.org, 317-965-2155

About NSWC Crane:

NSWC Crane is a naval laboratory and a field activity of Naval Sea Systems Command (NAVSEA) with mission areas in Expeditionary Warfare, Strategic Missions and Electronic Warfare. The warfare center is responsible for multi-domain, multi-spectral, full life cycle support of technologies and systems enhancing capability to today's Warfighter.

About The Mill:

The Mill is the heart of southern Indiana's entrepreneurial ecosystem and its largest coworking space. The Mill's mission is to spark Bloomington's innovation economy by launching and accelerating startups, and its vision is to become Indiana's center of gravity for entrepreneurship.

About Dioltas:

Dioltas is a global firm dedicated to providing design, implementation processes of superior technologies and next-generation security solutions to governments, global corporations, and organizations. Dioltas advises public and private clients on all facets of business strategy, planning, development, management, marketing, directorship, and obtaining access to capital markets in exchange for equity stakes in the companies and/or management fees.

About DEF:

The Defense Entrepreneurs Forum (DEF) exists to inspire, connect and empower people committed to US national security through convening events, forging partnerships and delivery of tangible solutions. DEF does this in order to promote and enable a culture of innovation in the US national security community. DEF is an independent, 501(c)(3) registered, non-profit. ■

NSWC Crane SEAP and SSEP intern competes at ONR HacktheMachine Crane Corporate Communications

March 2022

Julia Garrard started working at NSWC Crane as a summer intern in high school through the Science and Engineering Apprenticeship Program (SEAP). She works at NSWC Crane while pursuing a degree from Indiana University (IU) full-time for four years through the co-op STEM Student Employment Program (SSEP).

Last fall, Garrard recruited another IU student to participate in the HACKtheMACHINE: Unmanned competition. She says the team consisted of people from various technical backgrounds across NSWC Crane.

"The HACKtheMACHINE: Unmanned competition was a week-long combination Bug Bounty and Capture-The-Flag (CTF) national competition," Garrard says. "As a team, we were tasked with hacking the military's emerging unmanned pilot systems to discover new exploits and create high-end solutions to address these vulnerabilities. These solutions are directly integrated and utilized throughout the Navy."

She says her team placed third against other highly-competitive teams from industry, academia, and military.

"As a team, we were tasked with hacking the military's emerging unmanned pilot systems to discover new exploits and create high-end solutions to address these vulnerabilities," says Garrard. "These solutions are directly integrated and utilized throughout the Navy. In this competition, it was a black box situation in that we had no previous knowledge or intelligence of the system. In order to be successful, we had to be creative and innovative in our attacks, which required us to map out the integrated system components, conduct code analysis and reverse engineering, and investigate and understand the communication protocols between machines."

She says the event was challenging but worth the effort.

"My previous work has prepared me for such physical demands and technical challenges, as projects that deal with protecting the warfighter demand extra effort to complete our mission. Thus, on top of being a student, I was working 8+ hours a day on this competition. Moreover, it was a very collaborative and team-based environment, which again, is something I really enjoy. It required all skills our team members could muster to find innovative solutions and successfully apply them. I like critical thinking and developing new solutions, especially when it means I am keeping others safe with such developments.

Garrard says her experience in the STEM program led to further interest in those fields.

"When I first started at Crane, I was not originally working in Cybersecurity. I was very fortunate in that they were more than happy to allow me to 'experiment' with different substantive areas until I found the one that I really liked. I am really engaged with the branch that I am currently in, as it has provided me the opportunity to work on a lot of interesting and cool projects. I credit my Crane coworkers with nurturing my technical skills and professionalism. Specifically, my manager has given me the opportunity to prove myself and a platform to showcase my skills to Crane and our partners. I love the work I do at Crane, and the saying, 'It takes a village,' is undoubtedly true. People at Crane really do care about developing their young professionals and have a lot of resources to help you." ■

NSWC Crane STEM Program partners with S2MARTS to host 38th Annual Science and Engineering Fair

April 2022

CRANE, Ind. –
Naval Surface Warfare Center, Crane Division (NSWC Crane) held its annual youth Science and Engineering Fair virtually for more than 200 regional students from April 4 – 8. The NSWC Crane Science, Technology, Engineering, and Math (STEM) Program organized the 38th Annual Science Fair with a partner organization S2MARTS for Junior and Senior High School students.

Tina Closser, the STEM Program Director, says the event was a success.

"This year, we partnered with the S2MARTS team, who sponsored the prizes, on the annual STEM Science Fair," says Closser. "The STEM team, NSWC Crane scientists and engineers, and S2MARTS personnel participated as judges on the projects. It was great to see the students and how they creatively tackled projects."

Participating students grades six through 12 submitted 120 science and engineering projects covering a wide range of STEM area. Students came from six regional schools, including students who are homeschooled. Closser says hosting a virtual event for the second year was a way to maximize reach of regional students for this year and for future STEM Science Fairs.

"The virtual event enabled us to reach many students who might have not been able to get here in person. We do hope to have an in-person event next year."

The NSWC Crane Science and Engineering Fair is one of the events organized by the STEM Program, which is a program that aims to provide STEM-related educational opportunities to regional students from kindergarten to high school seniors. Annually, the program serves approximately four thousand students with engagement opportunities such as field trips, summer camps, and a science equipment lending library. ■

Jr. Division -

1st place - Cormac Duffy-Paiement and Eullan McLaughlin, 7th grade homeschool students - Project: Can Greenhouses Heat Homes?

2nd place - Greta Dunigan and Bryar Weddle, 7th grade students at Bloomfield Jr. High School - Project: What soap cleans coffee better?

1st place - Engineering Design - Roland Davis and Luke Ingram, 6th grade students at Salem Middle School - Project: Automated Plant Waterier

Sr. Division -

1st place - Reagan Weisheit, 8th grade student at Jasper Middle School - Project: Cover Crops - Conserving Our Future

2nd place - Abigail Burkart 9th grade student at Eastern Greene High School - Project: How do different mediums change the speed of light?

NSWC Crane graduates first student in Cranfield, Purdue engineering master's program

June 2022

CRANE, Ind. – The first Naval Surface Warfare Center, Crane Division (NSWC Crane) employee has graduated from the Defense Engineering and Technology Master's Degree program delivered jointly by the United Kingdom-based Cranfield University and Indiana's own Purdue University. The collaboration between Cranfield and Purdue Universities was formalized in 2018 to provide a tailored, advanced degree for the Crane workforce.

Figure 1: Now dual-degree graduate Ryan Ubelhor reviews information on the range in 2017Ryan Ubelhor, Chief Scientist of the Munitions Evaluation and Testing Laboratory at NSWC Crane, was the first to graduate from the program in December of 2021. Ubelhor started the program when it began in Fiscal Year (FY) 2018 and says the program was very beneficial.

"The experience was eye opening, challenging, and rewarding," says Ubelhor. "I was not itching to go back to school, but when the classes are very work-related it's hard to say no. It's a very tailored program to an active workforce with concepts that were interesting. The instructors have a clear priority that the students learn the topics and apply as closely as possible to their existing work areas. I received a window into the design or use of a defense technology normally outside my working experience."

Figure 2: Adam Parsley speaking at the Memorandum of Understanding signing ceremony, 2018Adam Parsley, a Chief Engineer on the Expeditionary Warfare Department staff at NSWC Crane, has been part of organizing this collaborative effort since its inception. Parsley says it is meaningful to see the students' efforts throughout their time in the program.

"It's really gratifying and validating to see the work and investment that we've put into the planning and execution of this Defense Engineering & Technology MS program finally come to fruition," says Parsley. "I can be impatient sometimes, but a degree is not something you turn out overnight. Crane started its investment into this program in FY18, and we are finally seeing the rewards in terms of degrees earned. Not only that, but I'm also super proud of the time and energy that each of the students have put into the program – it's no cake walk, as I'm sure they can attest."

Figure 3: Purdue University Data Mining Cohort, July 21, 2021

STEM education designed for an expeditionary workforce

The National Defense Strategy (NDS) states the importance workforce development and cultivating a high-quality military and civilian workforce. It states mission success relies on more than technology, but that it "depends on the ability of our warfighters and the Department workforce to integrate new capabilities, adapt warfighting approaches, and change business practices to achieve mission success." It also states the Department will continue to "explore streamlined, non-traditional pathways to bring critical skills into service" alongside highlighting partnerships with universities. The Personnel and Readiness Strategy for 2030 outlines that cultivating a technologically advanced military and civilian workforce will ensure national security. The Department of Defense (DoD) STEM Strategic Plan also states the importance of "sustaining engagement of DoD professionals in STEM fields in workforce development programs."

Figure 4: Students taking part in a Cranfield course, 2019Cranfield is a postgraduate university that offers specialized programs in defense engineering while Purdue offers a variety of globally-recognized programs across engineering and technology disciplines. This workforce development initiative provides courses developed for defense related technologies and applications, which is something not typically offered in academic curriculum.

Parsley says there are many ways that the Defense Engineering master's program is unique, including rapidly increasing access to critical knowledge of many defense systems.

"The course is a huge accelerator in getting our technical workforce to the cutting edge of knowledge and research in defense-related technologies," says Parsley. "The degree is designed to take students into great depth, very quickly, into fields that aren't typically touched in undergraduate studies. For example, the Fundamentals of Ballistics course, which I took as a short course, greatly accelerated my knowledge of ballistics and gave me an expansive list of resources to reference for further research. This type of knowledge is typically very concentrated at a DoD lab, is not often packaged for knowledge-transfer, and takes years of osmosis to pass from one individual to another. What we're doing helps to compress

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>> NSWC Crane graduates...

that from years to weeks and months."

Amber Hoffman, the Academics and Succession Planning Lead for Workforce Development at NSWC Crane, was involved in making this dual degree program a success. She says this approach for this program was different.

"When Adam came to me with the concept of this degree program and the format we hold it in, I was thrown for a loop," says Hoffman. "In the past and currently for most cohort programs we organize, they are on a set schedule with employees taking all course together until graduation. This program allows employees flexibility and freedom of choose some of the courses they want to take. The goal is to offer about five classes per year and give employees the ability to select the classes they want to take over the course of approximately three to four years to earn the degree. This approach is truly unique. Employees are in the driver seat for their education that is aligned to the mission of NSWC Crane and the Navy."

NSWC Crane's Expeditionary Warfare mission area consists of hundreds of engineers, scientists, and technicians who equip the most elite warriors for the combat environment. They are focused on intelligent solutions for the expeditionary warfighter providing enhanced detection, decision making, and engagement capabilities in an integrated environment. With more than one million square feet of office, laboratory, and test ranges, Crane provides a distinct advantage in sensors, communications, power and energy, mobility, specialized munitions, and weapons.

Expeditionary missions can involve multiple services, joint forces, or special operations—which often include a wide variety of systems that communicate to each other. The Chief of Naval Operations NavPlan 2021 states how the Marine Corps' focus on fielding a naval expeditionary force is a method to maintain security at sea: "By delivering mission-critical capabilities from expeditionary advanced bases, the Marines provide more vectors of attack to deter and ultimately defeat adversary aggression."

Ubelhor says the unique programming catered to expeditionary needs is beneficial to employees in a wide variety of roles.

"After getting their feet wet, this program allows them to focus, really focus, on the defense sector," says Ubelhor. "This brings students into the military problem set which is highly beneficial to the workforce. It is something that would be significant to someone just starting or someone more established in their career. Most of my job at Crane is dealing with the details, and this program helped me see the bigger picture about how these details impact the life cycle of the system."

Carina Rankinen, an Engineer at NSWC Crane, is a military spouse and employee working from NSWC Carderock. Rankinen is planning on graduating from the program at the end of this year. Rankinen says the program fit well with her experience and role.

"I have broad engineering experience in Navy, Army, and within the special operations community," says Rankinen. "This MS helps you be a jack of all trades. Most Master's degrees are used for people who want to get more specific in a discipline. This program was a phenomenal opportunity because it provided a bird's eye view of expeditionary technology across the Navy and British defense systems. It teaches analytical thinking—thinking laterally. It helps to better understand the evolutionary process and design approach in developing expeditionary weapon systems. As opposed to what you learn as an undergraduate engineer, this program teaches practical application."

Jonathan Kidner, an Engineer at NSWC Crane, will complete the program next year and says the class has been useful.

"This class was right up my alley and will allow me to do my job better," says Kidner. "Many engineers work having in-depth knowledge on a specific system or confined topic, focusing on a system environment or domain. I work on system of system engineering; can system A talk to system B? It's a mile wide and an inch deep—more of a workable knowledge of the overall problem which has helped me be able to communicate and translate between different technical groups. The breadth is unique—you wouldn't learn this outside of defense schools. For instance, with multi-domain systems engineering, if there is a new widget needed, you need the technical knowledge of the various systems."

Students enrolled in the dual MS degree are completing the courses and working full time—they also adapted to a virtual environment during the remote framework surrounding COVID-19. Ubelhor says the balancing the program with workload was challenging but worth the effort.

"We are all still working full-time," says Ubelhor. "In a virtual environment, it can be harder to have direct feedback on your work. You have to be assertive when you need help—but the help is always available. I would tell someone considering the program to 'just do it.' The goal of the instructors is to teach you; they'll work with you. Their goal is for you to learn this material."

Equipping the S&T community with knowledge needed for rapid innovation

The NDS also states the change in the global security environment—and how this change is different than previous decades of peacetime. The military faces "an ever more lethal and disruptive battlefield, combined across domains, and conducted at increasing speed and reach," further impacted by the "rapid technological advancements and the changing character of war."

The program provides students with specified knowledge on the systems they work with, or may work with, to tackle future warfighter problems. Rankinen says the program also increases process efficiency in order to solve difficult challenges.

"These skills are crucial due to the nature of threats today," says Rankinen. "We need people who understand the breadth of knowledge this program provides. Through the knowledge gained from the program, you get better cross-team discussion with capability development that is more efficient. This helps us move quickly—which is critical with expeditionary systems."

Parsley says the impact of this program extends beyond NSWC Crane.

"The impact manifests itself in a couple of different ways," says Parsley. "First, in the program itself, we have set a model for a custom-built MS program that I know is being looked at from other DoD Activities. We've had NSWC Corona, MARCORSYSCOM, and the Army participate in our courses, with continued discussions with the likes of NSWC Indian Head on future participation. Then we have the individuals themselves, and the accelerated and in-depth expertise that they garner in these focused, defense-centric courses."

Rankinen says the program is a force multiplier for teams.

"I love learning and I think personal growth is an important thing to strive for," says Rankinen. "Every day is a new experience and adventure. I loved how the classes built on each other. I would not have known what I know now about many systems without this course. And the program benefits not just those in the program, but also those surrounded by graduates. It is a great way to see what the bigger picture is, bring it back, and apply it to anything you do in the workplace."

Figure 6: Ryan Ubelhor as a Navy Research Enterprise Internship Program (NREIP) Intern, 2004. Also pictured: Dr. Jason Jouet (Director of Munitions Technology OUSD(R&E)), Dr. Suhithi Peiris (Recently Retired Senior Scientist, Munitions Directorate, Air

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>> NSWC Crane graduates...

Force Research Laboratory, Eglin Air Force Base, Florida), Rear Admiral Jay M. Cohen (ret), as well as other interns and Warfare Center scientists.Ubelhor holds multiple patents related to calorimetry and analysis tools utilized for thermal analysis of energetic or destructive events. He collaborates with government agencies, universities, and industry for thermal analysis and predictive surveillance of specialized munitions as well as energetic materials. Ubelhor is a board member of the International Heat Flow Calorimetry Symposium on Energetic Materials, which is an international society of researchers related to his field and was held at NSWC Crane in 2017. He is part of the North Atlantic Treaty Organization (NATO) Energetic Materials Characterization working group and as team lead, he facilitates technical and political discussion for the U.S. section regarding the concerns, tests, and data requirements for monitoring the ageing of energetic materials and devices.

Figure 7: Ubelhor pictured in front of National Aeronautics and Space Administration (NASA) Space Shuttle Endeavour in 2012Ubelhor is also part of NSWC Crane Science and Technology (S&T) working groups and strategic areas, which includes workforce development initiatives. These groups include subject matter experts in different S&T areas who work toward future capabilities. He says the program has provided an opportunity to develop future paths for collaboration.

"The S&T groups help me see what other teams work on at NSWC Crane," says Ubelhor. "Equipped with more broad knowledge and meeting more people in the program, now I know who I can reach out to and about capabilities at Crane. This will help me pull in experts to collaborate on future projects. The opportunity to grow outside of my specialty area is invaluable.

It helps me understand the needs and point of view of a larger customer base. The program has also opened doors for future education and collaboration with Purdue and Cranfield researchers."

Rankinen says learning alongside coworkers and motivated employees across the Department of Defense has been valuable.

"Networking with the other students has been wildly beneficial, especially as a remote employee," says Rankinen. "The classes are filled with nice, driven, and enthusiastic people. One of the other benefits of the education is that we are empowering individuals to find answers to difficult problem sets."

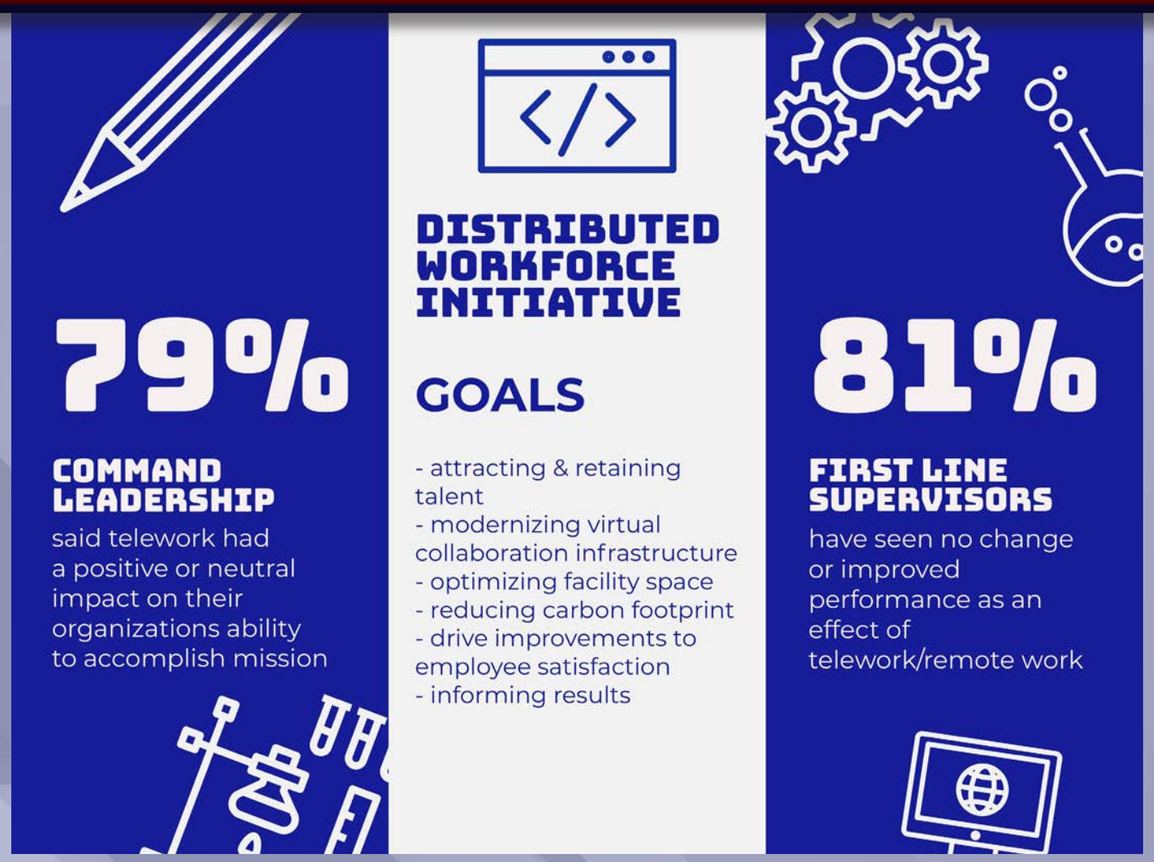
Future opportunities of the dual degree program

The program itself also offers employees access to individual courses per their interest without participating in the entire Master's Degree program. Parsley says the program continues to expand, with a possible cohort announcement later this year.

"We currently have around 25 members of the cohort, and they get first dibs at participation in a given course," says Parsley. "Then we open it up to the rest of the Command. These courses can also be taken as short course, for knowledge building in a certain area. So when we have Energetics related courses, we might see a surge in participation from our Specialized Munitions or Weapons Divisions; and when we have a Cyber course, perhaps from the C3I & Cyber or Expeditionary Electromagnetic Warfare Division."

Ubelhor says he has taken advantage of these courses.

"This has been great at opening doors," says Ubelhor. "The best part of the uniqueness of the program is it continues to develop and there are courses they continue to offer. Both universities are in ongoing discussions about organizing courses that are useful for what Crane does and what future Crane will do. They are always adapting to future workforce needs. Though I have completed the program, I am anxiously awaiting new course announcements as they come out." ■



NSWC Crane hosts Department of the Navy human capital leadership for in-depth distributive workforce study

August 2022

CRANE, Ind. –
Naval Surface Warfare Center, Crane Division (NSWC Crane) hosted a team from the Department of the Navy (DoN) Human Capital Strategy (HCS) Program Management Office (PMO) for their first visit on a Navy-wide Distributed Workforce (DW) study. The DoN HCS team visited Crane from June 28 through 30 and aim to share study results later this fall.

Jim Hardin, the DoN Civilian HCS PMO in the Assistant Secretary of the Navy Manpower and Reserve Affairs, and an accompanying team met with several different groups at NSWC Crane for a three-day visit to gather information for Phase II Initiative of the DW study. Hardin and the team are made up of Human Resources (HR) professionals and other related subject matter experts (SME's) from the Distributed Workforce Initiative at HCS headquarters in Washington, D.C. The DW study is being conducted with four different Navy or Marine Corps commands.

Hardin, who previously served as the HR Director at NSWC Crane, says the team is gathering data from NSWC Crane to learn and develop DW guidance for the future.

"Through these studies of various commands, including NSWC Crane, we will develop Navy-wide guidance, tools, and templates for commands," says Hardin. "We will use the details and information from this study to develop criteria to define what level of telework different roles can use. We will focus on positions and not the person."

The DW Initiative is a HCS effort aimed at understanding the unique HR, facilities, and information technology (IT) challenges and solutions to create a mission-focused DW model that is adoptable DON-wide.

Garry Wieneke, the Corporate Operations Deputy Department Director at NSWC Crane, says it was exciting to be the first site that the DW Initiative team chose to visit.

"As we emerge successfully from health conditions related to the COVID-19 pandemic, their time at NSWC Crane will help the DoN understand how to implement a distributed workforce long-term," says Wieneke. "Work is different now—and this is a good opportunity to highlight best practices regarding Distributed Workforce. Every person who works for the Navy could be impacted by the efforts taking place with this initiative."

Hardin says this visit launched Phase II of the overall study, which is more in-depth than information gathered previously in Phase I. Phase I focused on defining work and skills needed to understand what needed to be onsite and what could be remote.

>> NSWC Crane hosts...

"NSWC Crane was the first command we visited and was selected because they do a good job in the way they select the work they do," says Hardin. "Phase I of the study consisted of assessing the workforce post-COVID-19, people's thoughts about telework, and in what situations jobs can be done off-site. There is a need for guidance for commands to have objective criteria to make determinations about distributed workforce. What we are doing is the Navy's medium and long-term approach to help commands make decisions wisely."

The three-day visit consisted of an analysis of remote work, telework, and distributed workforce study, and a workshop to develop an organizational model. The analysis covered broad subject areas at Crane, including technical, HR, and IT teams.

Since March of 2020 due to the COVID-19 pandemic, many federal employees—along with many other roles in industry—have worked remotely. Hardin says the team is facilitating a broader movement.

"There is a huge cultural shift that is taking place—post-COVID, it's not the same," says Hardin. "Since 2021, the Navy has been looking at these efforts. Fifteen-thousand military and civilian supervisors were surveyed and more than 80 percent said telework had either no impact or a positive impact on productivity and culture. The cultural shift and DoN goals make this DW Initiative critical and essential."

Goals of the DW Initiative include attracting and retaining DoN talent, modernizing virtual collaboration infrastructure, optimizing the use of facility space, reducing carbon footprint, driving improvements in employee engagement and satisfaction, and informing Workforce Task Analysis and Position Management. Other federal agencies are also working toward DW initiatives.

The study and follow-on efforts, Hardin says, will help commands make informed decisions as the Navy encounters DW decisions.

"People are wondering what unintended consequences might be if remote work remains," says Hardin. "But, there are also fears of attrition. We can use this study to better understand and mitigate associated risk. For instance, managers fear losing 'water cooler' collaboration and innovation opportunities in the office—but there are ways to replicate those virtually. This is a joint military and civilian effort; we're all sharing what we're doing."

Hardin says there are significant examples of human ingenuity with innovative teams collaborating from different locations.

"If you think of Apollo-13, there were astronauts in space and scientists and engineers in various cities in the United States that worked together to bring them home," says Hardin. "Collaboration can be done virtually, and with the technology we have today there's no reason why we can't." ■

NSWC Crane collaborates with Warfare Centers to build dual-use data processing tool, rapidly transitions for industry

December 2022

Crane – Naval Surface Warfare Center, Crane Division (NSWC Crane) collaborated with NSWC Corona, and NSWC Port Hueneme to build a data preprocessing tool that can be leveraged by the Department of Defense (DoD) as well as industry. Through the Technology Transfer (T2) program, the technology was a cornerstone of the PROPELS 2022 program, which led to several teams proposing commercial market opportunities during the Radius Indiana Pitch Competition. During the week of October 17, the first patent license on the technology was finalized.

Hubert Goodman, Director of HG Asean Invest (HGAI), licensed the tool. He says he saw value in licensing the data preprocessing tool after learning about it at PROPELS and talking with one of its inventors.

"Over the course of my career, I have personally spent significant time preprocessing data for analytics," says Goodman. "I know that there is a market for data scientists and others working in analytics. HGAI intends to leverage the tool as a solution that can create value from raw data to enhance an organization's capability with modern data. The tool can be used to automate data cleaning, explore and investigate data, design and transform data, produce information outputs."

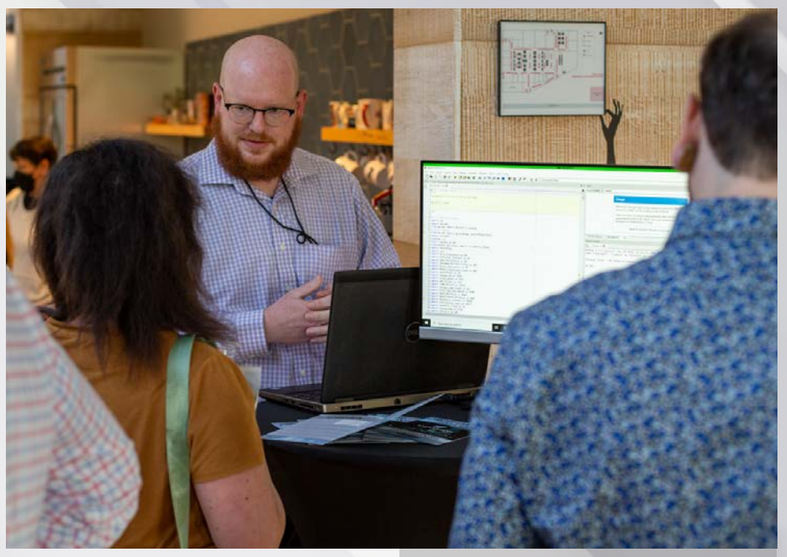
The NSWC Crane T2 Program patent portfolio includes more than three hundred patented technologies that are available for entrepreneurs, start-ups, and companies to license. The PROPELS accelerator was a program co-hosted by The Mill and NSWC Crane that guided participants through the process of building a business based on government intellectual property (IP). PROPELS participants were then invited to participate in the Radius Indiana Pitch Competition with their business ideas.

Annie Bullock-Yoder, an IP and T2 Specialist at NSWC Crane, says these programs can be leveraged to build economic impact.

"The PROPELS Tech Expo and Accelerator was a fantastic opportunity to introduce NSWC Crane's intellectual property portfolio to entrepreneurs and small businesses in the local Hoosier Uplands! Technology Transfer is about making sure the resources within the lab are fully utilized and to find prospects for economic impact through partnering with industry and academia," says Bullock-Yoder. "Creating collisions between unique inventions and great ideas is just the beginning, and we are excited to see it happening here right here in Indiana."

NSWC Crane, NSWC Corona, and NSWC Port Hueneme collaborated to create the data preprocessing tool a few years ago. Taylor Cole, the Chief Technology Officer for NSWC Corona, says the Navy is transitioning to Data as a Service.

"What this means is improvement to data quality from the source



Hubert Goodman

will eventually minimize the current extreme cleaning and curation requirements," says Cole. "But this transition will take time, and tools to benefit curation and cleaning will always have a critical place in our overall data strategy."

Logan Hedge, a Task Manager for a Data Scientist Team at NSWC Crane, was one of the inventors for the IP. Hedge says a few Data Scientists from the Warfare Centers got together at a data science conference and found common ground.

"We noticed Navy data takes time to 'clean' in order to use it for artificial intelligence (AI), learn from the data, and use it," says Hedge. "Working with teams at NSWC Corona and NSWC Port Hueneme, we realized these challenges could be automated."

Data preprocessing, or 'cleaning' data, is the process of transforming raw data into an understandable or machine digestible format. This allows people to gain insights from the information once it is easier to work with, as well as enabling artificial intelligence and machine learning algorithms to use the data. Hedge says the text-based analysis tool saves the Navy a significant amount of time.

"Cleaning data can take data scientists up to eighty percent of our time," says Hedge. "The average project savings of seven thousand dollars in labor costs. We want our smart folks focused on smart tasks. There are people who come to work for the Navy from academia or industry, and notice how 'dirty' the data is. Many times, Navy data wasn't necessarily looked at as an asset and the databases created haven't always been updated with more modern data philosophies. Today, the Navy thinks of data as part of the design process."

Logan Hedge

Each Warfare Center leveraged internal Naval Innovative Science and Engineering (NISE) funding to work on the project.

Hedge says the tool itself is data agnostic and modular.

"Meaning it can work on any data set," says Hedge. "It's modular, lightweight, and works on standard government computers but could scale up to an enterprise system. We created a user-interface so that the person using it doesn't have to know how to code. The tool helps people clean, analyze, and find trends in data. It can help you do AI, ML, and see how information is related to other topics. At the time we designed the tool, we couldn't find all-in-one tools that did data cleaning and AI, weren't expensive, and didn't require in-depth knowledge base to use them."

The technology was made available for commercialization through the PROPELS Accelerator launched earlier this year, where teams formed around the data preprocessing tool. Hedge says the Navy inventors have been available to participants to guide them through the tool.

"We ran preliminary data sets with those interested in the technology to make sure it was useful," says Hedge. "This buys down risk for companies and helps us grow in perspective in how to run projects in the future. If a company wants to develop the technology further and collaborate on development, Navy inventors can help."

NSWC Crane has an extensive and growing IP portfolio available for licensing and collaboration. To learn more about the inventions available, please visit: Naval Surface Warfare Center - Crane Division | TechLink (techlinkcenter.org)

To learn more about technology transfer or how to partner with NSWC Corona, please contact CRNA__orta@navy.mil. To learn more about technology transfer or how to partner with NSWC Crane, please contact Crane__T2@navy.mil

About NSWC Corona NSWC Corona is a naval laboratory and a field activity of Naval Sea Systems Command (NAVSEA). NSWC Corona's Mission is to provide transparency to warfighting readiness through data analytics and assessment, engineering the Fleet's Live-Virtual-Constructive training environment, and assuring the accuracy of measurements. ■

NSWC Crane makes selection for three key command roles

June 2022

CRANE, Ind. –
Naval Surface Warfare Center, Crane Division (NSWC Crane), a Navy federal laboratory located in the Southern Indiana, is pleased to announce the selection of three leadership roles: The Director of Engagement, Command Chief Strategist, and Technical Deputy for the Contracts Department.

"As our nation faces some of the toughest challenges we have seen in history, NSWC Crane's mission will remain a critical component to ensuring the future security of our country," says Dr. Angela Lewis, NSWC Crane Technical Director. "I am excited to see these leaders step into critical roles as we collectively navigate rapidly evolving technology requirements facing the Navy and nation."

Jenna Dix

Jenna Dix has been selected to serve as NSWC Crane's Director of Engagement, which is one of ten positions on the Executive Leadership Team (ELT) responsible for directing departments and leading NSWC Crane's strategic vision. Dix brings more than 17 years of service to Crane into this new role and has spent the last ten years of her career within the Chief Technology Office, cultivating valuable strategic partnerships both internally across NSWC Crane and externally with

the Innovation Ecosystem partners.

As Director of Engagement, Dix is responsible for the engagement and advocacy functions of NSWC Crane, representing NSWC Crane across the region, state, and country in order to further its strategic initiatives. She is the focal point in providing strategic awareness and leadership across the region to establish Crane and its Innovation Ecosystem as the "Destination of Choice" in support of the nation's security needs. Dix will be leading Crane's engagement with national, regional, and local organizations, promoting innovation and collaboration, connecting Crane's expertise to key national defense priorities, identifying opportunities for growth, and ensuring Crane is bringing the full force of its ecosystem to bear on national defense challenges facing the nation.

As Director of Crane's Technology Transfer (T2) Program and Office of Naval Research (ONR) designee as the Office of Research and Technology Applications (ORTA), Dix was responsible for the strategic management of Crane's intellectual capital and for developing key strategic partnerships that enhance the research and development capabilities of NSWC Crane. During her tenure, Dix demonstrated strategic thinking and decision making to create innovative initiatives to move Crane technologies into the marketplace and reduce barriers to collaborating with Crane. Dix received four national awards for demonstrated excellence and

innovation in T2; three were from the Federal Laboratory Consortium and one was from the Office of the Under Secretary of Defense for Research and Engineering (OUSD R&E).

Prior to serving as Director of the T2 program, Dix was Crane's subject matter expert in technology partnerships. She was responsible for connecting the science and technology (S&T) community with external resources to achieve research and development goals and employed Technology Transfer as a catalyst for mission execution.

Prior to serving in the T2 Program, Dix spent ten years supporting the Navy's Small Arms Program, providing multispectral programmatic and logistics support.

Dix has a bachelor's degree in Public Administration, a Graduate Certificate in Public Management, and a master's degree in Public Administration from Indiana University's School of Public and Environmental Affairs.

Monica Hutchins

Monica Hutchins has been selected as Command Chief Strategist where she will be responsible for leading strategic efforts that include development and deployment of NSWC Crane's strategic intent, planning, and execution activities. She will lead strategic activities designed to enhance and expand NSWC Crane's three mission areas and Command initiatives. She will work closely with key investment areas ensuring efficiency of resources available. Hutchins will continue to serve as the command's representative to the Bloomington Economic Development Corporation, additional regional economic forums, and a continued Navy Liaison/Mentor volunteer to the Air Force TechStars Accelerator.

Prior to this selection, Hutchins served as the Chief Strategist for the Global Deterrence and Defense Department where she planned, developed, and implemented mission plans for Trusted Microelectronics, Nuclear TRIAD modernization, and Advanced Concepts. She also served as the inaugural Regional Director for the Midwest Tech Bridge creating and standing-up the new NavalX Tech Bridge capability to connect regional defense ecosystems.

Over the course of her 24-year career with the Department of Defense (DOD), Hutchins has been an author of strategy and policy. During her career, she worked at various levels of the DOD including: multiple squadrons, Naval Air Facility, Airbase Wing, Major Command, Combatant Command, HQ USAF, and SECNAV & CNO senior staffs. She has served as an adjunct faculty member with Air University.

During a Combatant Command tour at U.S. Strategic Command, Hutchins served as a Nuclear Weapons Analyst. In this capacity, she developed modernization and budgetary plans for the nation's nuclear enterprise consisting of nuclear lab improvements, monetary policy, weapon system acquisitions, and Congressional testimonials. In addition, Hutchins worked at Air Force Space Command bases and multiple joint overseas locations including Keflavik, Iceland, and Misawa Air Base, Japan.

During her first Pentagon tour, Hutchins served on the HQ Air Force staff managing worldwide personnel programs, ran a multi-billion dollar Information Technology portfolio, and worked extensively on Joint military task forces spanning from the Middle East through Central Asia. As part of the Chief of Naval Operations (CNO) and Secretary of the Navy (SECNAV) staffs, her second tour at the Pentagon, she led Department of Navy-wide strategy and innovation efforts which directly impacted warfighting innovation and technology advances.

Hutchins holds a bachelor's degree in Business Administration and a master's degree in Management with an International Management concentration. She has completed the Professional Military Education levels of Squadron Officers School, Air Command and Staff College, and the Department of Navy Bridging the Gap Executive Leadership Program as well as numerous Executive Education courses.

Nancy Maloy

Nancy Maloy has been selected as the Technical Deputy for Contracts Department. Nancy brings more than 30 years of service with both technical and business experience to this role. This position serves as a customer advocate for Contracts Department by interfacing with the mission areas and provides synergy between the business and technical functions.

Maloy will begin this new assignment beginning in August, after a rotation through July as the Spectrum Warfare Department Deputy Director.

As the Technical Deputy for Contracts, Maloy will be responsible for overall strategic acquisition planning and direction in support of the technical product lines and business codes. This role requires comprehensive knowledge of NSWC Crane's Mission Areas, engineering, and scientific goals, and uses this understanding to help bridge any gaps between the technical departments and the Contracts department.

Maloy previously served as the Program Lead for Navy Hypersonics since 2019, where she joined a small team of dedicated professionals who have grown Crane's technical and program support in the areas of systems engineering, modelling and simulation, advanced concepts research and development, support equipment and logistics, pier side support equipment, test and evaluation, power and energy, program protection, and cyber security support. Along with this role, Nancy has served rotations as the Deputy for the Global Deterrence and Defense Department and Contracts Department.

Maloy spent a few years outside of Crane as the Chief of Staff for the NSWC Dahlgren Division Dam Neck Activity as the senior civilian to the Commanding officer, leading the Command staff and business operations. Nancy previously served as the NSWC Crane Corporate Operations Department Director, where she led the management of the Corporate Operations workforce to provide critical leadership of a 350-person department responsible in the areas of Human Resources, Infrastructure, Information Technology, Safety and Security, Business and Financial, and Property Management competencies.

In 1990, Maloy started her career as a budget analysist and then transitioned to a mathematician in a software branch. She has served in various key leadership roles since then in all three technical departments, such as Re-engineering Lead for Spectrum Department, branch manager roles in Global and Spectrum departments, and Division Manager of Specialized Munitions Division in the Expeditionary Department.

Maloy has a bachelor's degree in Mathematics and a certification in Public Management from Indiana University. She also holds a Master of Public Administration from Indiana University Purdue University Indianapolis. ■

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New Executive Leadership Selections at NSWC Crane

January 2022

Naval Surface Warfare Center, Crane Division (NSWC Crane), a Navy federal laboratory located in the Southern Indiana, is pleased to announce the selection of four new members of the Executive Leadership Team (ELT). The ELT is a group of 10 senior-level executives responsible for directing departments and leading NSWC Crane's strategic vision.

Dr. Kyle Werner

Dr. Kyle Werner has been selected to serve as NSWC Crane's Deputy Technical Director (DTD). Dr. Werner's brings more than 23 years of diverse and extensive leadership experience to this unique role.

"Dr. Werner is well versed in the strategic direction of NSWC Crane and provides valuable executive leadership across the organization," said Dr. Angie Lewis (SES), NSWC Crane Technical Director. "Kyle has served on our ELT for the past eight years and I am confident we will succeed with his leadership as Deputy Technical Director."

Dr. Werner's previous assignments on the ELT include having served as the Director of the Applied Science & Demand Management Department, Director of Innovation, Director of Engagement, and most recently acting Director of the Global Deterrence and Defense Department.

Dr. Werner received his bachelor's degree in Electrical Engineering from University of Evansville. He received his master's degree in Engineering Management from Rose-Hulman Institute of Technology, and his Ph.D. in Strategic Management from Sullivan University. Dr. Werner received a certificate in Public Management from Indiana University and a certificate in Executive Leadership & Management from Massachusetts Institute of Technology.

>> *New Executive Leadership...*

Mr. Dane Speer

Mr. Dane Speer has been selected as NSWC Crane's Business Director serving as a part of the Command Staff. Dane brings more than 30 years of dedicated service andMr. Dane Speer tremendous knowledge to this new role that was established in accordance with the Warfare Center Common Organization. This position was a dual role with the Corporate Operations Department Head position previously.

"Dane has a tremendous background spanning both technical and business experience that make him well-suited for this newly established role," said Dr. Angie Lewis (SES), NSWC Crane Technical Director. "I look forward to seeing our Business Excellence reach new heights with his leadership."

As Business Director, Speer will be responsible for Command planning, assessment, budgeting, and workforce shaping across both the technical and business domains. He will lead command workload planning and assessment, strategic planning and corporate business planning, and development of NSWC Crane's operations budget and investment portfolio, balancing competing priorities across departments. Speer previously served as the acting Corporate Operations Department Director and Deputy, Lead Customer Advocate, Technical Project Manager, Deputy Division of Expeditionary Electronic Warfare, Chief Business Strategist and Division Manager of the Weapon Systems and Corporate Business Office Divisions.

Speer has a bachelor's degree in Finance and Business Administration from Indiana State University and a certification in Public Management from Indiana University. Mr. Speer received a Master of Business Administration from Indiana Wesleyan University.

Mr. Brent Voigtschild

Mr. Brent Voigtschild has been selected as the Corporate Operations Department Director. Brent brings 22 years of leadership, management, and engineering experience at NSWC Crane that make him well suited for this important Executive Leadership Team role.

Mr. Brent Voigtschild"Brent consistently exemplifies and upholds the Crane Values and prioritizes time and attention to take care of the workforce in his charge," said Dr. Angie Lewis (SES), NSWC Crane Technical Director. "He communicated a passion for the corporate environment and will ensure continuance of the Business Excellence and Customer Service tradition."

As the Corporate Operations Director, he will lead the 350-person Department responsible for the Human Resources, Corporate Communications, Infrastructure (Facilities and Safety), IT, Security, Corporate Business Office and Financial Management, Corporate Communications, and Property Management competencies.

Brent previously served as acting Director of Engagement, Special Warfare and Expeditionary Systems Department Deputy Director, Munitions Development Branch Manager, Specialize Munitions Division Manager, and the NSWC Crane Test and Evaluation (T&E) Director.

Brent has a bachelor's and master's degree in Mechanical Engineering from Rose Hulman Institute of Technology. He also holds a Professional Engineering License in the State of Indiana.

Mr. James R. (JR) Ross

Mr. James R (JR) Ross has been selected as the Director for the Global Deterrence and Defense Department. Mr. Ross has more than 23 years of experience at NSWC Crane, 11 of which have been in Nuclear Deterrence, Hypersonics, and Missile Defense.

"JR has a proven track record of providing executive leadership in support of Strategic Missions, including Nuclear Deterrence, Missile Defense Agency, and Office ofMr. J.R. Ross Secretary of Defense to support Hypersonics and Microelectronics," said Dr. Angie Lewis (SES), NSWC Crane Technical Director. "He has demonstrated exceptional leadership skills and the ability to conceive, plan, and manage complex and innovative technical programs."

He previously served as the Deputy Director for the Global Deterrence and Defense Department, Division Manager of the Platform and Launch Systems Division, Division Manager of Irregular Warfare Technologies Division, and Deputy Division Director/Chief Engineer of the Expeditionary Systems Engineering Division.

Mr. Ross received his bachelor's degree in Electrical Engineering from University of Evansville. He received his master's degree in Engineering Management from Rose-Hulman Institute of Technology, and his Masters of Public Administration from Indiana University. ■

Expeditionary Chief Strategist Presses NSWC Crane forward

March 2022

CRANE, Ind. –
Naval Surface Warfare Center, Crane Division's (NSWC Crane) Shannon Kasinger Clark serves as the Chief Strategist for the Expeditionary Warfare Mission Area. The Expeditionary Warfare department at NSWC Crane has 1200 employees and involves a wide array of technologies, including electro-optics, sensor fusion, Command and Control (C2), cyber, and power and energy. In this role, she helps department leadership facilitate and develop strategy, and collaborates with the other Chief Strategists to advise on NSWC Crane command strategy.

"I work with our leadership and my counterparts to develop our thrust areas," said Kasinger Clark. "We work to understand where NSWC Crane is and where we need to go."

Kasinger Clark said the role requires considering customer support when weighing areas of emphasis.

"Whether it's Warfighter Driven Challenge, power and energy, sensor integration, or one of the many other areas of NSWC Crane expeditionary expertise, we are main pillars to help support those customers. We have to make sure we continue providing support for current customers while developing strategy years into the future."

Kasinger Clark said strategy is a two-way street.

"No one person is the expert in every area," she said. "You take in and you share to develop the strategic picture. You have to be ready to adjust and adapt quickly depending on what is happening in the world."

She emphasized the important role of strategy in pressing forward.

"To keep our military dominance and sound national security, we have to be ahead of the threat and know what technology advancements are happening," said Kasinger Clark. "If we're focused just on today, and not tomorrow, we'll be behind – and that means the warfighter would be behind."

Giving the warfighter an unfair advantage is personally important to Kasinger Clark. Her son is overseas in the military.

"What we do is so, so important. When I think of him, I think of all of them," said Kasinger Clark.

Before taking on the role of Chief Strategist, Kasinger Clark held positions in or in support of all three of NSWC Crane's mission areas: Strategic Missions, Expeditionary Warfare, and Electronic Warfare (EW). She has worked at NSWC Crane for 18 years, with positions including department level staff positions early in her career, a strategic analyst for the EW portfolio, and project and multiple branch manager roles within Expeditionary.

Kasinger Clark advised others interested in a career like hers to explore other roles at NSWC Crane.

"There are so many different areas. If you find your passions or desires are a little different than what you have been doing, there is definitely a program at Crane that aligns better. Lean on your mentors to help you get to your passion."

Kasinger Clark also shared lessons learned through experience with women starting out their careers.

"Continue to use your voice and take the seat at the table. A lot of times we second-guess ourselves and think we're underqualified for a position when in reality we're more than qualified," said Kasinger Clark. "Network, network, network, and pursue those opportunities and leverage your mentors." ■

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NSWC Crane exists to provide the AMERICAN WARFIGHTER with solutions to their toughest technical challenges in order to better equip them with a DECISIVE ADVANTAGE over our Nation's adversaries!

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FY12 - FY22

NEW HIRES FY22

Scientists & Engineers
184

Non-S&E
136

Build a team to Compete and Win

THE FORCE BEHIND THE FLEET

3,859 - Federal Civilians
32 - Military
1,998 - Contractors

AVERAGE SALARY FY22

$100.6K

HARNESSING THE POWER OF TECHNOLOGY FOR THE WARFIGHTER

INNOVATION ECOSYSTEM

Partnerships Solve Critical Problems

SMALL BUSINESS FY22

$386M

STEM

$600K

- SCHOOLS SUPPORTED - 29
- TEACHERS SUPPORTED - 48
- EMPLOYEE VOLUNTEERS - 66
- STUDENTS SUPPORTED - 9,559

ACTIVE PATENTS FY22

Expeditionary Warfare - By virtue of a unique, direct relationship with special operations warriors all over the world NSWC Crane delivers multi-mission, multi-platform sensors and weapons solutions utilizing open architecture/cost efficient design concepts for warrior centric applications. NSWC Crane's expertise in payload to platform organic capability is driven by consistent communication and understanding of Naval Special Warfare and Naval Expeditionary Warfighter requirements.

Electronic Warfare - With the DoD's largest concentration of Multi-Spectral, Multi-Domain (air, land, sea) EW Expertise, NSWC Crane is leading the Navy in electromagnetic capability development. Spanning all branches of the military, NSWC Crane has the largest concentration of technical EW expertise, facilities, and equipment. NSWC Crane provides distinct electronic warfare and integrated sensing technology to Control the Electromagnetic Spectrum in order to Control the Fight.

Strategic Missions - With a strong heritage that includes 60+ years with SSP (Strategic Systems Programs), 40+ years with the Air Force and a vital role with nuclear modernization programs, NSWC Crane is indispensable to the Nuclear Triad. As the Navy's primary organic field activity for full spectrum life cycle management including hardware, ordnance and power systems, NSWC Crane applies the distinct capabilities inherent in its people and facilities to assure 100% operational readiness of strategic missile systems. NSWC Crane is a national leader in trusted and radiation hardened microelectronics, and is providing increasing levels of support across engineering, acquisition, and flight test support to National Hypersonics Initiatives. Also, Crane hosts the OSD Joint Hypersonic Transition Office (JHTO) Systems Engineering Field Activity (SEFA). JHTO's mission is to accelerate hypersonics technology development to enable the systems the warfighter needs through an integrated S&T strategy, allied and university engagement, and collaboration. The SEFA supports this mission by providing systems engineering, facilitated integration with programs, and workforce development efforts.

HARNESSING THE POWER OF TECHNOLOGY FOR THE WARFIGHTER

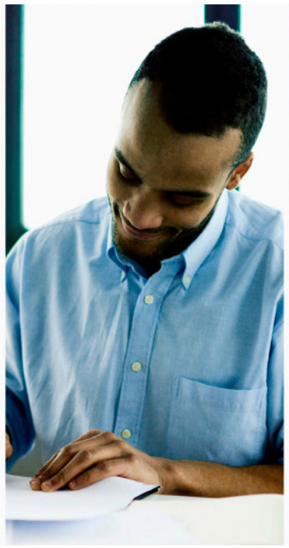
Statement A: Approved for Public Release; Distribution is unlimited.

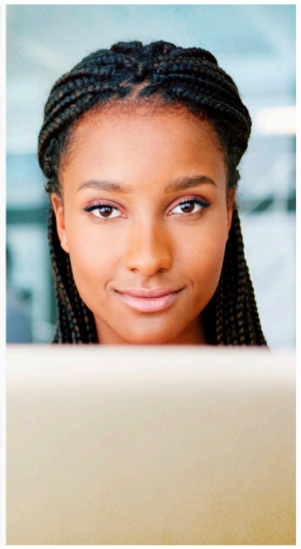
About NSWC Crane

NSWC Crane is a naval laboratory and a field activity of Naval Sea Systems Command (NAVSEA) with mission areas in Expeditionary Warfare, Strategic Missions and Electronic Warfare. The warfare center is responsible for multi-domain, multi- spectral, full life cycle support of technologies and systems enhancing capability to today's Warfighter.

Join Our Team!

NAVSEA employs a diverse, highly trained, educated, and skilled workforce - from students and entry level employees to experienced professionals and individuals with disabilities. We support today's sophisticated Navy and Marine Corps ships, aircraft, weapon systems and computer systems. We are continuously looking for engineers, scientists, IT and cyber specialists, as well as trade and other support professionals to ensure the U.S. Navy can protect and defend America. Please contact NSWC Crane Human Resources at crane_recruiting@navy.mil.





NAVAL SURFACE WARFARE CENTER
CRANE DIVISION

NAVSEA
WARFARE CENTERS
CRANE

YEAR IN REVIEW

is a collection of articles written by NSWC Crane Corporate Communications. These articles highlight the accomplishments, challenges, and initiatives undertaken by NSWC Crane over the past year in alignment with the National Defense Strategy (NDS).

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