CTMA CONNECTOR

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NATIONAL CENTER FOR MANUFACTURING SCIENCES

CTMA Connector

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UPCOMING EVENTS

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NCMS Technology Showcase: Puget Sound Naval Shipyard
Bremerton, WA

December 18–21, 2023
DOD Maintenance Symposium
San Diego, CA

January 17–18, 2024
NCMS Technology Showcase: Pearl Harbor Naval Shipyard
Pearl Harbor, HI

Save the Date!
May 7–9, 2024
CTMA Partner's Meeting
Providence, RI

Note that all NCMS event schedules are subject to change. Please check the NCMS Events Page for the latest updates. Don't hesitate to email eventsupport@ncms.org with any questions.

About NCMS

The National Center for Manufacturing Sciences (NCMS) is a cross-industry technology development consortium, dedicated to improving the competitiveness and strength of the US industrial base. As a member-based organization, it leverages its network of industry, government, and academic partners to develop, demonstrate, and transition innovative technologies efficiently, with less risk and lower cost.

About CTMA

The CTMA Program offers a unique contracting vehicle for industry, academia, and the DOD sustainment community to work collaboratively. Through these efforts they promote the demonstration, evaluation, and validation of new and innovative technologies that enhance warfighter readiness at optimal value and lowest risk. This non-FAR based contracting vehicle is the only DOD-wide program focused solely on maintenance and sustainment.

NCMS Collaborates to Pioneer Revolutionary KC-135 Sustainment Testbed

NCMS has partnered with Wichita State University's National Institute for Aviation Research (NIAR), the US Transportation Command (USTRANSCOM), and the US Air Force Air Mobility Command (AMC) to establish a KC-135 Stratotanker innovation testbed in Wichita.

In July 2023, an operational KC-135 aircraft landed at McConnell Air Force Base and was transferred to NIAR to establish the Sustainment Technologies, Research and Automation for Transformative Operations Testbed (STRATO-T).

STRATO-T is now located at Air Capital Flight Line LLC in a stretch of property near McConnell Air Force Base. A ribbon-cutting ceremony was held on July 28, 2023, at Air Capital Flight Line.

A ribbon-cutting ceremony for the STRATO-T program was held in July at Air Capital Flight Line in Wichita, KS. Pictured above (from left): Rick Muma, President, Wichita State University; John Tomblin, Senior Vice President for Industry and Defense Programs and Executive Director, NIAR; Melinda Laubach-Hock, PhD, Director of Sustainment, NIAR; Lisa Strama, President and CEO, NCMS; Albert Lowas, Chief Scientist, Air Mobility Command, USAF; and Joshua Baugher, Program Manager, NIAR. (Photo courtesy of Wichita State University.)

STRATO-T is now available for government, industry, and academia to study, develop, and test innovations for reducing legacy aircraft operations costs. STRATO-T will maintain in-flight-representative configuration to facilitate ground (non-flying) evaluations and studies of innovative sustainment, energy efficiency, and aircraft automation concepts. Leveraging NIAR's digital engineering experience throughout these and other studies, STRATO-T will also generate vital KC-135 digital models to improve the long-term supportability of this critical air refueling asset.

Acting as USTRANSCOM's and AMC's intermediary, NCMS will lead the effort to identify solution providers that have the potential to significantly improve the sustainment posture of the KC-135 and other aviation assets across the USAF. The development of autonomy technology is a priority for the STRATO-T program.

"STRATO-T will facilitate projects from government, industry, and academic partners that apply and advance technologies such as autonomy, digital engineering, predictive data analysis, and advanced manufacturing," said Lisa Strama, President and CEO of NCMS. "Projects that harness these technologies have the potential to extend aircraft lifespans. NCMS is honored to collaborate with USTRANSCOM, AMC, and NIAR to establish and develop this innovation testbed."

The selected KC-135 aircraft is approximately 60 years old and otherwise destined for long-term desert storage. It possesses inherent physical/structural and electronic characteristics gained from decades of military service, providing otherwise unobtainable insights into generations of maintenance, upgrade, environmental exposure, and global operational use. The aircraft's service life confers artifacts that are highly representative of the condition and performance of other legacy aircraft, resulting in a uniquely realistic environment for test and demonstration of new technologies.

Researchers and innovators will develop and transfer technical information related to extending the useful lifespan of legacy aircraft, modernizing aircraft systems, and exploring innovations in operations and maintenance. Expected outcomes include successful application of innovative technology and systems integration requirements as well as assessments of suitability and value in use. Additionally, STRATO-T will help advance the technology readiness levels of innovations including aircraft automation, advanced manufacturing, maintenance, and repair techniques, and make possible information collection for a wide range of uses. ■

An operator demonstrates the vacuum crawler robotic system that has been modified by Boston Engineering for use to remove biofouling on Navy vessels. (Photo courtesy of Boston Engineering.)

Vacuum Crawler Robotic System Increases Maintainer Safety and Productivity

Maintainers who work on submarines, ships, and other large assets encounter safety risks during inspection and repair procedures. While maintenance professionals face numerous occupational hazards during their work on large assets, one of the most serious is the danger of falling. It's not difficult to see why: Nimitz-class aircraft carriers stand approximately 244 feet. The mortality rate from falls onboard Navy ships is 59.2%, and injuries from falls account for nearly a quarter of non-battle injury hospital admissions.

To reduce these risks, Boston Engineering, a Waltham, Massachusetts-based technology development firm, is leveraging an existing vacuum crawler robotic system for ship and submarine maintenance at Portsmouth Naval Shipyard.

The system is used to traverse the outside of ships both above and below the surface. When outfitted with unique tools, it can perform cleaning, corrosion and other damage evaluation, and radiation evaluation. The vacuum crawler can also access places on the hull that are physically difficult or impossible for personnel to reach. Its ability to perform operations remotely, while being controlled by a maintainer from a fifty-foot distance, reduces safety risks to personnel.

"Imagine all the different scenarios where maintainers need to get up to a place where it's an unsafe position, which requires harnesses, donning safety gear, or putting up scaffolding. Instead of having to do all that, you alternatively 'drive' the robot to the place you want to go with the payload you want to use," said Mark Smithers, co-founder and CTO of Boston Engineering.

The project—Vacuum Crawler Robotic Capability Initiative, launched in December 2022—is ruggedizing the vacuum crawler system for defense applications. The team is actively working to ensure that the vacuum crawler can withstand shipyard operation stresses so it can perform in multiple environments including those exposed to water and cold temperatures.

"At Portsmouth, the first application was for delamination of the coating on submarines," said Smithers. "Instead of having maintainers manually cut the coating with knives, the dual robot system carries a coating cutter, and we cut it off in larger pieces versus creating a large amount of debris that needed to be cleaned up."

Boston Engineering also equipped the vacuum crawler robot to clean biofouling—the accumulation of microorganisms, plants, algae, or small animals on surfaces, such as ship and submarine hulls—that causes structural or other functional deficiencies.

"When naval systems come out of the water, if they have biofouling, what maintainers have to do now is erect scaffolding or get on man-portable lifts, and they use a spray nozzle to remove it," said Smithers. "The ruggedized vacuum crawler is going to have a spray nozzle on the front, so maintainers can drive the robot, which will waterjet the biofouling off down to the clean coating surface."

Another application of the vacuum crawler is for the installation of radiological meters.

"Instead of someone going to a troublesome or unsafe area manually, they use the robot, and the robot scans or works in that area with a tool with the worker controlling all or most of the actions," said Smithers.

The vacuum crawler can also use a terahertz sensor, which generates and detects electromagnetic waves at terahertz frequencies for spectroscopy, sensing, and imaging applications. In the Navy, terahertz sensors are used to scan assets for delamination.

"An advanced sensor can sense through the foam on submarines, instead of having to use cumbersome manual efforts to try to figure out if you have delamination," said Smithers. "In addition, the advanced sensor allows us to see the wires that are underneath the coating. These are things you just can't do manually."

Currently, the project team is completing the vacuum crawler ruggedization by ensuring its electronics and control architecture can reliably operate in industrial maritime environments. The ruggedization includes addressing Size, Weight, Power, and Cost (SWaP-C) analysis to increase performance and reliability. At the end of the project, which is scheduled to be completed in June 2024, all the software, electrical, and mechanical components will come together as the new ruggedized above-water crawler for the Navy.

The results are expected to be a robust robot design capable of providing a blueprint for integrated robotics in shipyards. In the short term, the vacuum crawler will allow manpower to be focused on points of greatest need. In the long term, the vacuum crawler will have the potential to perform most operations on its own. This system will greatly reduce the labor and cost required every year for ships that undergo major maintenance and hull inspections.

"These systems are valuable for any shipyard such as Ingalls, Newport News, Electric Boat, Norfolk, Portsmouth, Pearl, or Puget. Any location a worker can drive the robot with its payload opens up opportunities for faster and more automated inspection or work capability," said Smithers.

The vacuum crawler robot can also be used throughout the Department of Defense (DOD) on infrastructure that is difficult to access, such as remediating corrosion, which would eliminate the need for maintainers to climb towers, wind turbines, and other tall structures. Currently, wind turbines average 100 feet to the top of the hub and can reach 300+ feet. Antenna towers in the US range anywhere from 100 feet to 2,000 feet tall.

> **"The new robot design leverages open architecture, so we can allow many people to contribute to the capabilities."**
>
> *– Mark Smithers, Boston Engineering*

There are also potential benefits for the Air Force.

"The new robot design leverages open architecture, so we can allow many people to contribute to the capabilities, including scaling it bigger or smaller," said Smithers. "If we made a smaller variant of the robot, with all the same software and the same user interface, it could perform a battle damage assessment on an aircraft. For example, if an aircraft came in with damage to one of the control surfaces, the vacuum crawler could be used to investigate to see if there was damage to the lamination of the composite. The goal would be to determine if the aircraft was worthy of getting back into a fight."

Opportunities to employ the vacuum crawler do not stop with DOD. There are also a wide variety of applications to use this technology in commercial industries—including shipping and handling, building operations and maintenance, and commercial airlines—to quickly assess potential structural damage.

"This project is the foundational piece of the Family of Sustainment Augmentation Robots (FOSAR) Program," said Smithers. "NCMS got the ball rolling. Now we're asking other companies to come be a part of this program. We provide free software to any company who joins, for the benefit of bringing their capabilities to the DOD." ■

The Airless Tire project team conducts testing while driving through interior jungle trails located at the US Army Tropic Regions Test Center (TRTC) in Suriname. (Photo by Carlos Mora.)

Harsh Amazon Ideal for DOD Testing of Airless Tires

For man and machine, the Amazon rainforest contains some of the harshest environmental conditions on the planet: high temperatures, stifling humidity, torrential rains, dense vegetation, equatorial sun, mud pits, loose savannah sands, slick and rut-riddled trails, arduous terrain, fording obstacles, and more. In 2023, a CTMA project team of experts from the US Army Ground Vehicle Systems Center (GVSC), Michelin Tweel Technologies, and TRAX International Corporation (TRAX) worked for eight weeks in these challenging conditions at the US Army Tropic Regions Test Center (TRTC) in Suriname's remote interior to test developmental airless tires on the new Light Tactical All-Terrain Vehicle (LTATV): the Polaris Defense MRZR Alpha.

Airless tires are valued for military and commercial applications because they can withstand severe environmental conditions, survive punctures, and mitigate the need for spares. Michelin initially developed the airless combination tire/wheel, the "Tweel," for skid-steer loaders. Commercial sales of the Tweel began in 2012, and the Army first sought to transition them to light utility terrain vehicles such as the LTATV, and potentially also for higher-weight class vehicles.

"The skid-steer Tweel has a very high load capacity, but very low-speed capacity," said John Duty, senior product development engineer with Michelin Tweel Technologies. "This project allowed us to increase the load and the speed capability of the Tweel."

This year's testing was the fourth and latest phase of the Congressionally funded Airless Tire Technology project, which conducted its first test in the Amazon rainforest in 2019.

"The first test in 2019 was a benchmarking test where we used an off-the-shelf commercial Tweel product on a military application to see if the Tweels could hold up in that environment," said Duty. "I think that the tires, although they weren't designed for the application, performed fairly well, even in a situation where they were overloaded."

"We learned in the baseline test that the tires were very survivable under military damage," said Nathan Kamprath, Mechanical Engineer with the Army Combat Capabilities Development Command GVSC, Ground Vehicle Power and Mobility, Tires. "We also learned that we had to make the tires more durable for extended mileage."

After this baseline test, Michelin Tweel Technologies designed new airless tire and wheel assemblies specifically tailored for the LTATV Polaris MRZR Alpha application.

"Typically, there's always a trade-off," said Duty. "The higher the load, or the faster the speed, the more heat the tire generates, which eventually will kill the tire. Taking our skid-steer Tweel and making an all-terrain vehicle Tweel allowed us to increase the speed capability quite a bit. This latest project allowed us to make a clean sheet design where we can have an even higher load and an even higher speed capability, which is required for this new machine. It's a stepping-stone approach that allows us to then scale up our operations and our technology on the manufacturing side as well."

Earlier this year, a CTMA team returned to the TRTC to test these new tires in the Surinamese Amazon rainforest. A cohesive team of seasoned professionals—seven experts from TRAX in Panama and Suriname, including a logistics manager, office manager, test engineers, mechanic, test drivers, jungle expert first responder, and the GVSC project engineer—all lived and worked together in an austere area for a period of eight weeks during the major rainy season.

The Tweel airless tire deflects upon impact during testing at the US Army Tropic Regions Test Center (TRTC) in Suriname. (Photo by Carlos Mora.)

"The environmental elements were a conclusive factor in determining limitations on the 2019 test platform," said Carlos Mora, test officer on the TRAX TRTC contract in Panama. "Most of the elements you find in this natural environment, and the interactions between them, are infinitely complex and cannot be simulated in an environmental chamber. Tropics testing is key to providing insights and improvements in the design and performance of equipment."

"There are extreme hazards for driving vehicles in that environment," added Kamprath. "The mud will swallow you whole. The long hours and the abuse inflicted upon the Tweels test vehicle and crew were severe. Because of that, the results were accelerated as compared to what they would be like in a more conventional test environment stateside."

The results achieved were notable.

"The outcome was that the developed product is more survivable than what we tested previously in 2019, by a large degree," said Kamprath. "The tires are more robust, more durable, and better suited to the new LTATV vehicle."

Airless tires will have many commercial applications, especially for autonomous vehicles.

"If you get a flat tire, there's nobody to change it on an autonomous vehicle, so you don't have to worry about getting flats and having one of these robots becoming stranded," said Duty.

Airless tires are also useful in construction, agriculture, landscaping, material handling, and other industries.

"We're working on airless tires for passenger cars and light trucks as well," said Duty.

For the DOD, airless tires must be resilient enough to be depended upon in the heat of battle. The team hopes to leverage this effort as a building block to further increase airless tire durability and survivability by conducting iterative follow-on developmental efforts and tough tropical field testing for the Infantry Squad Vehicle (ISV), High Mobility Multipurpose Wheeled Vehicle (HMMWV), or other larger, heavier vehicles.

"The potential benefit in terms of military survivability is pretty high," said Kamprath. "Ultimately, I'm confident that this product will see some action in the real world and it's probably going to save lives." ■

A petty officer assigned to the USS Frank Cable, a submarine tender, uses a RADIAC meter on another officer to monitor possible radiological contamination. (US Navy photo by Petty Officer 1st Class Kim McLendon.)

RADIAC Project Produces State-of-the-Art Simulation Tools to Help Detect Radiological Hazards

Radiological hazards pose serious risks to personnel working in military, medical, industrial, and academic research environments. Yet current training on radiation detection, indication, and computation (RADIAC) instruments often relies on outdated technology and methods. A CTMA project is working to create state-of-the-art RADIAC simulation tools that will enable organizations to improve the performance of their employees in standard work processes and emergencies.

The project—Advanced Radiation Detection Indication and Computation (RADIAC) Technology—brings together four naval shipyards: Puget Sound, Portsmouth, Norfolk, and Pearl Harbor, with industry participant Radiation Safety & Control Services (RSCS), Inc.

The project kicked off in September 2020, when the team was tasked with developing new prototype simulation tools to replace outdated training technology and methods. The team used RSCS's commercially available training system called SIM-Teq® to create RADIAC and dosimetry simulation tools for training and testing with equipment that resembles those currently in use.

Dosimetry is the measurement of the amount or dose of radiation absorbed by a substance or living organism by using a dosimeter, an instrument used to measure ionizing radiation exposure via alpha or beta particles, neutrons, gamma rays, or x-rays. Dosimeters can come in many shapes and sizes, depending on their purpose. Personal dosimeters are small devices that are typically worn on the outside of clothing and are used by personnel working in industries such as nuclear power, military, maritime, construction, nuclear medicine, radiology, oncology, and public safety.

In the United States, 1.5 million radiation workers are occupationally exposed to ionizing radiation each year. Of this number, 300,000 nuclear workers are employed in the commercial nuclear industry.

"The SIM-Teq® product line incorporates 'live' sources that are not radioactive and can be configured through an instructor computer software application called the simulation control center or SCC," said Steve Nester, business development manager, Product Sales, RSCS. "The training instruments auto-respond to the simulated sources much the same as real instruments respond to real radioactive sources, based upon their distance and geometry between one another."

The technology is a portable wireless training network that facilitates communication between all types of simulated

radiation detection equipment, from all the different manufacturers.

"The SIM-Teq system is agnostic to all the instrument manufacturers," said Nester. "Most detection equipment can be modified or replicated, either through a probe or the meter itself, to work within the training platform."

The new simulation tools consist of an executable native simulation control software, optimized for a PC/tablet touch screen, that can be loaded onto a WIN10 and 11 PC/tablet, without using the internet, along with two simulation devices. The first is a Two-Way Ranging (TWR) simulated gamma radiation source. It's a battery-operated portable device that provides an omnidirectional simulated radiation energy field that can be wirelessly configured via the SCC software application to a desired dose rate. The second is a simulated Thermo Fisher Electronic Personal Dosimeter (EPD), another small, battery-operated portable device that operates like currently fielded dosimeters.

> **"The training instruments auto-respond to the simulated sources much the same as real instruments respond to real radioactive sources."**
>
> *-Steve Nester, RSCS*

The technology can create complex scenarios, including exposure to extremely small sources of radiation that require close proximity to register on a dosimeter, and exposure to large sources of radiation that can be detected from a distance of over 30 meters.

The project's second phase began in August 2021 and is scheduled to wrap up in February 2024. Phase II added more training instruments. This includes the development of two training probes, simulating a Beta/Gamma probe that will auto-respond to the simulated gamma sources, and a Beta Frisker probe that will auto-respond to pre-programmed radio-frequency identification device (RFID) sources that emulate surface contamination.

These simulation tools are designed to train personnel in the basics of radiation safety: time, distance, and shielding, to help them minimize their dose of radiation during work activities. The tools are easily adjustable by the instructor to simulate standard work processes and emergencies. Moreover, the simulation tools can be used in areas with physical constraints such as tight spaces, high vertical surfaces, and physical barriers.

"I recently supported a NATO exercise in the Czech Republic, where they had a variety of scenarios," said Nester. "One example was an IED explosion with radioactive material that caused a lot of casualties. When the victims were brought into the field hospital, they had to determine what to do with an injured person who had become a high radiation source."

These simulation tools can also be used for many training scenarios such as searching for sources, establishing access boundaries, or surveys of radioactive material in transport.

Above all, the project's prototype simulation tools can train staff in worst-case scenarios safely without exposing them to actual radiological hazards—even to very high, life-threatening levels. If employees are realistically trained and understand how their equipment will respond in a real-world situation, then they can confidently respond as trained and mitigate potential radiological emergencies whenever they may occur.

While these tools were initially designed for personnel at naval shipyards, their use could be transitioned to any Department of Defense (DOD) personnel who generate and handle radioactive material, maintain nuclear systems or equipment, and may be exposed to occupational ionizing radiation. The training tools will improve the performance of chemical, biological, radiological, and nuclear (CBRN) responders in all military branches, and various agencies of the DOD with radiological contamination detection and decontamination methods.

"This technology allows training of not only one specific organization but also larger groups needing to prepare for coordinated responses, such as emergency responders and Homeland Security personnel," said Nester. "It allows each of these groups to come together in a larger drill scenario, and even include fire and police response outside the fence line."

Commercial, state, and federal entities can readily adapt the simulation tools to meet their specific training requirements. These tools can be used for those who work in industries that handle radioactive materials, to ensure their radiation exposure is kept as low as reasonably achievable (ALARA).

These realistic, adaptable simulation tools have the potential to make a global impact on radiological safety for both personnel exposed to radiological hazards and the general public. ■

Personnel from NSWC Carderock Division and NavalX guide small teams of warfighters to identify high-priority problems at the Warfighter-Centered Design Thinking Workshop held during the 2023 Atlantic Diving Supply Warrior East Exposition in Virginia Beach, VA. Design thinking sprints make innovation processes, as a whole, more available across the command and Naval Sea Systems Command. (Photo by Shauna Love-vonKnoblauch.)

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

By Edvin Hernandez, NSWC Carderock Division Public Affairs

A warfighter-centered design thinking workshop was facilitated by Dr. Julie Stark, Naval Surface Warfare Center (NSWC), Carderock Division, Science and technology manager for combatant craft, and Lauren Hanyok, Capital Tech Bridge director, during the recent Atlantic Diving Supply Warrior East Exposition in Virginia Beach. The event was co-sponsored by NavalX and NCMS, a key partner for the Mid-Atlantic Tech Bridge (MATB) of NavalX.

NavalX and its tech bridges serve as an innovation and agility cell for the Navy and Marine Corps to foster their collaboration with industry, academia, and other military branches.

The warfighter-centered workshop challenged Department of Defense attendees to think of innovative ideas that have the potential to enhance naval warfighting capabilities. Dr. Scott Steward, the Office of Naval Research (ONR) TechSolutions deputy director, was also a key participant in the workshop. The TechSolutions program is a rapid-response science and technology program focused on rapidly bringing warfighter ideas to the field.

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

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

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

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

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

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

"Events like Warrior East where we held the workshop are a fantastic opportunity for widely distributed tech bridges like us to join forces with Warfare Centers in other tech bridges to run truly collaborative engagements," Hanyok said.

At the Warrior East exposition in Virginia Beach, Hanyok began the workshop by asking attendees to think about technologies they would like matured and encouraged them to reference the commercial solutions they had recently seen inside the exhibit halls at the convention center.

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

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

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

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

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

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

The winning team from the first-ever "Show Us Your Technology" workshop, held at the 2023 CTMA Partners Meeting in New Orleans, accept their award from (front row, left) Debbie Lilu, NCMS Vice President, Mx and Sustainment, Business Development, and (front row, right) Steve McKee, Director for Enterprise Maintenance Technologies, Office of the Deputy Assistant Secretary of Defense for Materiel Readiness. (Photo by NCMS Staff.)

NCMS Awards Project Funds to Winning Workshop Group to Develop CBM+ Solution

At this year's CTMA Partners Meeting, nearly 100 maintenance and sustainment (M&S) technology experts from the DOD, industry, and academia gathered for the first-ever "Show Us Your Technology" workshop, where they competed to create viable technology solution project proposals.

"I couldn't have been more pleased with the outcome of the 'Show Us Your Technology' workshop," said Greg Kilchenstein, Chief Technologist at NCMS. "The innovation and collaboration demonstrated by our industry partners was a testament that American ingenuity is alive and well."

The workshop was born from the success of the NCMS-supported REPTX, a Navy expeditionary repair event where real-world scenarios were provided to on-site industry participants who partnered to rapidly develop and demonstrate solutions aboard a Self-Defense Test Ship. NCMS determined that a similar collaborative problem-solving framework could be effective in a workshop setting.

By all accounts, the workshop at the CTMA Partners meeting was a resounding success as four teams collaborated around four relevant sustainment challenges and rapidly formulated solutions from existing commercial capabilities.

Participants worked in teams for 45 minutes to develop solutions for one of four scenarios: providing robotic sustainment for Navy vessels; repairing and manufacturing corroded B-52 landing gear; utilizing interactive, digital technologies to train tomorrow's optionally manned fighting vehicle (OMFV) M&S workforce; and leveraging condition-based maintenance plus (CBM+) for Marine Corps ground vehicles. Each team presented their proposed solution to the whole group, after which all were asked to cast a vote for two solutions, excluding the one they helped to develop.

The winning team proposed a solution for the CBM+ category. NCMS has awarded $25,000 to this team to enable them to develop a full proposal for a CTMA collaboration based on their solution.

The Winning Solution

Marines need the right parts, tools, and skills deployed at exactly the right locations and times to keep their

light and responsive lethal force ready for the next fight at a moment's notice. To maximize readiness, the US Marine Corps (USMC) seeks a holistic capability for real-time visibility of their Joint Light Tactical Vehicles (JLTV) materiel conditions. The USMC wants a solution that leverages condition-based maintenance plus (CBM+) and predictive maintenance capabilities.

According to DOD Instruction 4151.22, "Condition-Based Maintenance Plus for Materiel Maintenance," predictive maintenance is a technique to predict the future failure point of a component, so that the component replacement can be planned at an optimal time before it fails. CBM+ is the application and integration of appropriate processes, technologies, and knowledge-based capabilities to improve the reliability and maintenance effectiveness of DOD systems and components.

The team's proposed solution employs the Advana environment, a common enterprise data repository for the DOD that is accessible by all services. The solution consists of an onboard data logger—an on-vehicle tablet—that compiles data from onboard sensors, along with data on batteries, oil analysis, maintenance, and supply. The solution creates a single version of truth: a "Vehicle Health Model." This model feeds into a "Fleet Health Management Dashboard," which provides real-time information to maintainers via a "Tactical Mission Planning Suite."

The proposed system works by providing the user with information about likely mission-critical faults during operation. The in-vehicle display requires little training, with only critical, actionable information displayed. After operation, data is off-loaded and processed in near-real time to facilitate preventative maintenance. This data can be used to drive work orders and supply chain actions to change the right parts, at the right time, in the right place.

When fully developed, the solution will reduce unscheduled maintenance, optimize preventative maintenance, result in more vehicle uptime, and lower maintenance costs. The solution could be transitioned to a cross-functional DOD-wide capability, as the framework is scalable to JLTVs in the Army, Air Force, Navy, and other branches, as well as other ground vehicles, ships, and missiles. The team working to create this solution includes experts from the USMC, Army, and Air Force, along with industry partners Andromeda Systems, Astrolabe Analytics, Edlore, and Redhorse Corporation.

"CBM+ and predictive maintenance are extreme maintenance paradigm-changing challenges across the entire DOD," said Kilchenstein. "It was truly impressive that the winning team could rapidly devise and present an extremely viable solution to holistically apply CBM+ to Marine Corps vehicles."

Nearly 100 technology experts representing industry, academia, and the DOD—all attendees at the 2023 CTMA Partners Meeting—competed in four teams to develop solutions for one of four proposed real-world scenarios at the "Show Us Your Technology" workshop. (Photo by NCMS Staff.)

In addition to the CBM+ solution, three other teams developed proposed solutions for the other maintenance challenges. These teams included experts from the Air Force, Army, and Navy as well as representatives from 20 companies and 4 academic and research institutions.

For more information about the 2023 CTMA Partners Meeting, please visit: https://www.ncms.org/ctma-partners-meeting/. ■

Representatives from exhibitor Keyence Corporation of America demonstrate their enhanced inspection technologies to attendees at the NCMS Technology Showcase at Tinker Air Force Base in Oklahoma City, OK. (Photo by NCMS Staff.)

First NCMS Technology Showcase at Tinker AFB Shines Spotlight on Innovative Solutions

The first NCMS Technology Showcase with the Air Force, held at Tinker Air Force Base (AFB) in Oklahoma City, July 17-18, 2023, provided an opportunity for mission-relevant companies to exhibit how their technologies serve Tinker AFB's mission: providing sustainment and logistics readiness to deliver combat power for America.

Companies exhibited technologies in multiple focus areas including Advanced/Additive Manufacturing, Business IT and Analytics, CBM+/Predictive Maintenance, Coatings and Corrosion Prevention, Enhanced Inspection, Reliability Improvement (Hardware), and Workforce Development/Visualization.

Industry exhibitors engaged with hundreds of decision-makers, managers, artisans, and technicians, allowing them to demonstrate how their next-generation technologies can help solve Tinker AFB's maintenance and sustainment challenges.

"This event has been extremely beneficial to re-engage with existing relationships here at Tinker AFB and also to get a better understanding of the offerings of our fellow small businesses and tech innovators," said Kyle Burns, strategic partnerships development manager at Essentium, which provides industrial 3D printing solutions at scale.

"We've had fantastic conversations with our DOD customers and others to learn about new technologies. The ability to speak with both the end-users and the decision-makers is a priceless opportunity. I appreciate NCMS for organizing the event," said Joe Laws, program manager at Grey Gecko LLC, which delivers custom corrosion-detection solutions to the DOD.

The opportunity to interact with DOD decision-makers is especially valuable for small businesses.

"We're a small business unit so there's no one looking us up on our website and then calling us to invite us on base. NCMS events get us access to talk to people that we've never had," said Mark Murphy, director of operations of FASTORQ, a SNAP-ON company that provides precision bolt installation and removal solutions. "Having the base commanders' support

behind it, they give people time off to come see us and collaborate. We get to ask them about what problems they face, daily. We've even had people from the first day bring additional contacts through on the second day. Having contacts at multiple installations within the DOD has been huge for us."

The contacts that industry exhibitors make at NCMS Technology Showcases are often very productive.

"The NCMS Technology Showcase has been great. We went to the CTMA Partners Meeting in New Orleans, and here it's gotten even better," said Dillon Banner, senior sales engineer, Surface Analysis Team, Keyence Corporation of America. "DOD and industry attendees spent time at our booth and now we have many great contacts to follow up on. We've got a demo set up on Wednesday after the showcase to go and do some testing of our equipment. We're really excited about it."

As a leader in industrial base modernization, Tinker AFB is hosted by the 72nd Air Base Wing, which provides base installation and support services for the headquarters, Air Force Sustainment Center, the Oklahoma City Air Logistics Complex, and more than 45 associate units assigned to six major commands, including the largest flying wing in Air Combat Command, the Navy's Strategic Communications Wing One, and several defense agencies. The Oklahoma City Air Logistics Complex performs maintenance on multiple aircraft, TF33 engines, and a wide variety of commodities for the Air Force, Navy, Marine Corps, and foreign military. In addition, the complex is responsible for the development and sustainment of a diverse portfolio of mission-critical software.

NCMS collected feedback from all participants and is working with Tinker AFB and industry to take the next steps to transition technologies that can significantly improve sustainment operations.

To learn more about the NCMS Technology Showcase at Tinker Air Force Base, please visit https://www.ncms.org/events/ncms-technology-showcase-tinker-air-force-base.

To learn more about the exhibitors, please visit https://www.ncms.org/events/ncms-technology-showcase-tinker-air-force-base/#exhibitor-directory. ■

MEMBER SPOTLIGHT

Meet ESE Industries

ESE Industries designs and builds custom, lightweight carbon fiber parts for military, aerospace, robotics, marine, automotive, sporting goods, and other applications. A one-stop shop, ESE takes projects from concept to completion, providing carbon fiber design, engineering, mold fabrication, tailored fiber placement (TFP), high-pressure resin infusion, and custom parts manufacturing.

ESE's manufacturing processes include 5-Axis CNC machining and high-pressure resin infusion, which help automate and accelerate the carbon fiber layup process. These processes enable the company to produce mechanically efficient parts while dramatically lowering raw material costs and increasing turnaround times.

A minority-owned small business, ESE Industries was founded in 2011 in Jasper, GA with the goal of making carbon fiber composites more accessible.

ESE Industries is a division of ESE Carbon Company, the manufacturer of the first and only one-piece carbon fiber aftermarket wheel in the US. ESE is leading the way in automotive wheel advancements, serving on the SAE International Wheel committee and helping to develop international standards for carbon fiber wheels.

For more information about ESE Industries, please visit: https://ese-industries.com/. ■