CTMA CONNECTOR

WINTER 2025

P5

Latest Airfield Autonomy Initiative Achieves 99.55% Success Rate

IN THIS ISSUE

CTMA Connector

CTMA Program

Debbie Lilu
EVP, Mx and Sustainment, Business Development

CTMA Connector Staff

Pam Hurt
Executive Editor

Nancy LaMarca
Editor

Christina LaRose
Senior Writer

Lindsey Konarske
Designer

UPCOMING EVENTS

January 20 - 23, 2026
DoW Maintenance Symposium
Phoenix, AZ

January 20 - 22, 2026
NCMS Sustainment Accelerator: Pearl Harbor
Honolulu, HI

September 22 - 24, 2026
2026 CTMA Partners Meeting
Jacksonville, FL

All NCMS events 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.

Join the CTMA Connector digital distribution list.
Email: https://ncms.org/connect-with-ncms

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 DoW 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 DoW-wide program focused solely on maintenance and sustainment.

This Expeditionary Fabrication System represents an early self-contained additive manufacturing lab fielded by the Marine Corps. Its design offered insights for a CTMA project developing a more advanced portable manufacturing system. (US Marine Corps photo by Lance Cpl. Jessica J. Mazzamuto.)

Portable AM Hub To Deliver Rapid Repair Parts to Distant Outposts

Maintaining the US military's worldwide presence requires the ability to perform maintenance and sustainment (M&S) activities globally, which necessitates a continual supply of a wide assortment of repair parts and components for multiple weapons systems. But ensuring maximum readiness sometimes also requires solving difficult supply chain challenges including long lead times to acquire parts and components, the unavailability of some legacy parts and components, and legacy design deficiencies that result in unreliable parts.

By leveraging additive manufacturing processes, M&S operations can solve many supply chain issues that plague legacy platforms, improving overall operational effectiveness while lowering costs.

In an effort to expand the use of additive manufacturing in locations where standard supply chains have unacceptably long lead times for delivery, the Naval Facilities Engineering and Expeditionary Warfare Center has partnered with NCMS and industry participant Defense Engineering Systems (DES) on a CTMA initiative to create a prototype portable manufacturing system. The overall goal is to create a system that can enable rapid production of parts that allow for, at minimum, temporary repair while new replacement parts are in transit. During development, the project team has been tasked with identifying critical requirements for producing legacy parts effectively. Likewise, technology gaps will be defined, such as electrical power needs, environmental conditions, and the suitability of certain advanced manufacturing technologies.

This portable manufacturing system will be a containerized version of an additive manufacturing or fabrication lab. It will function similarly to the way that Emergency Medical Services (EMS) operates in support of a larger medical apparatus. In an ideal situation, all medical procedures would take place in a hospital or office setting. However, due to medical emergencies, EMS workers are deployed to triage and stabilize the patient while in transit to the hospital. The portable manufacturing systems will function similarly. They may not have the same capabilities of the larger, traditional production facilities, but they are optimized to meet the most critical needs of maintainers while in the field. These containers will offer a variety of additive and advanced manufacturing capabilities mounted into a mobile package that can help save valuable time for repairs and prevent prolonged downtime for military assets.

US Marines test out an expeditionary fabrication lab developed in 2023, equipped with multiple 3D printers, scanners, laser cutters and other support tools. Its design informed the recent CTMA project team that developed a new portable AM lab. (U.S. Navy photo by Michael Walls.)

"At DES, we are committed to delivering innovative solutions that address the military's most pressing challenges," Greg Gordon, DES Managing Principal, said. "This portable manufacturing system is a game-changer, enabling rapid repairs and minimizing downtime for critical assets in remote locations."

In the early stages of the initiative, the project team developed an initial design for the fabrication facility and received appropriate approvals and stakeholder support. Work has now begun on prototype production with a delivery goal set for the end of 2025. One unique aspect of this CTMA project is that, while portable manufacturing systems are not new, this project places more emphasis on enabling rapid implementation of parts through secure access to engineering data stored in a government digital repository of approved designs. Additionally, this system will include capabilities for design improvements of faulty parts, enabling real-time evaluation for future improvements.

"This initiative represents a significant leap forward in leveraging advanced manufacturing technologies to support military operations," Gordon added. "By integrating secure access to engineering data and enabling real-time design improvements, we are setting a new standard for efficiency and innovation in the field."

Rapid progress on this initiative has been fueled by the project team's ability to gain valuable insights from existing set-ups used by other services. One such preexisting option—the US Marine Corps' Expeditionary Fabrication (XFab) program—is a 3D printing and fabrication lab designed for use in deployed locations, which the project team was able to visit.

The ability to produce parts and components at the point-of-use will certainly reduce costs and turn-around time. Additionally, rapid design iteration will improve part quality. Altogether, this project contributes to the development of rapid portable manufacturing, strengthens the US industrial base, and improves remote maintenance and sustainment activities for both the public and private sectors.

Latest Airfield Autonomy Initiative Achieves 99.55% Success Rate

The AAI Next group selected COAST consortium to build and demonstrate an autonomous system for perimeter patrol, foreign object debris sweeping, and grass cutting. The consortium consists of COAST Autonomous, Pratt Miller Engineering, Renu Robotics, and ARIBO. (Photo by Travis Shea.)

In spring 2025, the second phase of the Airfield Autonomy Initiative (AAI), AAI Next, achieved extraordinary success with utilizing autonomous ground vehicle systems for three routine airport tasks: perimeter patrol, foreign object debris (FOD) sweeping, and grass cutting. Over eight weeks, the vehicles completed 1,763 autonomous missions with zero safety issues and a 99.55 percent success rate, including a 100 percent success rate during two weeks of steady-state daily operations.

"The Airfield Autonomy Initiative Next was groundbreaking," Greg Kilchenstein, NCMS Chief Technologist, said. "The demonstrations, held at the Atlantic City International Airport (ACY) and the adjacent National Airport Pavement and Materials Research Center (NAPMRC), were wildly successful. AAI Next is on the cutting-edge of integrating autonomous capabilities into commercial airfields."

The Airfield Autonomy Initiative was launched in 2022 after the Federal Aviation Administration (FAA) received Congressional funding to advance autonomous capabilities on airfields. The AAI leadership team consists of experts from the FAA, the Air Force's Air Mobility Command (AMC), the National Aerospace Research and Technology Park (NARTP), and the National Center for Manufacturing Sciences (NCMS). Working with partners from commercial industry, AAI is automating routine airport tasks to reduce costs, improve efficiency, and increase safety in both military and commercial aviation. Early demonstrations were conducted at Joint Base McGuire-Dix-Lakehurst (JB MDL) in New Jersey, enabling the consortium to view potential technology solutions from industry partners.

"A lot of things moved forward in the journey from the first Airfield Autonomy Initiative to AAI Next," Kilchenstein said.

The first stage of AAI similarly gathered proposals from industry teams, then selected Maren-Go Solutions, Inc., a firm that designs and builds autonomous systems. The team developed and demonstrated an autonomous airport operations (A2O) system paired with a few robotic operators. Ultimately, the initiative resulted in four military airfields requesting a setup pairing the A2O system with a FOD detection rover that employs radar and a FOD collection unit that utilizes both an industrial vacuum and industrial magnets.

For the AAI Next initiative, the FAA has been more deeply involved as a sponsor and enabler for the movement toward technology transition to operations. (Photo by Travis Shea.)

"For AAI Next, there has been a lot more integration of commercial capabilities," Kilchenstein said. "Also, the FAA has been more deeply involved as a sponsor and enabler for the movement toward technology transition to operations."

The AAI Next initiative was launched when NCMS issued a request for proposal (RFP) that solicited autonomous capabilities needed at airfields for perimeter patrol, FOD sweeping, and grass cutting. "We received a significant number of proposals from companies as well as industry consortiums," Kilchenstein said. "The Airfield Autonomy Initiative leadership team reviewed each proposal, and the COAST consortium was the clear winner."

The COAST consortium consists of COAST Autonomous, Pratt Miller Engineering, Renu Robotics, and ARIBO. For planning and deploying the three autonomous vehicles, ARIBO drew on their organization's experience with 60 autonomous vehicle projects that aligned military, public sector, and commercial ground vehicle robotics R&D.

COAST Autonomous utilized their command and control (C2) system to govern the interactions between all three autonomous ground vehicles operating on the airfield. A cloud-based platform, the COAST C2 System oversees vehicle scheduling, routing, and coordination, ensuring seamless integration into airfield operations. The COAST C2 System updates the map of the environment, service, and schedule of operation.

For FOD sweeping, COAST Autonomous demonstrated their Pro XD Autonomous Road Machine (ARM), based on a modified Polaris Pro XD gas-powered utility task vehicle, equipped with a FOD*BOSS sweeper. The COAST Pro XD ARM executes missions by schedule, operator command, or dynamic operational events as defined via the COAST C2 System interface. Throughout the Airfield Autonomy Initiative, operations persisted successfully during heavy rainfall, confirming system ruggedness and reliability.

To perform autonomous perimeter control, Pratt Miller Engineering employed their Flexible Robotic Platform Light (FRP-L) platform. Guided by mission paths and directives defined within the COAST C2 system, the FRP-L overlays pre-surveyed map attributes with real-time autonomy sensor data to ensure path adherence and identify and report surveillance events or anomalies. When the platform detects obstacles or objects of interest, it halts and alerts the COAST C2 System, awaiting further instruction to proceed, ensuring operational transparency and safety.

For autonomous grass cutting, Renu utilized their Renubot, which integrates GPS with real-time kinematic (RTK) positioning, light detection and ranging (LiDAR), and cameras to allow the platform to precisely position, detect obstacles, and safely operate near airfields, all while continuously reporting its progress and operational health to the C2 system. The Renubot can be fully controlled, either locally or remotely, and maintains areas in the 120+

COAST Autonomous demonstrated their foreign object debris (FOD) Pro XD Autonomous Road Machine (ARM), based on a modified Polaris Pro XD utility task vehicle, equipped with a FOD*BOSS sweeper. (Photo by Travis Shea.)

acre range. Additionally, the unit is 100 percent electric, which reduces maintenance requirements.

By the end of the Airfield Autonomy Initiative, the team successfully demonstrated real-time management and coordination of the three autonomous vehicles via the COAST C2 System. All vehicles exhibited reliability in obstacle avoidance, geofencing, and emergency stop functions using sensor fusion (LiDAR and cameras), maintaining safe and error-free performance, including during inclement weather. Real-time fleet supervision was ensured by both on-site and remote operators through a cloud-based dashboard, supporting distributed oversight, planning, and immediate human override if necessary.

Secure communications were provided by two-factor authentication, bi-directional data exchange, and flexible integration with third-party maps and APIs. The team ensured secure data management and analysis by establishing comprehensive telematics collection, secure cloud-based storage, real-time access controls, and systematic management of operational data to enable transparent evaluation, compliance, and future scalability.

Bringing together multiple autonomous ground vehicle systems to demonstrate over an eight-week period required NCMS's team to provide expertise in contracts, accounting, and project management.

"NCMS took on the administrative role of getting all partners on contract, organizing demonstrations, and making sure that the resources the FAA provided to the NAARTP were applied correctly to get the Airfield Autonomy Initiative Next demo done," Kilchenstein said. "For AAI Next, the FAA led the initiative, and the Air Force was an interested observer. This is a great example of how NCMS is championing and facilitating the development and transition of dual-use capabilities for airfield autonomy."

To view videos of the autonomous vehicles demonstrated in AAI Next, see:

https://www.nbcnews.com/nightly-news/video/researchers-test-new-airport-tarmac-technology-242441797571

New Final Reports

Every quarter, the CTMA Program releases to the public the most recent final reports for completed CTMA projects. See below for highlights of some of the latest releases, which are all linked to their project summaries posted on the NCMS website. To see more final reports for CTMA projects, please visit: https://ncms.org/ctma-projects/.

3 in 1 Portable Surface Preparation System
The PlasmaBlast 7000-M system demonstrated over 90 percent labor savings compared to traditional methods such as abrasive blasting and chemical stripping. Its quick setup time—operational in under 5 minutes—minimizes equipment downtime, enhancing overall maintenance efficiency. Transition of the technology was actively pursued through onsite demonstrations and stakeholder engagements at key facilities. User training and field adoption were advanced at Norfolk Naval Shipyard, Hill Air Force Base, the National Training Center, and with Army watercraft personnel. See Report

Additively Manufactured High Temperature Friction Stir Tooling through Thermal Spray Techniques
This initiative used the US Army as a surrogate for the commercial industry to improve the performance, reduce the cost, and increase the lifespan of friction stir welding (FSW) tools. By enabling new and more efficient joining techniques, it provides a variety of lightweighting material solutions for use by commercial industries such as automotive and aerospace. See Report

Advanced Manufacturing Processes for Improved Maintenance and Sustainment Environments
After extensive assessment and testing, the Keyence Wide Area Coordinate Measuring Machine (WM-3500) portable CMM has demonstrated superior precision and efficiency in measuring complex aerospace components. The machine's versatility and ease of use have been validated, confirming its suitability for integration into the 76th PMXG aerospace maintenance environment. See Report

Advanced Materials for Lithium-Ion Batteries – Phase IV
To assist with meeting the US Army Ground Vehicle Systems Center's (GVSC) military vehicle electrification goals set for 2035 and 2050, PPG took two approaches: (1) Advancing ultra-high-power aqueous-based supercapacitor technology using high-voltage aqueous electrolytes, and (2) Beginning to explore a methodology of processable all-solid-state battery devices toward a novel, scalable electrolyte composite solution. See Report

Artificial Intelligence and Machine Learning Applications for Data Analytics – Phases I-VII
BigBear.ai (BBAI) led a comprehensive effort to design, develop, enhance, and integrate advanced digital solutions in support of the DoW mission to optimize readiness, modernization, and sustainment across the materiel life cycle. BBAI delivered a suite of interoperable software platforms that improve the decision-making process, operational transparency, and speed of action across the Total Army. See Report

Dynamic Component Rebuild Facility Gap Initiative
A modernization initiative was launched to upgrade the Dynamic Component Repair Facility at Corpus Christi Army Depot (CCAD) with advanced technology and infrastructure enhancements. The initiative resulted in the installation of the latest equipment, enhancing CCAD's capacity to perform efficient and high-quality repairs, overhauls, and modifications of critical rotorcraft components. These upgrades directly contribute to reduced production time, improved cost efficiency, and overall enhanced performance of maintenance operations, ensuring that the Army's rotorcraft fleet remains mission-ready at all times. See Report

Improved Watercraft Coatings – Phase II
Over the course of the project performance period, PPG demonstrated the superlative performance of SigmaGlide® multiple times under conditions of high fouling pressure. SigmaGlide controls were consistently cleanable (as established with dynamic exposure tests and mild pressure washes), amenable to high speeds, and reasonably durable considering the delicate balance between fouling performance and mechanical rigidity. See Report

Improvements in Ship Maintenance
Puget Sound Naval Shipyard partnered with Swagelok and CS Unitec to customize readily available commercial off-the-shelf equipment so that work could be done in a safer, more efficient manner, and meet the strict requirements to work in the only US facility that recycles nuclear vessels. Participants worked on a modification for a self-feeding pipe clamp for pneumatic hacksaws and developed a process for pre-cleaning valves, fittings, and tubing components. See Report

Improving Design Processes to Reduce Manufacturing Risks for Subcomponents

Design optimizations introduced through structured design for manufacturability and sustainability workflows support reduced assembly time, lower labor costs, and faster development cycles—key advantages for competitive, high-volume production environments. While this initiative was primarily developed for military application, the technologies, materials, and engineering practices refined during the project have significant crossover benefits for the commercial sector, particularly the automotive, off-road, and heavy equipment industries. See Report

Leveraging Advanced Tools and Processes for Software Sustainment of Vehicle Systems

The team successfully delivered a modern, cyber-secure, high-performance, supportable software baseline for sustainment and piloted new advanced tools and processes using development, security, and operation (DevSecOps), agile, and advanced code resource environments to sustain a government-owned vehicle operating system. See Report

Leveraging Data Analytics to Support Maintenance and Sustainment Activities

The overall objective of the project was to integrate the vast array of datasets available to Naval Aviation Enterprise (NAE) operations and maintenance personnel to improve decision-making at all levels. The project produced over 150 prototyped analytics toolsets for government customers and stakeholders. The analysis included examples and methods to confront the challenging goals inherent in any sustainment effort over a system's life cycle. See Report

A Sea Change in Aircraft Maintenance: E-Drill

The findings of this study confirmed that both the Perfect Point Electro-Discharge Machining Handheld Inspection Device and GelSight Mobile provide effective and quantifiable solutions for measuring electro discharge machining (EDM) fastener offsets, addressing the critical need for a secondary inspection method in EDM-based fastener removal. The importance of this investigation is its potential to improve the safety, reliability, and efficiency of aerospace maintenance operations by providing a validated means of detecting and mitigating EDM-induced damage. See Report

The Fleet Readiness Center Southeast F-5 Aircraft Production Line uses the E-Drill system to remove metal fasteners on an F-5 Tiger II vertical stabilizer. (US Navy Photo by Toiete Jackson.)

NCMS Sustainment Accelerator at Robins AFB Welcomes Military Leadership

NCMS, in partnership with Robins Air Force Base (AFB), hosted a successful Sustainment Accelerator on base in Warner Robins, Georgia. This exclusive Sustainment Accelerator was held in coordination with the Organic Industrial Base (OIB) Commanders and Leaders Peer-to-Peer meeting.

Robins AFB is home to the 78th Air Base Wing and over 50 mission partners, making it vital to Air Force operations. It's the largest industrial complex in Georgia, with almost 22,000 civilians, contractors, and military personnel—proudly known as Team Robins—working together to keep everything running smoothly.

Members of the Organic Industrial Base commanders and leaders peer-to-peer meeting are briefed about the Warner Robins Air Logistics Complex capabilities in additive manufacturing at Robin Air Force Base, Georgia. (US Air Force photo by Joseph Mather.)

The OIB Commanders and Leaders Peer-to-Peer meeting brought together military leadership and decision-makers from government-owned industrial facilities including arsenals, depots, shipyards, and manufacturing plants that support critical military needs. OIB officials were briefed on the CTMA Program prior to entering the Sustainment Accelerator. Exhibitors were able to gain high visibility for their products and services, while also learning about opportunities for future collaboration among the leading technology experts who serve the DoW.

In contrast to more typical NCMS Sustainment Accelerators, this event was invite-only due to limited exhibition space—ensuring that the government decision makers were paired with technology providers that aligned with pre-determined desired capabilities. In total, 21 industry exhibitors were able to meet with 60 military leaders and maintenance and sustainment stakeholders as well as 50 Robins AFB personnel. For more information on the exhibitors, visit the online exhibitor directory: https://ncms.org/wp-content/uploads/2025/09/Robins-AFB-Exhibitor-Directory-final2.pdf

While this was NCMS's first event at Robins AFB, this is the second time NCMS has worked to support the OIB of the South—having hosted an April event at Marine Corps Logistics Base – Albany, Georgia.

To stay up to date on upcoming NCMS events, be sure to check out ncms.org/events. Interested parties can request to be added to NCMS mailing lists here: https://ncms.org/connect-with-ncms/.

The 402nd Aircraft Maintenance Group commander provides a briefing on the capabilities of the maintenance overhaul and repair line to members of the OIB commanders and leaders peer-to-peer meeting tour at Robins Air Force Base. (US Air Force photo by Joseph Mather.)

PART WORKS

PartWorks

PartWorks helps aerospace organizations extend structural life, reduce repair time, improve repeatability, and make every installation traceable. Founded by senior aerospace engineers and product leaders, PartWorks pairs life-extension hardware with hands-free, point-of-action digital capture so the parameters that influence fatigue performance (e.g., fit interference, forces, dimensions, and location) are recorded during production and repair—creating audit-ready records.

PartWorks' solutions include:

- **RepĀR™** — AR hands-free goggle-based guidance with real-time, airframe-level data capture for structural holes (local coordinates, diameters, edge margin, torque/force, process states). AI-trained and designed to evolve with customer input and new needs.

- **TitanLoc™** — Thin-wall, shrink-fit-emulating bushings engineered for high push-out resistance and consistent interference—without handling cryogenic materials.

- **StrataX™** — Residual-stress bushing technology improves damage tolerance and enhances fatigue resistance in high-load, vibration prone or heavy wear locations.

- **EdgeMax™** — Cold-expanded sleeves that restore damaged holes, preserve edge margin, and mitigate corrosion.

- **PrecisionFX™** — Battery-powered hydraulic puller for installing expanded-fit bushings over 1 in. diameter and coldworking stack-ups over 3 in. thick. Supports shrink-fit and press-fit installs (including flange seating).

PartWorks serves defense programs, depots, repair stations, airframe OEMs, and airlines seeking faster turnarounds, tighter process control, highest level of rapid data capture integrity, and traceable records. Adding favorable residual stress to counter known stress risers is a proven cost effective and weight neutral means to improve structural durability. By capturing as-installed parameters and linking them to each hole and part, PartWorks closes the loop from design to MRO. The company welcomes collaborations and rapid pilots to prove value on real structures and schedules. To learn more about PartWorks, visit partworks.com.

Finalists Announced for the 2025 Maintenance Innovation Challenge

The US Department of War (DoW) has announced five finalists for the 2025 Maintenance Innovation Challenge (MIC), a competition that seeks innovative solutions with potential to improve DoW sustainment operations with the goal of improving materiel readiness.

The five finalists are:

- "Advanced Manufacturing Competitive Advantage Pathfinder," submitted by the US Marine Corps' Marine Depot Maintenance Command
- "AI-Powered Robotic Maintenance Repair and Overhaul," submitted by GrayMatter Robotics
- "FIRstView Enhanced Real-Time Thermography for Field NDI," submitted by Thermal Wave Imaging, Inc.
- "Grey Gecko Real-Time Inspection Tool (GRIT)," submitted by Gray Gecko, LLC
- "NESAR Distance Support Kit," submitted by the US Naval Sea Systems Command (NAVSEA) 05T Directorate's Navy Expeditionary Sustainment and Repair (NESAR) team

The MIC's objective is to raise awareness of new and promising technologies and processes that show strong potential to positively impact DoW sustainment. The five finalists will present their solutions at the 2025 DoW Maintenance Symposium, scheduled for January 20-23, 2026 in Phoenix, AZ.

The National Center for Manufacturing Sciences (NCMS), the competition's facilitator, has committed to support the winners' innovations by making available $50,000 of in-kind support for the Overall Award and the People's Choice Award winners to enable them to conduct further demonstrations for DoW representatives.

For more information on the Maintenance Innovation Challenge, visit: https://ncms.org/maintenance-innovation-challenge.

Graphic provided with "Advanced Manufacturing Competitive Advantage Pathfinder" entry for the MIC.

Graphic provided with "AI-Powered Robotic Maintenance Repair and Overhaul" entry for the MIC.

Graphic provided with "FIRstView Enhanced Real-Time Thermography for Field NDI" entry for the MIC.

Graphic provided with "Grey Gecko Real-Time Inspection Tool (GRIT)" entry for the MIC.

Graphic provided with "NESAR Distance Support Kit" entry for the MIC.