MAINTENANCE INNOVATION CHALLENGE

JANUARY 21-23, 2026
PHOENIX, ARIZONA

Objective

The MIC is designed to raise awareness across the DoW community to a myriad of new and promising technologies and innovative processes that present the best opportunities to positively impact DoW Maintenance.

Abstract

The importance of sustainment innovation development and adoption is increasingly relevant as we strive to accelerate materiel availability. The MIC endeavors to highlight some of the most promising solutions to improve materiel readiness across the field-level activities, Organic Industrial Base, and Defense Industrial Base. There were 59 innovations submitted to the MIC this year. All 59 are included in this booklet.

MIC Breakout Session

This live session showcases the five MIC finalists as they present their technologies, best business practices, and innovative maintenance processes. The finalists were selected by an evaluation board of maintenance technology subject matter experts from the Joint Technology Exchange Group and industry. Each finalist will be given 15 minutes to present their promising innovations and approaches. A single MIC winner was selected by DoW Sustainment Technology Executives representing all the Military Services, the Defense Logistics Agency, and the Office of the Secretary of War, Materiel Readiness. Breakout session attendees will have an opportunity to cast a ballot to select the “Peoples’ Choice Award,” which will be presented along with the winner of the MIC at the conclusion of the session.

The Maintenance Innovation Challenge (MIC)

Background

The importance of sustainment innovation development and adoption is increasingly relevant as DoW strives to accelerate materiel availability by improving the effectiveness and viability of the Defense industrial base, including industry and our own organic capabilities. The current events ongoing across the globe have illuminated the need to advance the sustainment enterprise to achieve global competitive advantages over any current or future adversaries. We need to capitalize on our innovative spirit within domestic resources, industrial capabilities, and supply chain approaches to develop world-class technology and innovative processes that enhance our sustainment community. Novel innovations can provide significant advances in capabilities to our sustainment enterprise and benefit other military and domestic challenges. The Military Services, Defense agencies, industry, and academia, are all actively pursuing innovative technologies and processes to improve maintenance capability, effectiveness, and efficiency.

Purpose

The objective of the Maintenance Innovation Challenge (MIC) is to elicit and share unique, enhanced maintenance capabilities, to potentially elevate and expand sustainment innovation beyond new technology, to include value-added partnerships, resourcing strategies, business practices, processes, and other transformative capabilities.

MIC Submission Evaluation

Evaluation Process

MIC submissions are reviewed and evaluated by the Joint Technology Exchange Group (JTEG) Principals, composed of DoW logisticians representing each Military Service, and the Defense Logistics Agency (DLA). The JTEG selected five finalists from the group of submissions. In the second phase, the finalists were evaluated by senior DoW logisticians who ultimately selected an overall winner.

The Evaluation Criteria used to judge the submissions are:

- Innovation's impact on maintenance
- Originality of the Idea
- Technical Maturity
- Cross-Service Application
- Potential to Benefit Maintenance
- Assessment of how viable the innovation is to transition to DoW maintenance

Finalists Presentations

At the 2025 DoW Maintenance Symposium, the MIC finalists will present their new technologies, processes, or business practices to the symposium audience during a breakout session. Attendees at this breakout session will have the opportunity to select the MIC People's Choice Award based on the finalists' presentations. Additionally, all who submit a qualifying abstract and quad-chart are published in this MIC book.

MIC Winners

The MIC winner as selected by a panel of senior DoW logisticians, and the "People's Choice Winner" will both receive high profile DoW-wide recognition during a DoW Maintenance Symposium plenary session. Additionally, the National Center for Manufacturing Sciences has offered to provide each winner $50,000 of in-kind support.

This MIC book contains the abstracts, a link to a short video, and contact information for all the innovations submitted, and is a great tool to utilize for information exchange as well as keep as a reference source.

Joint Technology Exchange Group (JTEG)

The purpose of the Joint Technology Exchange Group (JTEG) is to provide a forum for the exchange of information on new technology, processes, and equipment developments. Collect, analyze, and disseminate DoW maintenance requirements for new technology, processes, and equipment. Advocate for new technology or equipment with cross-service potential to increase efficiency.

JTEG Mission:

- Use an integrated approach to identify, evaluate, and implement maintenance innovation ideas, products, processes, and technology to optimize weapons systems' performance and readiness.
- Pursue innovations in maintenance concepts and capabilities to maintain national defense materiel readiness at optimal cost and advise seniors as appropriate.
- Contribute to cross-department maintenance technology information sharing consistent with statutes, regulations, and DoW policies governing the proper use of appropriated funds.

JTEG Community:

The JTEG community includes anyone in DoW, industry, or academia interested in exchanging information associated with DoW maintenance. The JTEG is overseen by a panel of representatives, or Principals, from each of the military services, the Defense Logistics Agency, and the Office of the Deputy Assistant Secretary of War for Materiel Readiness – (ODASW-MR).

JTEG Monthly Technology Forums:

The JTEG conducts virtual monthly technology forums that provide opportunities for the DoW maintenance community to exchange information on maintenance related technology that has the potential to benefit DoW maintenance. The forums feature presentations and demonstrations from industry, academia, and government organizations on a variety of maintenance-related topics and are open to the public. The topics generally fall into one of three areas:

1. Technology focus areas which feature a specific maintenance capability such as digital maintenance, additive manufacturing and repair, or advanced wiring inspection capabilities.
2. Maintenance and sustainment processes such as better ways to adopt new capabilities, workforce development, or safety.
3. Organizational perspectives which describe maintenance capabilities and initiatives at specific DoW maintenance activities such as maintenance depots or research centers.

To receive calendar invites to the virtual monthly JTEG Technology forums please email osdas-cop4st@groups.mail.mil.

JTEG Website:

Industry, DoW, and academic personnel can use the JTEG website, **jteg.ncms.org**, to view and share information on new technology, processes, and equipment developments that have proven benefits or potential applications involving depot maintenance. Visitors are welcome to review new and exciting technology posted on the website or reach out and contact the JTEG Principals listed on the website. In addition, all past and future JTEG technology forums are posted on the website.

The JTEG Principals and Key Representatives' Profiles

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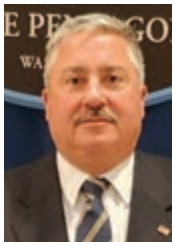

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Keeping Weapon Systems in the Game - From First Pitch to Final Out

Commercial Technologies for Maintenance Activities (CTMA)

What is CTMA?

For over 25 years, the CTMA program, operated by NCMS, has provided a streamlined and agile non-FAR-based contracting vehicle.

CTMA enables DOW partners to collaborate with industry and academia, aimed at solving specific maintenance and sustainment (M&S) challenges. Through CTMA projects, new technology solutions can be demonstrated, evaluated, and validated, thereby helping to transition innovative technologies that support the DOW's most critical M&S needs.

Through CTMA, the DOW can leverage our trusted network of technology experts to apply state-of-the-art solutions to maximize our warfighters' readiness.

Technology Focus Areas

CTMA initiatives can target any of the following nine M&S areas:

- Advanced/Additive Manufacturing
- Business IT and Analytics
- CBM+/Predictive Maintenance
- Coatings and Corrosion Prevention
- Energy, Environmental, Health, and Safety
- Enhanced Inspection
- Facilities and Industrial Process Modernization
- Reliability Improvement (Hardware)
- Workforce Development/Visualization

The CTMA Value

The CTMA process offers great benefits for all participants.

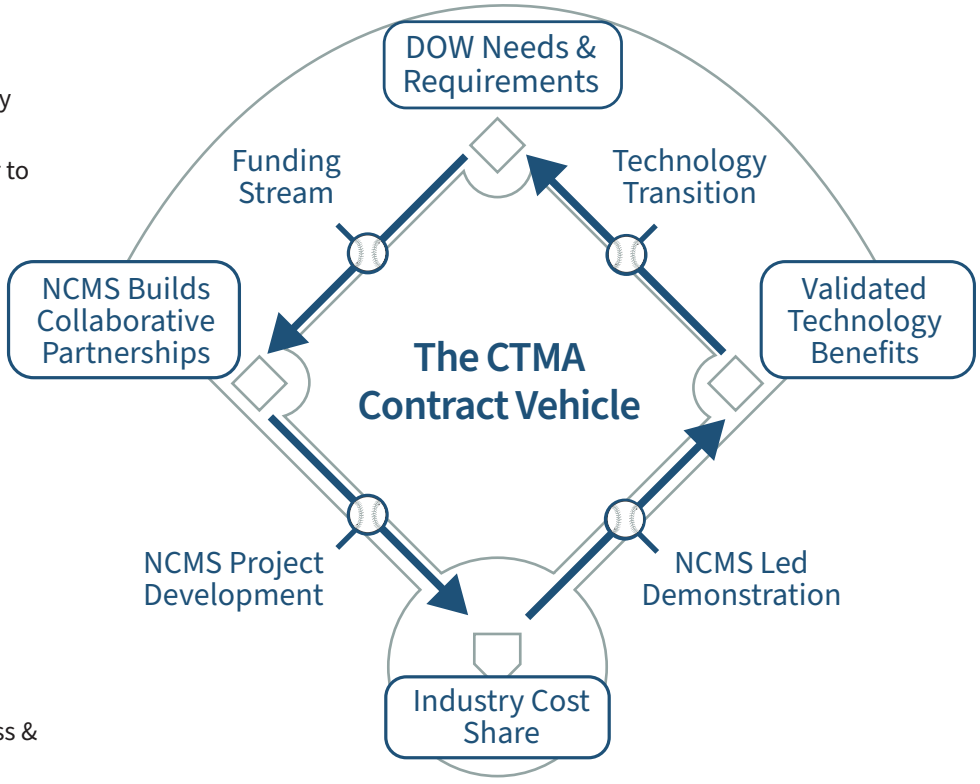
DOW Benefits

- Advanced technologies that improve military capabilities
- Testing and evaluation of technologies prior to acquisition
- Reduced cost of R&D through leveraging and cost-sharing
- Streamlined contracting and cost accounting
- Access to industry and academic expertise and knowledge

Partners Benefits

- Access to DOW facilities and equipment
- IP protection guaranteed by cooperative agreement
- Reduced time between innovation and commercial production
- Opportunities to commercialize inventions
- Opportunities to enhance DOW preparedness & corporate objectives

How CTMA Works



CTMA is a partnership between the Office of the Deputy Assistant Secretary of War for Materiel Readiness (ODASW-MR) and the National Center for Manufacturing Sciences (NCMS)

CTMA FIELD

COME SEE US IN DUGOUT #471

NCMS Lineup

88	DEBBIE L.
25	REBECCA T.
13	GREG K.
29	FRANK S.
30	CANDICE B.
42	MARC S.
17	MICHELLE R.
73	JOSH C.

Maintenance Innovation Challenge (MIC)

NCMS is pleased to support the MIC by providing $50,000 to both the Overall MIC Award winner and the People's Choice Award winner.

NCMS has a long-standing interest in the MIC, as it provides a wellspring of innovative capabilities that can be implemented throughout the DOW.

Now Batting

Debbie Lilu
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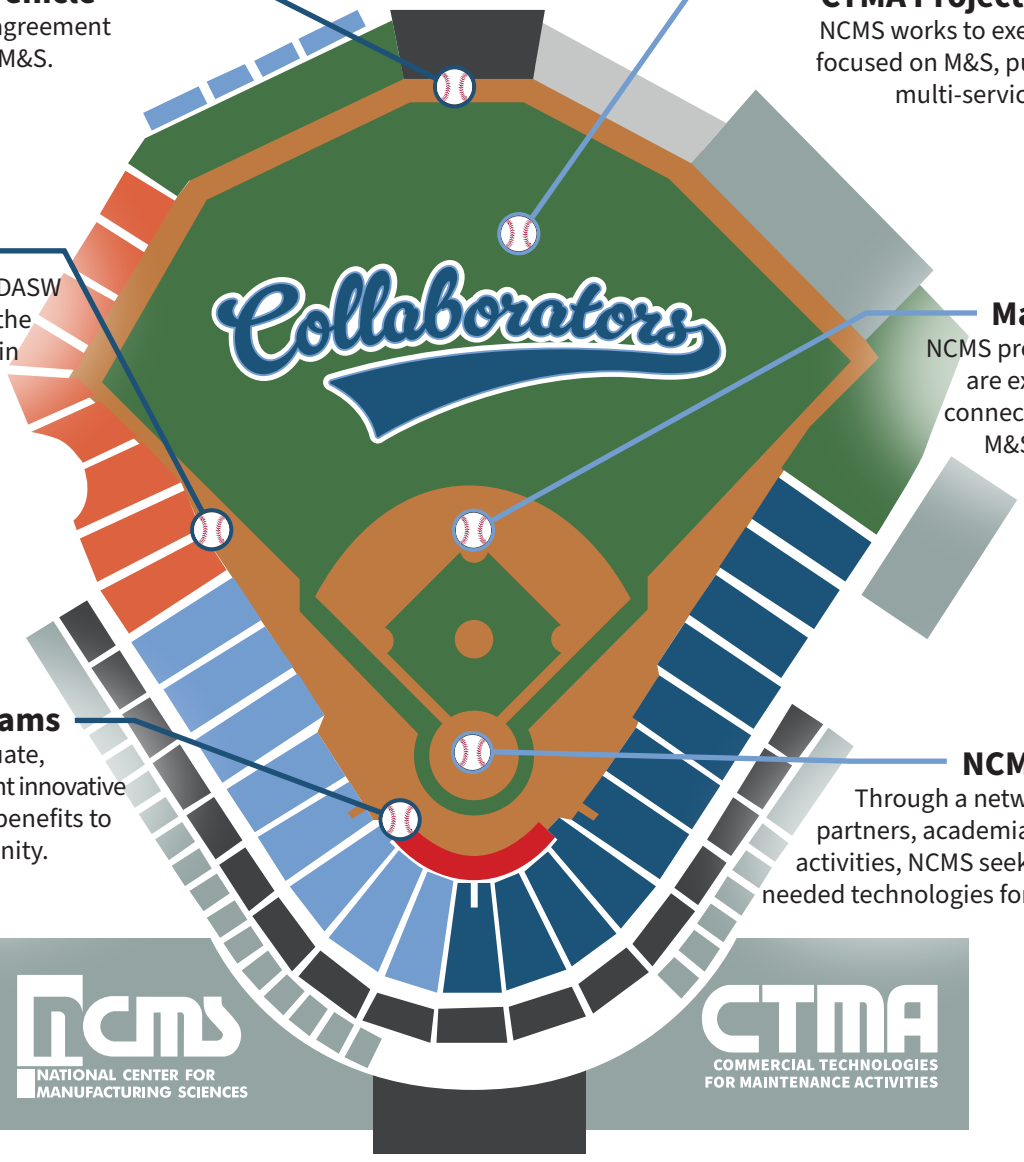
CTMA Contract Vehicle
The only cooperative agreement that focuses solely on M&S.

CTMA Project Formation
NCMS works to execute initiatives focused on M&S, public good, and multi-service involvement.

ODASW-MR
NCMS partners with ODASW to align efforts across the enterprise and maintain materiel readiness.



Project Management
NCMS project managers are experienced and connected to the DOW M&S communities.

CTMA Project Teams
Work together to evaluate, validate, and implement innovative capabilities resulting in benefits to DOW and M&S community.

NCMS Network
Through a network of industry partners, academia, and outreach activities, NCMS seeks and finds the needed technologies for collaboration.

NCMS NATIONAL CENTER FOR MANUFACTURING SCIENCES

CTMA COMMERCIAL TECHNOLOGIES FOR MAINTENANCE ACTIVITIES

Congratulations to our 2024 Maintenance Innovation Challenge WINNERS!

Overall Winner of the 2024 Maintenance Innovation Challenge:

Enhancing Field Repair Capabilities through Mixed Reality

Stephanie Bryan, Marine Depot Maintenance Command
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Problem Statement: Modern warfighting and support systems are complex, encompassing advanced electronics, software-driven components, and intricate mechanical parts. Traditional maintenance at Marine Depot Maintenance Command (MDMC) is reliant on in-person diagnostics and repairs, often leads to extended downtime, higher costs, and logistical challenges. This is particularly important for equipment that is in a remote and/or contested environment. As the demand for timely, efficient, and precise maintenance grows, the limitations of current tele-maintenance solutions, primarily based on video calls and remote guidance, becomes apparent.

Peoples' Choice Winner:

On-Aircraft to Optimize Maintenance and Reduce Logistics

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This submission highlights the benefits of using cold spray repair for on-aircraft maintenance in contested logistics scenarios with the benefits of reduced downtime, increased aircraft availability, improved safety, and significant cost savings. The demonstration and testimonials provide evidence of the effectiveness and efficiency of the cold spray repair process, while the results section shows the quality and durability of the repairs.

The portable spray booths being used were developed using a NAVAIR Improvement program called AERMIP (Aircraft Equipment Reliability and Maintainability Improvement Program). This has allowed for this technology to be used in such a unique and effective way. The submission highlights the benefits and challenges of using cold spray repair on aircraft, as well as its potential future applications. These future applications are not limited to just aircraft but to armed land vehicles to naval ships. This would alleviate some of the logistical barriers of getting replacement components for the warfighters especially forward deployed units.

2025 Maintenance Innovation Challenge

Congratulations on being selected a finalist for the 2025 Maintenance Innovation Challenge (MIC)!

You are one of only five finalists invited to present your submission in-person on Tuesday, 9 December at the DoW Maintenance Innovation Challenge Final. The Joint Technology Exchange Group (JTEG) principals chose your submission among an extremely strong and high-quality field of 59 innovative submissions. Your selection as a finalist is a significant accomplishment as this years' entries were extremely competitive!

The five finalists selected are (listed in alphabetical order):

Advanced Manufacturing Competitive Advantage Pathfinder
Eric Gilmer, Marine Depot Maintenance Command

AI-Powered Robotic Maintenance Repair and Overhaul
Neel Dhanaraj, GrayMatter Robotics

FIRstView Enhanced Real-Time Thermography for Field NDI
Bharat Chaudhry, Thermal Wave Imaging, Inc.

Grey Gecko Real-Time Inspection Tool (GRIT)
Joe Laws, Grey Gecko, LLC

NESAR Distance Support Kit
Phillip Borrelli, NAVSEA 05T NESAR

Grey Gecko Real-Time Inspection Tool (GRIT)

Joe Laws

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Problem Statement: Hidden corrosion and structural flaws cost the DoW over $20B annually. Traditional inspection methods are labor-intensive, inconsistent, and often miss hidden defects under 20–25 mil coatings, resulting in an average repair cost of $12,000 and six days of lost mission availability per event. These risks are amplified by uncertain budgets, procurement delays, life-cycle extensions, parts shortages, and an escalating geopolitical deployment tempo that demands more sorties from aging fleets with fewer spares and tighter maintenance windows. In deployed or austere settings, these combined pressures threaten projection, readiness and aircrew safety across all services.

Innovation Solution: The Grey Gecko Real-Time Inspection Tool (GRIT) 125v2.5 is a rugged, handheld, battery-powered infrared imager that "sees through paint," detecting corrosion, cracks, voids, and moisture beneath coatings up to 25 mils thick without the need for chemicals, PPE, or external power. It delivers live, high-resolution images on a tablet and captures customer-dictated metadata (including time, location, tail number, and inspector ID) for instant report generation. A patented image-stitching algorithm expands inspection areas from ~1,200 mm² to 11,500 mm², dramatically increasing coverage. GRIT integrates directly with Aircraft Notebook, IADS/IETMS, and GCSS-Army for seamless condition-based maintenance (ANSI 4180 Compliant).

Benefits to the DoW: GRIT cuts corrosion-related downtime by ~25% and inspection labor by >50%, producing a 3–7-month ROI on fourth-generation aircraft. It is eye-safe, FCC-compliant, and eliminates toxic paint-removal processes. The U.S. Coast Guard Aviation Logistics Center adopted GRIT for HC-144 wing-joint inspections, reducing a 30-hour job to six hours; an 80% labor savings and elimination of hex-chromium exposure. Navy Fleet Readiness Centers, Air Force AFWERX "Flightline of the Future," Army aviation (including a flawless MH-60M tail-rotor inspection with the 160th SOAR(A)), and Lockheed Martin (F-16, C-130, U-2) have all demonstrated GRIT's cross-service impact, extending airframe life and boosting readiness.

Innovation Challenges: Current limitations include reduced efficacy on radar-absorbent/Low Observable coatings (effective depth ~3 mils), lack of intrinsic safety for explosive atmospheres, and the requirement for a 500k-image dataset to train GRIT's next-generation machine-learning module for automated defect recognition. These are active R&D targets, with planned upgrades for enhanced AI detection, HERO certification, and GRIT as a payload for autonomous inspections.

Technical Maturity / Demonstration Results: GRIT is at TRL-9 with 32,000+ inspection hours across Navy, Marine Corps, Air Force, Army, and Coast Guard fleets, and was down-selected by the National Center for Manufacturing Sciences as one of the Top 3 Innovative Sustainment Technologies, reinforcing its cross-service value and transition readiness.

To view a short video demonstration, scan the QR Code

AI-Powered Robotic Maintenance Repair and Overhaul

Neel Dhanaraj

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Maintenance, repair, and overhaul (MRO) of weapon systems, including aircraft, ships, vehicles, and submarines, remain among the most complex and labor-intensive operations in the Department of War. Fleet readiness is constrained by manual paint, corrosion-control, and inspection processes that rely on a shrinking skilled workforce. Surface preparation, coating, and inspection are often performed separately, creating multiple handoffs, long queues, and high manpower requirements. These workflows are slow, ergonomically demanding, and prone to variability, resulting in rework, extended maintenance timelines, higher sustainment costs, and reduced fleet availability.

Traditional robotic automation has failed to scale in these high-variability DoW environments because it relies on offline programming and part-specific teaching. GrayMatter Robotics (GMR) addresses this challenge through its AI-driven Scan–Plan–Act–Verify framework, which enables geometry-agnostic, adaptive automation without preprogramming. Scanning captures the geometry of any part; planning incorporates operator input and process preferences to generate optimal toolpaths; execution drives robotic sanding, blasting, spraying, or inspection with precision; and verification embeds inline quality checks for continuous feedback.

Building on this core framework, GMR delivers a suite of modular turnkey systems tailored to surface preparation, coating, and inspection:

- Scan&Sand™ standardizes surface finishes through adaptive force-controlled sanding.
- Scan&Blast™ integrates geometry-aware blasting and inline verification to ensure safe, consistent coating removal.
- Scan&Spray™ achieves uniform coatings via 3D localization, conformal path planning, and real-time quality monitoring.
- Autonomous Inspection combines multi-modal sensing and edge AI to deliver decision-quality metrology at production speed.

Together, these systems form a closed-loop, air-gapped robotic workflow that streamlines depot operations. Beyond automation, GMR's ecosystem of software and services ensures reliable deployment and sustained operational excellence:

- GMR-Guardian™ continuously monitors robotic cells for disruptions such as improper debris removal or tool misloads, adapting in real time to maintain uptime.
- GMR-ProcessPro™ optimizes process parameters across materials to extract maximum operational value.
- GMR-Insights™ transforms cell-level data into actionable intelligence on utilization and performance.
- GMR-Care™ provides 24×7 remote and onsite support to ensure sustained reliability and customer success.

GrayMatter Robotics (GMR) transforms DoW sustainment by uniting sanding, blasting, coating, and inspection in a single intelligent robotic ecosystem. The TRL-9 technology proven across 50+ deployed cells and 30 million square feet enhances safety, ensures full traceability, and scales from components to full aircraft or ships, reducing costs and boosting fleet readiness through AI-driven autonomy.

To view a short video demonstration, scan the QR Code

NESAR Distance Support Kit (DSK)

Phillip Borrelli

NAVSEA 05T NESAR
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Every day, hundreds of Subject Matter Experts (SMEs) travel globally to troubleshoot various complex systems and components, addressing mission-critical deficiencies. However, with increasing demand and limited SMEs, technical resources are overextended and disrupted by emergent work. Modernizing distance support is essential to maintain operational readiness and streamline assistance where it is needed most.

Deployable video telepresence provides the solution, offering instant connectivity in expeditionary environments where traditional methods falter, specifically in difficult locations inside the skin of a ship like shaft-alley and machinery spaces. This approach virtually assembles SMEs from global locations, enabling faster, more cost-effective solutions while freeing up personnel for other critical global events.

NAVSEA 05T's Navy Expeditionary Sustainment and Repair (NESAR) team developed the Distance Support Kit (DSK) that brings comprehensive connectivity anywhere within a ship, between ships, and from ship to shore.

Most recently, this capability was critical following a fire aboard an active Navy surface ship. Within 72 hours of notification, a single SME was deployed with the DSK to Okinawa, Japan, enabling live, high-definition walkthroughs of affected spaces. This allowed offsite personnel, including leaders in Washington D.C., to directly assess the damage, accelerating recovery by a full week. The system also previously proved its value by simultaneously connecting 66 participants across 10 global locations for a complex ship damage assessment.

The DSK integrates three proven technologies. Dedicated satellite broadband for the DoW ensures high-speed, encrypted connections with priority processing on the Starlink network. Secured wireless radios create high-throughput data mesh networks that penetrate signal-constrained areas on ships and also extend miles for long range needs. Finally, dedicated telepresence apps on DoW tablets enable high-definition global communications with advanced tools such as document sharing, step-by-step instructions, and on-screen annotations.

Designed for rapid deployment, the DSK can be set up in 15 minutes for immediate reach-back. As a man-portable system in airline-compliant cases, a single person can transport it anywhere, and it's compact nature also allows easy storage whether shipboard or in small compartments.

Growing use of the DSK is driving efforts to scale availability to meet the DoW's expanding needs as technical teams work to provide real-time support to their deployed assets. As demand for rapid, reliable support in forward and communication-constrained environments increases, the DSK stands out as the critical solution. By enabling real-time assistance, reducing downtime, and minimizing people in conflict zones, this system plays a key role in mission readiness and global operational superiority for U.S. military forces.

To view a short video demonstration, scan the QR Code

Advanced Manufacturing Competitive Advantage Pathfinder

Eric Gilmer

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Problem Statement: Modern maintenance needs fast, local part production, even in contested or disconnected areas, but current supply chains are slow, insecure, and hindered by IP limits. Without a trusted, secure way to share technical data across Services, industry, and allies, the force cannot repair or regenerate combat power quickly enough to maintain readiness.

Solution: The Digital Manufacturing Exchange (DMX)—led by Marine Depot Maintenance Command (MDMC) under the Advanced Manufacturing Competitive Advantage Pathfinder (AM/CAP)—is the Department's only accredited digital backbone for transmitting TDPs and IP-protected manufacturing data to support maintenance and sustainment. DMX enables point-of-need production by livestreaming OEM-controlled design data directly to distributed 3D printers and other manufacturing assets, even when units operate without enterprise network connectivity. Its secure architecture protects IP through encryption and access control while incorporating a built-in remuneration model—similar to purchasing music online—so every OEM use is tracked and compensated. DMX integrates with existing Service repositories, creating a trusted ecosystem where industry, DoW, and allied partners can collaborate without sacrificing security or IP rights.

Maintenance Relevance: DMX speeds maintenance by enabling local, secure production of approved parts in hours instead of months, cutting downtime, repair cycles, and manpower needs. It ensures safe, configuration-controlled data use and extends advanced manufacturing to austere or contested areas, boosting readiness and resilience across all maintenance levels.

Contribution: DMX is first-of-its-kind in combining DoW accredited secure delivery, IP trust and compensation, and cross-domain interoperability between military, industry, and allied manufacturing networks. No other platform has achieved an Authority to Operate (ATO) while solving the dual challenge of protecting OEM data and incentivizing participation for digital sustainment.

Technical Maturity:

Phase 1 (Nov 2023 Complete) Prototype validated with USMC for disconnected ops.

Phase 2 (Apr 2025 Complete) Integrated with Army, Navy, Air Force, USMC, and industry, livestreamed parts globally with secure IP control.

Phase 3 (In Progress) Expanding to coalition partners and validating remuneration workflows.

DMX was the only system to digitally manufacture with allied partners during the Trident Warrior exercise, proving operational viability.

Cross-Service Applicability: DMX already integrates with Army, Navy, Air Force, and USMC systems and is expanding to coalition networks. Its joint-service demonstrations, secure ATO, and clear path to full remuneration and repository integration make transition to operational DoW use highly feasible and imminent.

To view a short video demonstration, scan the QR Code

FIRstView – Enhanced Real-Time Thermography for Field NDI

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Problem Statement: Nondestructive Inspection (NDI) at the field level is the number one readiness degrader for DoW fixed and rotary wing aircraft*. Several critical inspections are manual, imprecise or time-consuming. Thermographic NDI (TNDI) is an effective inspection tool at the depot level. However, the cost, size, power consumption and complexity of current TNDI systems make them impractical for rapid deployment in field applications where electrical power may not be available or space constraints limit access to the inspection area. Although simple systems may address cost or footprint requirements, they lack sufficient detection sensitivity and provide subjective results that rely heavily on interpretation by the inspector. Existing battery-operated systems are unable to provide sufficient excitation for reliable NDI over the duration of an inspection.

A compact, battery-operated TNDI system that simplifies interpretation for the operator is required to address DoW field inspection requirements.

Our Solution: FirstView is a handheld, battery operated TNDI system that provides results to the inspector in real-time. The power unit can be worn as a backpack or mounted in a small roll-along case, and the lightweight imaging head (3 lbs) reduces operator fatigue common to COTS systems. Signal processing enhances subsurface defect indications and compensates for operator jitter and surface emissivity variations.

Benefits to the DoW:

- Improved safety and airworthiness – FirstView's small footprint and self-contained configuration will allow replacement of imprecise coin-tap inspection with full-field thermography in areas of the aircraft or ships where physical access is limited (e.g. ducts, bladders, bulkheads) or electrical power is not available
- Rapid response to unscheduled maintenance events – Portable system can be transported as carry-on baggage or stowed as onboard kit for emergency inspections
- Cost savings - Reduced inspection man-hours and time-on-ground as a result of continuous scanning and on-the-spot processing and analysis
- Lower investment cost – The use of COTS components and low-cost excitation and IR cameras make FirstView significantly less expensive than existing thermography solutions.

Innovation Challenges: Configuration for new inspection tasks requires coordination of scan rate and sensor-to-surface distance with material properties of the part. This procedure should be automated and made transparent to the operator.

Technical Maturity/Demonstration Results: FirstView has been successfully demonstrated on DoW samples in simulated field environments with composite impact damage, trapped water in honeycomb sandwich structures and corrosion under paint, using the scanning and spotlight configurations. It is currently TRL 6 and expected to be TRL 7 by Q4 2025.

* Maintenance and Availability Data Warehouse: A Cross-Cutting Case Study OSD71C1/Jul 2017. p3-7

To view a short video demonstration, scan the QR Code

Accio3D – Agentic AI for Maintenance, Repair & Sustainment

Wendy Manywhitehorses

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Problem Statement: The Department of War (DoW) faces escalating challenges in maintenance and sustainment due to part obsolescence, extended lead times, and fragile supply chains. Systems lasting 20–30 years often rely on components obsolete in 4–5. This mismatch forces lifetime buys, costly warehousing, emergency sourcing, and mission delays. A single obsolete part can cost millions in procurement and logistics, driving up sustainment costs and eroding readiness.

Innovation Solution: Accio3D delivers an AI-powered additive manufacturing platform purpose-built to solve the end-of-life parts problem. Its ecosystem of specialized AI agents automates more than 80% of sourcing and qualification workflows:

- Printability Agents evaluate whether parts can be 3D printed.
- Materials & Equipment Agents match components with certified materials and MIL-STD equipment.
- Sourcing & Ordering Agents connect buyers with ITAR-compliant vendors across the Defense Industrial Base.
- Qualification & ROI Agents assess mission requirements, cost tradeoffs, and recommend qualification levels.
- Logistics & Payment Agents consolidate orders, manage suppliers, and enable secure transactions.

  The result: static inventory becomes digital inventory—parts printable on demand, anywhere in the world.

Benefits to the DoW:

- Accelerated Readiness: Lead times shrink from months to days with point-of-need printing.
- Cost Efficiency: Eliminates lifetime buys, warehousing, and global shipping.
- Operational Resilience: Adds redundancy while protecting IP and digital thread integrity.
- Sustainability: Reduces waste from over-ordering and scrapped parts.
- Workforce Enablement: Serves as a co-pilot for engineers, reducing workload pressures.

Innovation Challenges: Adopting AI-enabled additive manufacturing requires addressing:

- Cybersecurity and IP protection for sensitive defense data.
- Integration with legacy PLM/ERP systems.
- Trust and qualification standards under MIL-SPEC.

Accio3D is tackling these through secure Azure-based deployment, ITAR/DFARS compliance, and close collaboration with DoW advisors and industry experts.

Technical Maturity / Demonstration Results: Accio3D has developed a working architecture with an Azure-orchestrated agentic AI framework. MVP delivery is planned for late 2025, with demonstrations underway with aerospace and defense partners. Early testing confirms the platform automates most workflows, identifies viable 3D-printable parts, and connects with qualified suppliers in real time. This mission-ready capability directly addresses the DoW's sustainment gap with on-demand, cost-effective part replacement.

To view a short video demonstration, scan the QR Code

Supply Chain Independent SolidStir® Repairing Technology

David Dress

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Problem Statement: Expeditionary vehicle and equipment repair is hampered by the availability of appropriate feedstock in the field (such as remote locations, at sea, or on aircraft). In addition, standard manufacturing equipment used for machining is not suitable for repairing components with filler metal addition.

Description of the Innovation Solution: Enabled Engineering has created a breakthrough solution with its patented SolidStir® technology, addressing key gaps in metal additive manufacturing (AM) and repair. SolidStir® is a next-generation, solid-state AM and metal extrusion platform that builds on the principles of friction stir welding and processing, delivering high-performance and sustainable manufacturing capabilities. Enabled Engineering delivers high-performance, scalable solutions for the defense, aerospace, automotive, and energy sectors. The parts produced with this technology are composed of fully dense, consolidated deposits using AM. The parts have superior interlayer bonding with wrought metal microstructures and properties.

Enabled Engineering's systems can be mounted on any existing computer numerical control (CNC) machine and located on the back of a vehicle or the deck of a ship or in an airplane hold. It can even be miniaturized to mount on industrial robots for solid-state repair applications. Not only can this system be used for manufacturing new components, one can do so by cutting up broken or worn-out parts as feedstock and recycling them into new parts or extruding them into various profiles, rods and wires. Wires and rods can be used for welding and conventional additive processes as feedstock. The feedstock size and shape are flexible in SolidStir® technologies. It is simply cut to fit into the feed chambers, and the feeding system will handle these irregular pieces. In addition, the system can be set up for continuous feeding. In using this SolidStir® technique, the resultant parts have the same or improved material properties when compared to the original parts due to dynamically recrystallized microstructure. The system is designed for high build rates using lubricant-free manufacturing.

Scaling the system down in size is one challenge while having it large enough to accept reasonably sized cut-up parts, which can be turned into new high-quality replacements. Enabled Engineering can make these trades and develop a robust system capable of supporting the DoW in challenging locations. Another critical objective is simplifying the system for ease of set-up, use, and repair in the field.

Technical Maturity / Demonstration Results: Enabled Engineering has demonstrated using cut-up aluminum parts through our research and development system, resulting in manufactured components as shown in our video for this challenge. The technology is at a MRL of 7 for a range of aluminum alloys. It is ready to demonstrate in the field. For future applications, our researchers have experimented with magnesium, copper and titanium with limited success thus far.

To view a short video demonstration, scan the QR Code

Advanced Manufacturing Competitive Advantage Pathfinder

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Problem Statement: Modern maintenance needs fast, local part production, even in contested or disconnected areas, but current supply chains are slow, insecure, and hindered by IP limits. Without a trusted, secure way to share technical data across Services, industry, and allies, the force cannot repair or regenerate combat power quickly enough to maintain readiness.

Solution: The Digital Manufacturing Exchange (DMX)—led by Marine Depot Maintenance Command (MDMC) under the Advanced Manufacturing Competitive Advantage Pathfinder (AM/CAP)—is the Department's only accredited digital backbone for transmitting TDPs and IP-protected manufacturing data to support maintenance and sustainment. DMX enables point-of-need production by livestreaming OEM-controlled design data directly to distributed 3D printers and other manufacturing assets, even when units operate without enterprise network connectivity. Its secure architecture protects IP through encryption and access control while incorporating a built-in remuneration model—similar to purchasing music online—so every OEM use is tracked and compensated. DMX integrates with existing Service repositories, creating a trusted ecosystem where industry, DoW, and allied partners can collaborate without sacrificing security or IP rights.

Maintenance Relevance: DMX speeds maintenance by enabling local, secure production of approved parts in hours instead of months, cutting downtime, repair cycles, and manpower needs. It ensures safe, configuration-controlled data use and extends advanced manufacturing to austere or contested areas, boosting readiness and resilience across all maintenance levels.

Contribution: DMX is first-of-its-kind in combining DoW accredited secure delivery, IP trust and compensation, and cross-domain interoperability between military, industry, and allied manufacturing networks. No other platform has achieved an Authority to Operate (ATO) while solving the dual challenge of protecting OEM data and incentivizing participation for digital sustainment.

Technical Maturity:

Phase 1 (Nov 2023 Complete) Prototype validated with USMC for disconnected ops.

Phase 2 (Apr 2025 Complete) Integrated with Army, Navy, Air Force, USMC, and industry, livestreamed parts globally with secure IP control.

Phase 3 (In Progress) Expanding to coalition partners and validating remuneration workflows.

DMX was the only system to digitally manufacture with allied partners during the Trident Warrior exercise, proving operational viability.

Cross-Service Applicability: DMX already integrates with Army, Navy, Air Force, and USMC systems and is expanding to coalition networks. Its joint-service demonstrations, secure ATO, and clear path to full remuneration and repository integration make transition to operational DoW use highly feasible and imminent

To view a short video demonstration, scan the QR Code

Parts Life, Inc. Response to Maintenance Innovation Challenge

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Combat systems deployed worldwide face persistent sustainment challenges. Equipment failures in the field lead to Non-Ready for Issue systems, delaying missions and reducing combat effectiveness. Traditional sustainment models rely on extensive supply chains and pre-stocked inventories, both of which are impractical in contested or austere environments where logistics are unreliable, and time sensitive repairs are critical. The Department of War requires a more agile and resilient approach to ensure continuous readiness in all operational domains.

Parts Life, Inc. has developed the Engineering and Electronic Product Innovation Center (EEPIC) to address these challenges. EEPIC is a portable, self-reliant sustainment solution capable of delivering manufacturing, repair, inspection, and diagnostics directly at the point of need. Housed in a secure, ISO-compliant 8' x 20' shipping container, the system can be rapidly deployed by land, air, or sea. Once on-site, it expands into a 20' x 20' configurable, climate-controlled facility, providing a fully functional environment for sustainment operations. It is operable on generator or shore power, requires no external resupply, and is designed for use by trained personnel or local operators. EEPIC's versatility allows it to adapt to mission requirements and fleet-specific needs.

Technical capabilities include reverse engineering or inspection with 3D scanning, material analysis, and non-destructive testing, as well as conventional manufacturing with CNC milling, turning, or precision assembly. Depending on mission priorities, advanced manufacturing with metallic and polymer additive processes, or on-site diagnostics and calibration for immediate repair and validation, can also be employed.

The system is structured to support both Government-Owned/Contractor-Operated (GO/CO) and Government-Owned/Government-Operated (GO/GO) models, with the flexibility to transition from contractor-led operations to full government operation as required. Standalone software, operable without internet connectivity, enables secure and independent use in contested environments. Successful integration of EEPIC requires personnel training, system standardization, and tailoring capabilities to mission-specific requirements, all achievable within existing DoW frameworks. Designed with flexibility at its core, EEPIC can be configured to operational needs, scaled to mission size, and customized to local environments while integrating ISO-compliant manufacturing, additive production, and diagnostic systems proven in commercial use and adapted to DoW standards. This positions EEPIC as a near-term, fieldable solution capable of bridging sustainment gaps in demanding environments, directly enhancing fleet readiness and mission effectiveness.

To view a short video demonstration, scan the QR Code

RaptorRFID – Enhancing Inventory Visibility and Audit Compliance Across the DoW

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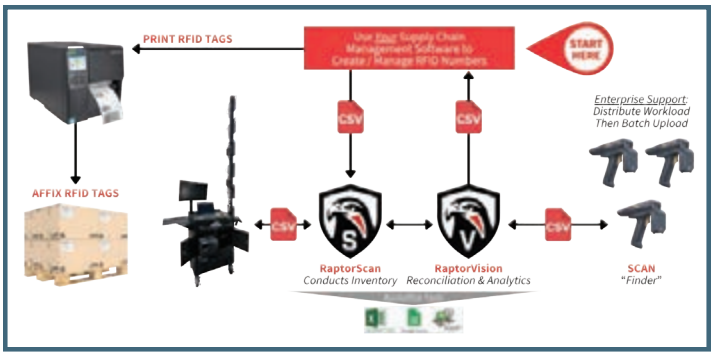

Problem: Despite billions invested in ERP platforms, WMS modernization, and audit remediation contracts, the Department of War still faces material weaknesses in inventory visibility, asset accountability, and internal control compliance. Current tools fail to provide real-time, rack-level asset traceability, particularly in high-tempo environments.

One of the Department of War's most persistent readiness challenges: achieving accurate, auditable, and real-time visibility of inventory assets across the joint supply chain. Recent audits and policy guidance continue to highlight inventory visibility and internal control compliance as mission-critical shortfalls.

Solution: RaptorRFID, a passive RFID-based, COTS technology, can serve as a rapid, scalable capability to help close these gaps and create new opportunities for audit readiness, operational insight, and process improvement. Where other RFID providers focus solely on movement tracking, RaptorRFID provides verifiable, audit-ready inventory intelligence.

RaptorRFID is precisely the type of outcome-driven, COTS-based solution highlighted in recent executive orders and modernization guidance with low deployment friction to improve traceability and provide ongoing feedback on procedural deficiencies.

Benefits: RaptorRFID contributes to mission assurance by resolving one of the most persistent and disruptive barriers to readiness: lack of real-time, auditable inventory visibility. By enabling faster, more accurate accountability of mission-critical assets, RaptorRFID supports both warfighter outcomes and enterprise-level mandates.

- Improved Auditability and Compliance

  RaptorRFID generates time-stamped, user-attributed scan records that serve as evidence of internal controls directly supporting financial statement audit objectives

- Reduced Logistics Burden

  Enables fast, low-labor cycle counts and continuous inventory reconciliation

- Operational Transparency

  Gains and Losses, unauthorized movements, and storage misalignments are uncovered before they become audit failures or readiness risks

- Informs Better Decision-Making

  RaptorRFID's discrepancy reports create new operational insight for commanders and logisticians to highlight asset trends, tag anomalies, and exception frequency

Innovation: RaptorRFID is designed for fast, low-disruption deployment within operational environments. RaptorRFID can be executed with minimal IT footprint, and no direct system integration. Using rugged, portable RFID, RaptorRFID's phased deployment approach is designed to support rapid deployment, security compliance, and operational integration.

The RaptorRFID solution combines rugged passive RFID hardware, mobile interoperability, and telemetry-based analytics in a single, intuitive platform. RaptorRFID supports import/export via CSV, making it easy to integrate with government WMS. The system's mobility, speed of setup, and user-focused design make it ideal for deployment in high-priority environments

To view a short video demonstration, scan the QR Code

Interactive Flow Diagram Viewer

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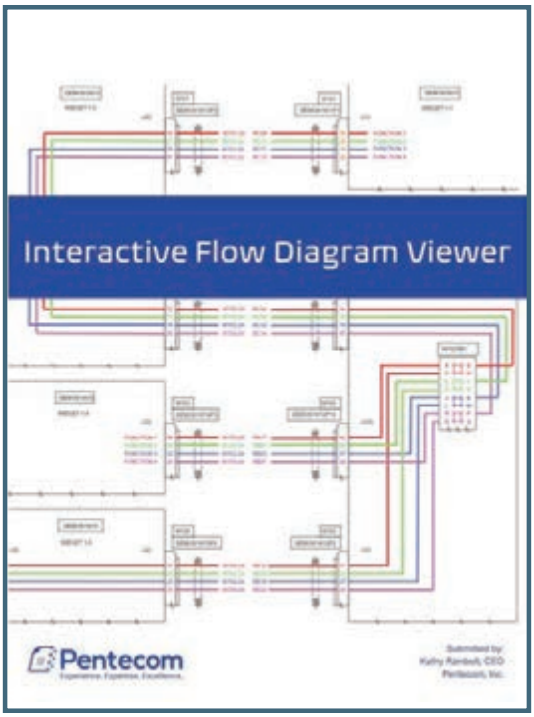

Problem Statement: Military technicians use diagrams and schematics (wiring, hydraulics, pneumatics, hydro-mechanical) in technical manuals to troubleshoot faults. Many platforms still rely on cumbersome paper foldouts up to 45 inches wide or static PDFs. Technicians often print and tape pages together, using a highlighter to trace circuit paths. Large diagrams and schematics are difficult to view in digital environments. Technicians often struggle with zooming in and out, making tracing paths on 2-D images difficult. Troubleshooting becomes even harder when the flow jumps between sheets of a multi-sheet diagram.

Description of the Innovation Solution: Technicians will benefit from an electronic interactive wire/fluid tracing tool that supports highlighting a circuit path on a set of graphics. The solution simulates the operation of a switch, valve, or relay, changing the flow's highlighted path. The tool will add to existing technical data viewing tools and will be accessible on portable devices technicians already use in the field.

Benefits to the DoW: Interactive flow tracing helps maintainers identify and follow circuit paths as they perform maintenance on complex systems such as aircraft or other vehicles and will make maintenance and sustainment less costly and more effective and efficient. A tool that highlights paths in real time will save maintenance hours and speed the return of equipment for use in the field. Circuits are highlighted, providing a visual cue that is easy to see even on a small screen or when circuit paths jump across diagram sheets. This tool can be used by all military services (even industry) to trace circuit flow within a diagram.

Innovation Challenges: Standardization of the structures for the interactive flow diagram are in process in S1000D, the international specification for technical publications. Traditionally adoption happens many years after the standard is published. Until the standards are approved, COTS vendors are reluctant to invest in development. By developing the viewing solution in tandem with the standardization effort, we are accelerating U.S. adoption for this critical need.

Technical Maturity/ Demonstration Results: Interactive flow tracing is not a new concept; however, existing solutions are proprietary and outdated. The proposed standard is still in the infancy stages and will not be published for 3-5 years at best. Platforms need this capability now, but technology that works with the standard does not yet exist. Early adoption of the proposed standard by the DoW will fill the immediate need. The accompanying video provides a brief proof of concept.

To view a short video demonstration, scan the QR Code

REACH: Robotic Element for Autonomous Cargo Handling

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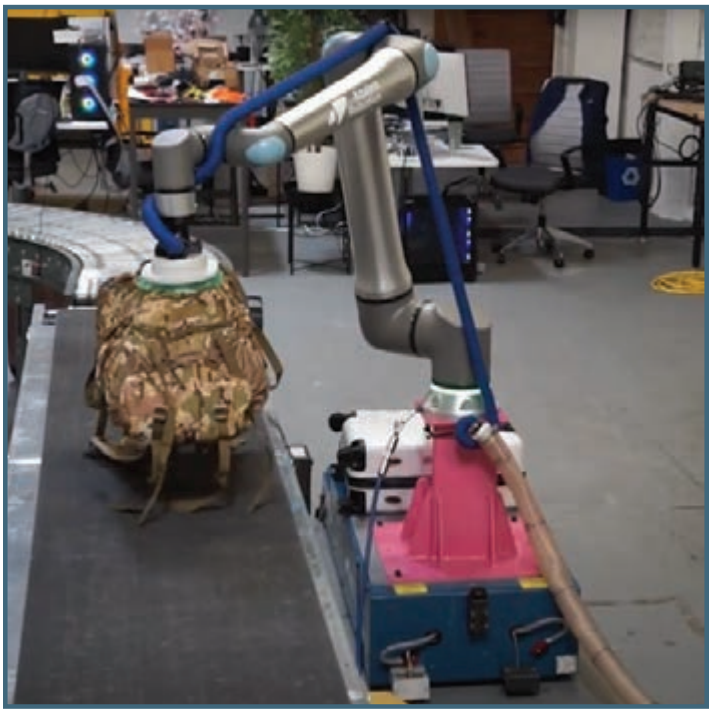

Baggage handling remains almost entirely manual across all DoW branches. At passenger terminals and aerial ports, logistics personnel lift rucksacks, duffels, and deployment bags that can weigh up to 110 lbs. A single flight can require more than 7,000 lbs of baggage to be moved by hand. This slows throughput, increases musculoskeletal injury rates, and diverts manpower from mission-critical roles. Lost or delayed baggage further undermines readiness and operational timelines.

The Robotic Element for Autonomous Cargo Handling (REACH) is a mobile, wheeled robotic platform that autonomously lifts, transfers, and stages baggage. The platform consists of UR 20 certified components for autonomous robotic safety standards. A six-axis arm mounted on a four-wheel base operates effectively in bag rooms and ramps. Its dual-mode gripper applies suction for soft bags and mechanical force for rigid/irregular loads. Stereo and depth cameras, time-of-flight sensors, and force feedback create a 3D map of the work zone, select grip points, and confirm secure lifts. All perception and control run locally for real-time adaptation without preset routines. Each lift generates a 3D scan and time-stamped record, producing a digital trail that integrates with current tracking systems.

REACH reduces injury risk, conserves manpower, and traces throughput to directly improve troop movement across the DoW. Repetitive lifting exposes handlers to back, shoulder, and knee injuries that limit availability and increase medical costs. REACH lowers injury risk and keeps more personnel fit for duty. It also reduces the size of teams needed for each passenger movement to more efficiently use manpower. One operator can oversee several robots at once, which frees significant hours for training, aircraft preparation, and deployment planning. REACH produces a 3D scan and time-stamped record for every lift to trace throughput. This creates a verifiable digital trail that shows how much baggage has moved, where it is staged, and how long each step took. The result is greater accountability, fewer lost items, and stronger confidence in deployment timelines.

Innovation challenges focus on grip reliability with strap-laden or irregular bags, sensor accuracy in low-light or cluttered environments, and integration with legacy logistics software. Mitigation includes reinforcement learning tuned to military baggage, redundant safety systems independent of AI control loops, and modular components for future upgrades.

REACH has reached TRL 6. It has demonstrated consistent success rates lifting and transferring loads up in controlled pilots. Its hardware components are commercially sourced and its software is proprietary.

To view a short video demonstration, scan the QR Code

Aurora

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Problem: The DoW's maintenance facilities face a daunting scheduling challenge, in terms of the size and complexity of the maintenance that is performed on ships, aircraft, ground equipment, etc. This scheduling challenge is exacerbated by the uncertainties that are inherent to maintenance, that requires adaptation per unanticipated events such as faults/failures discovered upon inspection of the asset. The problem can be summarized as how best to allocate limited resources to maximize throughput considering all real-world constraints including priorities and deadlines across the entire portfolio of projects.

Description: Stottler Henke has studied human expert schedulers making scheduling decisions in critical applications for 25+ years and has implemented these decision-making processes in the world's most intelligent scheduling software, Aurora. Aurora has been applied to a wide variety of domains, demonstrating its generality, and Aurora has always been shown to generate more optimal schedules in every domain where a comparison has been performed. Most of these comparisons were made by the clients themselves in order to pick the tool that performed best. In the case of Boeing, after they performed a worldwide search for applicable scheduling tools, Aurora beat all competitors, including Boeing's own internally developed software, which had been specifically optimized for aircraft manufacturing scheduling. The use of Aurora for scheduling has typically meant that 10% to 25%+ more tasks can be accomplished with the same resources in the same amount of time (or the same tasks accomplished in 10% to 25%+ less time) compared to other scheduling methods.

Aurora is a complete software solution that is designed to be easily customized and integrated into new domains. Aurora is used throughout the world to solve many of the world's most challenging project management and scheduling challenges. For example, Aurora is used by Boeing, NASA, General Dynamics Electric Boat, Mitsubishi, Pfizer, the US Air Force, Bombardier, and many others.

Boeing selected Aurora initially for the final assembly scheduling of the Dreamliner 787 aircraft due to its superior resource-constrained scheduling and is now used on both the commercial and defense side of their business. Boeing was kind enough to provide a subset of real data that Stottler Henke is permitted to share. Even though this subset is much simpler than the actual project, it still reveals the significant difference between the scheduling results. The results of scheduling this Boeing resource-loaded file with different software are as follows:

Primavera P6 - 115 days
Aurora - 102 days

Results with similar improvements have been realized in many different domains. NASA currently utilizes Aurora for some of its most complex scheduling challenges, and Aurora scheduled the maintenance, repair & overhaul (MRO) of the Space Shuttle during its tenure.

Aurora is best leveraged when integrated with other enterprise applications. So, the next step is to integrate Aurora with other DoW data sources for seamless data flow, so that the DoW can receive all the benefits of Aurora, including but not limited to the following: 1) Multiple-pass intelligent resource-constrained scheduling; 2) Large multi-project support; support for 100,000+ tasks per project; 3) Mixed-mode scheduling -- providing both ASAP and ALAP scheduling; 4) Schedule rationale -- Aurora provides an explanation for each task on why it was scheduled where it was scheduled; 5) Support for more types of constraints than other software.

To view a short video demonstration, scan the QR Code

XTRU – Digital Thread Manufacturing

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Structural spare part production for airframes requires significant skill and time for designing, manufacturing, and proving out the dies, fixtures and joggle blocks required by traditional presses and mills to manufacture these components. This limits production to the same location of the large machines and tools, leaving high value warfighter assets rendered mission incapable for months to years, diminishing warfighter readiness.

The solution is XTRU, a native digital suite of three portable tooling-free CNC machines, XtruForm (XF), XtruMach (XM), and XtruJog (XJ), that implement traditional extrusion forming, machining, and joggling processes for producing spares without tooling, using CNC programs. Starting with the drawing-specified extrusion XTRU produces flight critical structural parts that meet all requirements, including airworthiness. Digital TDPs and avoidance of tooling enables rapid production of spares where needed for repairs.

Starting with a CAD model of a part, a technical data package (TDP) for manufacturing typical parts can be developed in a few hours to 1 day if the manufacturing technical data package (TDP) is available, and a week to a few weeks for complex parts needing a TDP, custom soft jaws, thinning of extrusion, etc. Once the TDP has been developed for a part, it can be used to reproduce the part anywhere the machines and material are available. XTRU produces high accuracy components, while saving cost and lead time of tool development, NRE, setup and tool maintenance.

With digital CNC programs replacing tooling and containerized portable small footprint machines capable of producing unlimited length parts because they flow through the machines, XTRU enables forward-deployed sustainment capabilities. Depots and operational bases can access a shared database of TDPs to produce components on demand, simplifying supply chain logistics. Wide adoption of XTRU will lower the cost base of spares and increase asset availability.

One challenge will be the compatibility of communication in transferring data to remote locations. We will work closely with users upfront to understand programs like Athena and the development that may be required to ensure our processes support that network. Some modifications to our utilities and or hardware may be required to support self-contained operation. A container with doors along the side will allow longer length components to flow through while being manufactured. We will validate each of the technologies in a containerized setting to ensure smooth fielding.

XTRU has been demonstrated to the depots and ABDR units and is in the process of being acquired by WR-ALC. Thousands of formed, milled and joggled components have been sold to DLA Aviation as well as commercial OEMs. Active projects are being worked with all three branches to expand the capabilities of the suite. XTRU promises to impact many aspects of aircraft sustainment and increase warfighter readiness.

To view a short video demonstration, scan the QR Code

Adaptive Mission Readiness – Dynamic, Adaptive Maintenance with Distributed Manufacturing

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Problem Statement: The Department of War (DoW) currently operates a maintenance paradigm that is largely reactive & based on static, periodic schedules. The system can struggle to provide adaptive or immediately actionable solutions for the dynamic maintenance and repair needs of today's weapon systems, not least because spare parts are often unavailable when and where they're most needed.

Description of the Innovation Solution: Our innovative platform provides adaptive and dynamic information, decision space and actionable maintenance options by integrating dimax cloud, an industrial platform for trusted, distributed manufacturing with Google's world-class agentic analytics to dynamically make parts, components or products required at the point of need for maintenance and repair with proof of Security, Quality and Authenticity.

Benefits to the DoW: We increase warfighter readiness and uptime by offering maintenance decisions and actions that are agile, effective, and affordable. We provide an unprecedented ability to make informed decisions and then adaptively act on them in a dynamic maintenance and repair environment. We offer knowledge and actions across 3-time horizons that drive most maintenance decisions:

- Dynamic: Make Now! Immediate part production through local, distributed manufacturing.
- Proactive: Plan Ahead / Make Ahead! For short- & medium-term maintenance and repair needs that cannot be satisfied by existing spare parts inventory or supply chain. Leverages a wider distributed manufacturing network that includes the industrial base.
- As Planned plus Resilience: Adds contingency options (suppliers, routing, materials, and production nodes) to existing maintenance supply chain.

This innovation directly enhances warfighter readiness by shifting the maintenance posture from static to adaptive across every armed force location including the Army, Navy, Air Force, Marines, and DLA. Key benefits include a significant increase in asset availability, reduction in unscheduled downtime, lower operational costs and an expansion of the industrial base.

Innovation Challenges: Today's military readiness demands a new way of operating enabling rapid, organic, local repair. Use of this adaptive, actionable, agentic platform requires participation by an expanded pool of Creators, Producers and Buyers encouraged to participate in a larger industrial base with more capability and capacity.

Technical Maturity/Demonstration Results: Google's AI/ML models are Technology Readiness Level (TRL) 9 and are utilized globally across multiple industries. The dimax platform has been developed to TRL 7 across 3 tool chains: CNC machining, additive manufacturing and formulated production. Together they are ready to employ in a secure, private pilot or POC across any service or joint agency benefitting emergent operational repair.

To view a short video demonstration, scan the QR Code

Remanufacturing Execution (REX)

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Problem Statement: The Department of War (DoW) currently uses different solutions to track and execute maintenance at depot installations, with separate systems for the Army, Navy, Marines, and Air Force. Shop floor systems are generally designed to integrate with Enterprise Resource Planning (ERP) systems. However, this integration often results in cumbersome processes that complicate shop execution. Costs and schedules recorded in ERP systems frequently do not align with what occurs on the shop floor, especially when multiple funding sources are assigned to a single asset being worked on in one location.

An execution system is needed that aligns with shop floor requirements while still providing ERP systems with the necessary data—without burdening shop personnel. The current misalignment leads to schedule delays, cost overruns, lack of asset visibility, and, most critically, increased risk of failing to meet quality, safety, and maintenance certification requirements.

Description of Solution: The Remanufacturing and EXecution solution (Rex) is a cloud-based application that provides a unified platform for executing maintenance while offering full, real-time visibility of assets and their components. Rex recognizes asset structures so that as soon as an asset is disassembled, all components are automatically tracked and time-stamped to record status, touch times, and wait times.

Unlike ERP systems, Rex is not directly coupled with ERP process—by design. Instead, it maps shop floor cost and schedule data back into ERP systems to support cost, capacity, and scheduling requirements.

Key features include:

- Asset visibility: Ensures accountability for every defect, issue, or maintenance requirement.
- Integration with Army maintenance processes: Supports faults/status tracking and seamless transition of unit-level open requirements to depot-level systems with minimal data entry.
- Mobile accessibility: Enables shop personnel to update information in real time, improving mobility and reducing data entry delays.
- Secure hosting: Deployed in IL5 Azure Gov Cloud, allowing future integration with advanced technologies such as AI/ML and IoT hubs.

Rex also applies the P4T3 framework—Problem, People, Parts, Plan, Tools, Time—to ensure shops have the right context, resources, and schedules to execute tasks efficiently.

Benefits to the DoW:

- A single system to manage all maintenance execution requirements across services.
- Full visibility of assets throughout depot maintenance.
- Streamlined processes that reduce direct labor time.
- Reduced or eliminated quality defects through better accountability and execution.

Challenges

- Budget constraints may limit adoption of advanced technologies such as RFID tracking and expanded mobile device use.

Technical Maturity and Demonstration Results: Rex represents a new technology built on a proven concept. At Corpus Christi Army Depot this concept processed thousands of aircraft over 10 years.

To view a short video demonstration, scan the QR Code

ProDex: The Fastest Text to Discrete Event Simulation

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Across Navy and Department of War (DoW) environments, maintenance, repair, and overhaul (MRO) scheduling remains managed by static, siloed tools. Systems like SKED, spreadsheets, and legacy ERP/MES platforms ensure compliance but cannot adapt to shifting operational realities. When materials, labor, or equipment change, planners resort to reactive firefighting—creating bottlenecks, longer cycle times, and delayed return of ships, aircraft, and vehicles to service. These inefficiencies waste manpower and limit readiness.

ProDex Labs has built the first AI-native operations research platform for sustainment and MRO scheduling. A discrete-event simulation engine models maintenance complexity—process logic, shop constraints, ERP/MES data, workforce, cycle times, and tacit knowledge. AI agents use this model to generate optimized schedules, test "what-if" scenarios, and reconfigure workflows in real time. This transforms scheduling from compliance tracking into adaptive, constraint-aware decision support. By shortening cycle times, ProDex accelerates asset turnaround and increases capacity utilization. Its intuitive interface helps planners and supervisors make faster, more accurate decisions without specialized analytics training.

As an API-first platform, ProDex overlays existing systems like SKED and ERP, enabling modernization without rip-and-replace risk. Integration with legacy IT, cybersecurity, and user adoption are addressed through a modular, RMF-ready architecture and human-centered design.

The platform has proven maturity in large industrial environments mirroring DoW depot operations—complex workflows, resource constraints, and shifting priorities. Demonstrations show up to a 99% reduction in planning cycle time and major mitigation of disruption-related delays. A live demonstration with Fleet Readiness Center East (FRCE) on October 14 will validate operational impact in a Navy context.

ProDex's architecture supports cross-service use: optimizing ship and submarine availabilities for the Navy, aircraft sustainment for the Air Force, and lifecycle maintenance for Army depots and arsenals. The Defense Logistics Agency (DLA) can apply its digital-twin capabilities to improve supplier visibility and surge forecasting. ProDex also collaborated with DLA on a new SBIR topic for AI agents and digital twin infrastructure, underscoring transition readiness.

By addressing the core bottleneck of scheduling, ProDex delivers a practical, field-ready capability that turns maintenance planning from reactive coordination into proactive readiness management.

To view a short video demonstration, scan the QR Code

Asset Distributed Data Acquisition and Processing Topology (ADDAPT)

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Problem Statement: Preventative maintenance and inspection intervals for DoW aircraft have been historically aligned with flight and/or calendar hours, set to satisfy a pre-defined acceptable risk threshold. This schedule is predicated on many assumptions, including the aircraft operating consistently with anticipated flight profiles and environmental conditions, and many of the parameters associated with these assumptions—such as strain, vibration and temperatures—were just extracted from limited full-scale ground and flight test aircraft. Furthermore, it is nearly impossible to practically account for unanticipated manufacturing defects and maintenance errors. To bridge the gap between assumptions and experienced conditions, digital twin models have been developed to provide more accurate tail-specific insight on structure health. If properly implemented, digital twins promise to improve maintenance logistics efficiency without compromising accepted risk. However, like most models, digital twin output fidelity is only as reliable as its input fidelity.

Description: The Asset Distributed Data Acquisition and Processing Topology (ADDAPT) system was designed as a companion tool for digital twins, serving as a link between the physical and virtual structure to facilitate collection of the multi-physics data points necessary to ensure robust model predictions. ADDAPT has an ultra-low size, weight and power footprint, and provides a plug-and-play daisy-chainable infrastructure for mixed-and-matched analog and digital sensors. It offers the convenience of a common physical, electrical and communication interface to deploy a wide range of off-the-self sensors, whose signals can be selectively gathered continuously in-flight or on-demand post-flight, while being accumulated at a single access point. The intent is for ADDAPT to be networked within the NLign framework such that the collected data can be periodically uploaded to a secure cloud database for convenient access by maintenance facilitators, and eventually incorporated into their respective digital twins.

In collaboration with the F-15 SPO, a preliminary demonstration has been conducted using ADDAPT integrated with fatigue crack gauges, including flight testing conducted at Eglin AFB. Planning is underway to validate a broader scope of ADDAPT installed on ten F-15 aircraft to assess performance under a cross-section of operating conditions for sensors monitoring fatigue cracks, fastener health, strain, temperature, oil pressure and flow rate, vibration and electrical circuit voltage and current. Real-time data reduction and feature extraction will be conducted for many of the sensors. This work will be conducted in alignment with Aircraft Structural Integrity Program (ASIP) as prescribed through MIL-STD-1530D, the Mechanical Equipment and Subsystems Integrity Program (MECSIP) as prescribed through the MIL-STD-1798C, and Structural Bulletin EZ-SB-24-01 with regards to Structural Health Monitoring (SHM) Systems.

To view a short video demonstration, scan the QR Code

Interoperability Platform for Monitoring Legacy Equipment

Gregory Scott, PHD., Karoline Pershell

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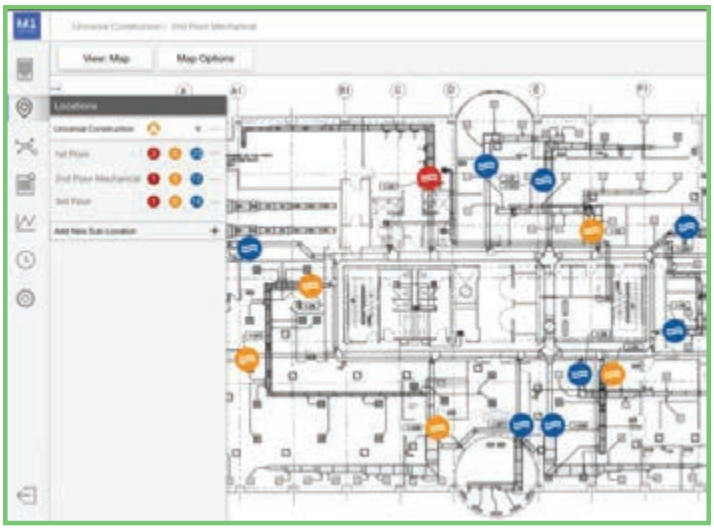
571-327-8763



Upgrades in monitoring have not kept pace with the commercial sector's rapid changes and new technologies, particularly on older infrastructure whose lifespans reach 30+ years. Deployed systems have limited ability to provide affirmative readiness assurances due to siloed and disconnected infrastructure hence creating significant interoperability hurdles and resulting in incomplete and inaccessible data. The lack of interoperability across subsystems, analog and digital sensors, and modern and legacy machinery, restricts sensor fusion resulting in siloed information limiting ability to make informed decisions especially during critical periods of operations.

SRT Labs overcomes this problem by providing a hardware-agnostic, interoperability ecosystem that connects analog and digital subsystems, in addition to providing condition-based maintenance, real-time asset tracking, and infrastructure monitoring. Consolidated base-wide monitoring is most useful when there are both complex systems and a labor shortage. Commands such as NAVSEA, MDMC, and NAVFAC have the added difficulty of assets distributed across miles on bases and across multiple bases, so monitoring of these complex systems (currently with many manual steps) stresses resources, and most importantly cannot provide the complete picture of the current state of all assets. These deployments focus on cost avoidance and minimizing the risk of failure of critical infrastructure systems and machinery.

This solution provides diagnostic and prognostic assessments and improves machinery health and operational efficiency by providing early detection of degraded system performance, reducing the need for human input, expensive delays during maintenance work, safety concerns caused by critical failures, and ensuring optimal conditions for maximum system performance and readiness. ROI has been demonstrated in the identification of machine performance issues that would have caused unplanned downtime in several active deployments.

CAPABILITIES. Operational Deployments (TRL9) at PSNS

- Motor health vibration monitoring for pumpwells & critical machinery
- Gate & valve position monitoring
- Motor & pump state monitoring
- Water intrusion monitoring
- Runtime monitoring by both machine state & current draw
- Filter health monitoring for portable Dust Collectors
- Incoming power monitoring across machines
- Wastewater contamination & flow monitoring
- Paint & sand blasting booth monitoring (MDMC)

CURRENT PSNS DEPLOYMENT

- 300+ sensors (machine shop, 3 pumpwells, 7 caissons, 1 drydock, 2 lift stations, 30 dust collectors)
- LoRaWAN network to support up to 10,000 devices
- HERO/HERF approval for 12 device types
- Containerized software for IL2/IL4/IL5
- Alerts, compliance reports, & text/email notifications

This software has broad DoW applicability—deployed with USMC and working with USAF—addressing the needs to unify the "data plumbing" for maintenance systems that span decades.

To view a short video demonstration, scan the QR Code

BEARS Submission

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Problem Statement: Predicting the failure of military equipment such as armor and weapons, along with infrastructure like bridges, is crucial for planning and operational success in the field. Predicting the failure of structures made of steel, composites, and roadways can determine the outcome of combat.

Description of Innovative Solution: BEARS integrates three disciplines – intelligent sensors at the edge, advanced AI/ML, and group theory algorithms, along with telematics. The system has successfully completed extensive proof-of-concept tests for vehicles and weapons in formal competition within a real environment. The product is now in the process of developing custom applications tailored to specific military and commercial needs.

Innovation Challenges: Adapting the core technology trio of BEARS—edge sensors, advanced algorithms, and telematics—presents challenges for specific applications. Each has unique spatial, technical, and functional needs that require significant modifications and validation. For example, bridging, weapons, and structures all differ in their power, algorithm speed, and complexity, plus interconnect requirements. The current challenge is to optimize these components for the particular tasks.

Technical Maturity: BEARS has conducted significant technical demonstrations on survivable vehicle structures, kinetic weapons, and overstress durability tests of military vehicles. The technology components are proven, but they need to be adapted and refined to optimize them for specific applications. Bridging becomes a key focus because it offers dual-use benefits for both the defense and public sectors. BEARS has a funded project for the next three years that will help advance the application of technology.

To view a short video demonstration, scan the QR Code

QuickTurn: Transforming DoW Maintenance with Comprehensive Spatial Digital Twins

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Problem Statement: The DoW faces critical sustainment challenges from unstructured, siloed maintenance data. Manual data translation creates inconsistencies, subjective decision-making, and slow feedback loops that compromise fleet readiness. For naval aviation, this results in millions of wasted man-hours annually, especially when tracking pervasive issues like corrosion quantification, which is currently poorly managed and hard to address proactively.

Innovation Solution: QuickTurn™ is a proprietary spatial computing platform that creates comprehensive digital twins of military assets, transforming maintenance and logistics. Built on proprietary Converged Mixed Reality and Parallel Content Authoring (PCA) frameworks, QuickTurn unifies data in a spatial context, closing the gap between the physical asset and its digital record. The integrated Mark2Maintain (M2M) module allows maintainers to visually annotate discrepancies, like corrosion, directly onto the 3D model, generating structured, quantifiable data in real-time. QuickTurn automatically converts legacy technical manuals into interactive, multimodal 3D guidance, enabling accurate, traceable, and adaptive “5th Generation Maintainer” capabilities. Furthermore, the system incorporates a natural language processing chatbot to allow users to query spatial data using voice or text, enabling advanced analytics quickly and efficiently.

Benefits to the DoW: QuickTurn delivers immediate, quantifiable improvements in maintenance affordability and agility. Automating the generation of Maintenance Action Forms (MAFs) and work instructions from spatial data is projected to save over 55,000 processing hours per year at one depot site, equating to an estimated annual cost avoidance of up to $9.6 million. The platform supports data-driven predictive maintenance, enhances fleet readiness through consistent, high-quality maintenance, and is designed for seamless interoperability with next-generation systems like the Navy’s Material Condition Automated Documentation System. Its architecture ensures cross-service applicability for aircraft, ground vehicles, and naval vessels.

Innovation Challenges: The primary challenge is converting vast libraries of unstructured, legacy technical documentation into a cohesive, structured format that supports real-time 3D interaction and version control. We are also focused on securing Authority to Operate for the platform and ensuring seamless bi-directional connectivity with existing maintenance databases for critical DoW deployment.

Technical Maturity/Demonstration Results: QuickTurn is currently assessed at TRL 5 following a successful SBIR effort with NAVAIR. The functional prototype demonstrated full end-to-end maintenance workflows, including O-Level and D-Level inspections on the E-2D aircraft, real-time metadata “painting” of discrepancies using M2M, and procedural generation of draft MAFs directly from spatial data. The core PCA component is highly mature (TRL 7).

To view a short video demonstration, scan the QR Code

Autonomous Sustainment: OPTRIX AI for Predictive Maintenance and Agentic Root Cause Analysis

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Problem Statement: DoW sustainment relies on reactive or time-based maintenance, leading to high costs, excessive cycle times, and low materiel readiness. Post-failure diagnostics demand specialized technical expertise, creating a significant manpower constraint across the Organic Industrial Base (OIB) and field commands. Transforming sustainment requires an autonomous, high-confidence solution to minimize downtime and efficiently augment the workforce.

Description of the Innovation Solution: OPTRIX AI is a no-code Agentic AI Platform delivering autonomous, end-to-end Condition-Based Maintenance Plus (CBM+). The platform allows maintenance personnel - not data scientists - to rapidly deploy specialized AI Agents that monitor assets from any source (PLC, SCADA, CMMS, sensors). Core to its reliability is the Domain-Grounded Knowledge Model, which enforces guardrails, grounding predictions in engineering specifications. This ensures high-confidence, non-biased recommendations. OPTRIX AI provides real-time Prognostics and Health Management (PHM) to predict degradation, automatically executing a Root Cause Analysis (RCA), isolating the failing component, and prescribing precise maintenance action.

Benefits to the DoW: OPTRIX AI directly supports DoW goals for agile, effective, and affordable maintenance:

- Increased Materiel Readiness: Predicts critical failures weeks in advance, minimizing unscheduled downtime and enabling high availability (e.g., demonstrated).
- Reduced Cost & Cycle Time: Delivers actionable maintenance plans, including part number, time, and estimated cost (e.g., 'Part: DMTC #98765-ABC'), eliminating costly diagnostic labor.
- Manpower Augmentation: The Automated RCA leverages the Knowledge Model to embed expert knowledge, augmenting technician skills and allowing focus on complex repairs over troubleshooting.

Innovation Challenges: Interoperability with disparate Operational Technology (OT) and enterprise systems is a key CBM+ challenge. OPTRIX AI solves this with its no-code architecture, allowing non-expert users to rapidly build and deploy custom data connectors and AI agents, cutting time-to-value. User trust in autonomous AI is mitigated by the Domain-Grounded Knowledge Model, which provides transparent, auditable predictions with high confidence (for root causes), guaranteeing alignment with established engineering standards and practical maintenance needs.

Technical Maturity/Demonstration Results: Technical Readiness Level (TRL): TRL 8 (System fully qualified and demonstrated in mission-relevant environment). OPTRIX AI is a commercially deployed, operational platform managing complex logistics equipment in high-throughput OIB/DoW-equivalent environments. The demonstration shows successful anomaly detection, automated Root Cause Analysis, and prescription of the exact solution. This proven performance confirms its feasibility and practicality for immediate transition into DoW maintenance activities.

To view a short video demonstration, scan the QR Code

DefenseTech Expeditionary Corrosion Kit (D.T.E.C.K.) for Effective MRO

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Problem: An inevitable enemy threatens fleet performance and longevity—corrosion. It costs the Department of War (DoW) over $20 billion in military assets annually. Amid federal budget reductions, identifying efficient and cost-effective maintenance solutions is imperative for the DoW (DAU, 2024). The agency is also pressured to adopt eco-friendly cleaning solutions under an executive order aiming for net-zero emissions from federal procurement by 2050 (House, 2021). Despite safety and environmental risks, outdated abrasive blasting methods still dominate the defense industry. Sandblasting alone generates over 1.75 million tons of hazardous waste annually and increases the risk of silicosis (USDHHS, 2020).

Description: The DefenseTech Expeditionary Corrosion Kit (D.T.E.C.K.) provides two TAA-compliant, TRL 9 proven laser systems – DTMF-1020 and DTMF-4020 – housed within an A/C-powered, mobile, and expeditionary container. DTMF-1020 is a high-precision, handheld laser tool for speedy polishing, meticulous cleaning, and top-layer coating removal needs. The DTMF-4020 is a Class I enclosed laser system with no additional PPE required. The D.T.E.C.K. ensures rapid, safe, and effective surface maintenance in both field and depot-level environments, coming equipped with power outlets, integrated storage, generator, fume extractor, air compressor, and other materials.

By adopting laser technology, the DoW can significantly reduce expenses associated with surface prep and corrosion control. Our laser systems don't damage the underlying substrate, increasing equipment longevity and decreasing aircraft downtime. They enhance the safety of military personnel and comply with ESG regulations aligning with DoW's sustainability goals.

While transitioning to laser-based corrosion removal poses logistical challenges, the D.T.E.C.K. concept offers a low-friction, widely applicable solution to all service branches of the military and the DLA. The U.S. Navy and USMC have already demonstrated confidence in our systems by placing a second order this year, proving their effectiveness and compatibility with existing defense operations. Military personnel are also adamantly familiar with containers, given they are widely used in the military for the efficient movement of supplies and mandatory equipment. Containers are often even repurposed as lodging, making the D.T.E.C.K., a viable solution for DoW maintenance needs.

Corrosion Prevention and Control Planning Guidebook for Military Systems and Equipment | DAU(2024).

House, T.W. (2021) FACT SHEET: President Biden Signs Executive Order Catalyzing America's Clean Energy Economy Through Federal Sustainability | The White House

USDHHS (2020) NTP Technical Report on the toxicity studies of abrasive blasting agents. https://ntp.niehs.nih.gov/sites/default/files/ntp/htdocs/st_rpts/tox091_508.pdf

To view a short video demonstration, scan the QR Code

Transforming Defense Maintenance: Apellix Drone-Based Power Washing for Enhanced Safety and Readiness

Robert Dahlstrom

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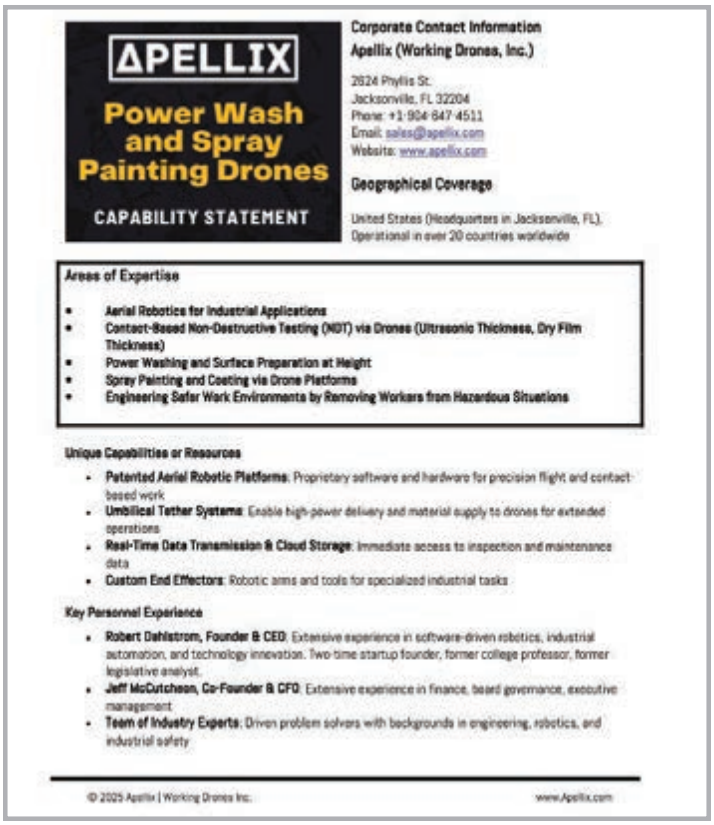

Problem Statement & Solution Overview: Maintenance and decontamination of military ships, vehicles, and infrastructure are time-consuming, hazardous, and costly due to reliance on manual methods, scaffolding, and ground-based equipment. These outdated practices expose personnel to dangerous environments, contribute to higher accident rates, and lead to maintenance backlogs that threaten asset readiness and operational capacity. Inconsistent cleaning results and extended downtime further underscore the need for greater automation. The Apellix Power Wash Drone directly addresses these challenges by automating high-risk cleaning tasks with a safe, NDAA-compliant solution designed for rapid deployment across federal and defense sectors.

The Apellix drone performs precision, data-driven power washing—both on accessible and hard-to-reach surfaces—without lifts or scaffolding. This eliminates worker exposure to hazardous conditions and expedites asset turnaround, directly supporting the DoW's mission of sustainable operational readiness. Its remote operability and on-demand activation enable immediate response to contamination threats or urgent redeployments, boosting resilience for critical defense infrastructure.

Benefits to the DoW:

- Enhanced Safety: The system reduces the need for personnel to operate in dangerous conditions, lowering accident rates during maintenance tasks.
- Efficiency and Readiness: Automated workflows shorten maintenance cycles, decrease downtime, and allow assets to be returned to service faster.
- Cost Savings: Drones eliminate or reduce the expenses of scaffolding, lifts, and extensive manpower, offering long-term operational savings.
- Consistent Quality: Data-driven cleaning ensures standardized results for both easily accessible and complex surfaces.
- Environmental Gains: Lower water and chemical use and reduced waste align with sustainability and environmental goals.
- Scalable Across Services: The solution is adaptable to multiple branches and facilities, providing broad DoW applicability.
- Digital Transformation: Supports the DoW's modernization agenda with real-time analytics and seamless integration with digital maintenance systems.

Innovation Challenges: Adoption of drone-based automation demands change management, including updates to legacy procedures and training personnel accustomed to conventional tools. Demonstrating technical maturity, maintaining NDAA and cybersecurity compliance, ensuring cross-service compatibility, validating results in varied defense scenarios, and integrating seamlessly into military asset management systems are essential steps for widespread adoption.

Technical Maturity & Demonstration Results: The Apellix Power Wash Drone is a mature and globally deployed technology, currently in use across over 20 countries. Real-world demonstrations have validated its ability to perform consistent, high-quality cleaning on both military and commercial assets, reducing reliance on manual labor.

To view a short video demonstration, scan the QR Code

Elinor Coatings ALUMA45: Chrome-Free Corrosion

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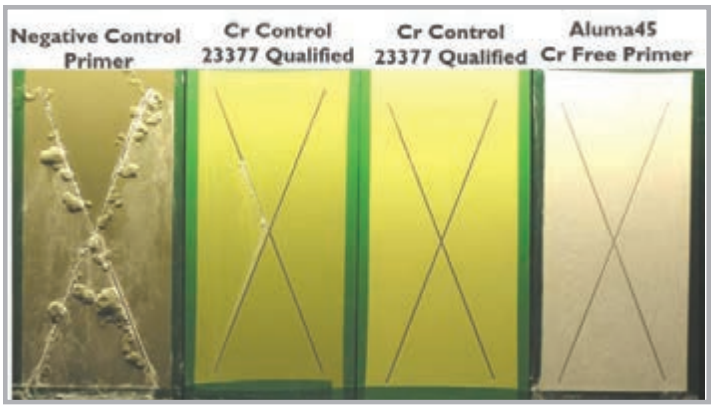

Elinor Coatings' Aluma45 is a Chromate-free corrosion protection coating that provides repair timing flexibility and creates an opportunity to include embedded sensors for real-time monitoring to aid in predictive maintenance.

Problem: DoW spends billions each year to mitigate the impact of corrosion on its assets, including aircraft, ground vehicles, and naval vessels. Current protective solutions for those critical assets involve using protective coatings to slow down/ eliminate the ingress of moisture/ corrosive pollutants from the environment to metal substrates. Chrome-based coatings provide protection against corrosion on aluminum substrates. However, the carcinogenic nature of chrome-based coatings (due to presence of hexavalent chromium) puts personnel at risk when exposed to these coatings during production, application, and removal. To eliminate the health risk and environmental risks from this pollutant, DoW is looking for non-chrome, environmentally benign coatings that provide protection similar to chrome-based counterparts. Use of chromates also adds time and expense to the painting process by requiring an extra step in application and special care in the removal process during repair/refinish for collection, disposal and safety protocols dealing with the chromate residue.

Solution: Aluma45 magnesium-rich, chromate-free primer protects Aluminum alloys through galvanic protection. It provides equivalent protection to chromate without harm or danger to the applicator or the environment. Unlike chromate treatments, Aluma45 does not rapidly oxidize on exposed surfaces so there is no need to immediately apply an epoxy primer. Aluma45's ability to act as a stand-alone coating provides flexibility for applicators as the primer can be topcoated in as little as four hours or months later without further surface preparation. TRL 5 with prototype is in field trials.

Benefits: Aluma45 provides three benefits to DoW painting operations: 1) elimination of chromate treatments which are harmful to workers, to the environment, and to the surrounding community; 2) faster, more manageable turnaround by eliminating the chromate step and providing a flexible time-window for topcoat application; 3) Aluma45 is applied in thinner coats than the high build primers used with chromate treatments resulting in up to a 20% coating weight reduction benefiting fuel efficiency.

The next step in the innovation journey for Aluma45 technology will be incorporation of micro-sensors that can detect /monitor Aluminum Oxide formation, providing real-time monitoring to enable as-needed maintenance scheduling. By combining existing drone technology and AI-based corrosion-detection software, this coating will enable fast and accurate identification of corrosion before visual inspection can identify. This will allow maintenance teams to identify/ monitor corrosion and prioritize maintenance efficiently, knowing which areas need to be prioritized because of deterioration rate or criticality.

To view a short video demonstration, scan the QR Code

Smart Automation EMMA

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Problem: Automating surface prep on DoW assets like ships and aircraft requires the inclusion of real-time decision making: the ability to adjust processes on the fly. The abrasion process is highly variable, with different geometries and materials, micro and macro movements of the surface, and how the scope of work changes as coating thickness differences and substrate condition are discovered during abrasion. A successful approach must work harmoniously with this variability and must fit into the operation seamlessly such that other operations (masking, inspection) can happen simultaneously to maintain the appropriate level of organizational engagement.

Description: TAI's EMMA is the only automated system that allows for real-time decision making and has sanded 25 widebody commercial aircraft. EMMA is a turnkey solution that is instantly deployable and safe around humans, allowing for personnel to monitor and adjust the process in real time, while also performing parallel tasks like masking and inspection.

EMMA continuously monitors the surface and its surroundings to safely operate alongside humans and on the assets being sanded. EMMA relays information to the painter through the Operator Tablet to improve their decision making and incorporates their inputs to adjust the sanding in real time. EMMA requires no scanning, programming, part fixturing or models, responding instead directly to actual conditions in real time.

Benefits to the DoW: In commercial and military use, EMMA systems have:

- Reduced sanding time by 63%, headcount by 25%, and labor time billed to sanding by 73%
- Dramatically improved final paint finish quality
- Eliminated all sanding injuries
- Eliminated schedule volatility
- Reduced rework by 80%
- Increased facility capacity by 250%

By using a reactive control system and human-in-the-loop decision making, eliminating reliance on models and programming, EMMA:

- is usable by new painters with only (1) hour of training
- performs any sanding operation on any surface
- does not need part fixturing or locking
- is instantly deployable, no changes to facility or current process flow
- has no downtime when process or workpieces change

Challenges: EMMA is on a path of ever-increasing autonomous decision making. The current challenge is improving EMMA's ML to the point that she correctly decides when an area is properly abraded and chooses to move to a new area. To further increase the autonomous decision making, the data already being collected needs 6 months to be processed and trained on to achieve a sufficient performance level to be deployed.

Technical Maturity: EMMA is at a TRL of 9, operating commercially since 2023, certified for C1D1 environments and passing an ISO 13849 risk assessment, and has sanded dozens of productions 787s across all shifts at Boeing with no downtime for maintenance.

To view a short video demonstration, scan the QR Code

The Game Changer for Surface Prep and Corrosion Removal: The GC-500X Laser Cleaning System

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The GC-500X popularity is spreading throughout industry and the DoW while finding almost limitless applications for this time saving tool that improves and accelerates asset readiness. G.C. Laser Systems Inc. is an American WOSB laser equipment manufacturer that designs and makes advanced globally patented laser cleaning equipment in the USA. The new GC-500X is the most powerful compact 1064nm pulsed laser cleaning system ever made for removing corrosion, removing coatings, and surface prep.

This record breaking 500W tunable pulsed laser can run off of a standard 120V power outlet in the USA, or any standard power outlet in the world ranging from 90V-240V AC 50/60HZ. This smart system detects what voltage it is plugged into and adjusts accordingly. The GC-500X achieves peak powers per pulse of well over 10,000W and offers unmatched precision and control over surface prep.

This durable portable unit is literally smaller than a folding chair, can go into confined spaces, and has enough power to quickly and safely remove rust, coatings, paints, and contaminants from ferrous and non- ferrous metals as well as other materials to help get critical components and assets ready faster.

This versatile system offers unmatched precision to meet industry standards and guidelines such as the new AMPP laser ablation standards and guidelines: SP21511, GUIDE 21611, GUIDE 21711.

This powerful compact unit is a “Game Changer” for surface prep and asset maintenance in the field as it is designed to be used outdoors and can easily fit in a vehicle, on the back of a UTV, in a helicopter, or simply be hand carried inside of a ship or asset anywhere in just about any environment. Proudly designed and made in the USA, the GC-500X can clean a metal surface and preserve existing surface profile as well as be configured to create new surface profiles.

To view a short video demonstration, scan the QR Code

Acoustic Antifouling for DoW Maritime Assets

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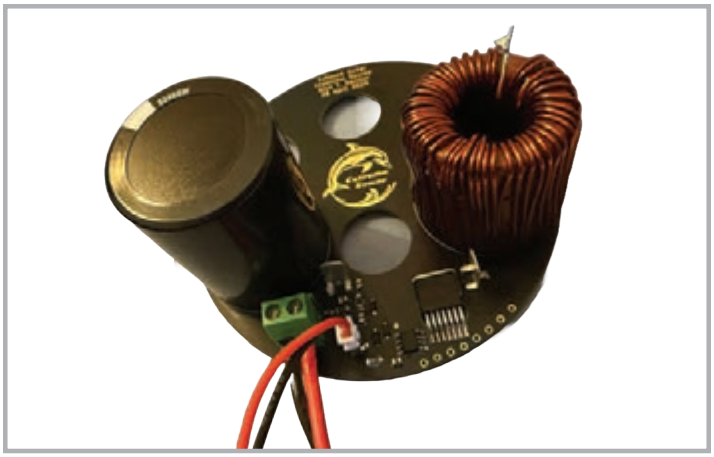

Biofouling on maritime assets is a persistent maintenance challenge for the Department of War (DoW), directly degrading mission readiness and increasing sustainment costs. The accumulation of marine organisms raises hydrodynamic drag, driving up fuel use, reducing vessel speed and range, and requiring frequent, hazardous, and costly cleanings. Traditional antifouling methods rely on ablative coatings or chemical treatments with limited lifespans and ecological drawbacks.

We have developed and demonstrated the Biomimetic Impulsive Source, a novel low-frequency (5–25 kHz) acoustic technology for proactive, persistent biofouling prevention. The system emits high-power, single-cycle impulses—up to 20 kW (217 dB re 1μPa)—at a 1 Hz duty cycle, maximizing biological effectiveness while minimizing energy use. These short pulses disrupt microscopic organisms' ability to settle, creating a protective deterrent field around submerged assets without requiring physical modification. Unlike continuous-wave ultrasonic systems that vibrate the hull inefficiently, our approach projects the waveform directly into the surrounding water. With an average power draw of only a few watts, it supports long-duration, battery-powered or remote operation.

At TRL-6, full-scale prototypes have been successfully demonstrated in real-world maritime environments, validating both performance and safety for marine mammals and divers. The maintenance impact is immediate and substantial: it drastically reduces or eliminates manual hull cleaning and dry-docking, lowers lifecycle costs, minimizes hazardous material use, and reduces manpower requirements. By maintaining a clean hull, vessels sustain optimal speed and fuel efficiency, directly enhancing operational availability and range while mitigating the spread of invasive species—a growing logistical and environmental threat to global force projection.

The system's low Size, Weight, Power, and Cost (SWaP-C) and non-invasive installation make it practical for rapid transition across the DoW. Its cross-service applicability spans Navy surface combatants, Coast Guard cutters, Army watercraft, and SOCOM sub-surface craft, as well as fixed infrastructure such as piers and sensor platforms, and DLA prepositioned assets. This technology delivers a robust, energy-efficient, and environmentally responsible solution to neutralize the pervasive maintenance burden of biofouling—enhancing readiness and reducing sustainment costs across the joint force.

To view a short video demonstration, scan the QR Code

Multi-Layer System Lagging Product

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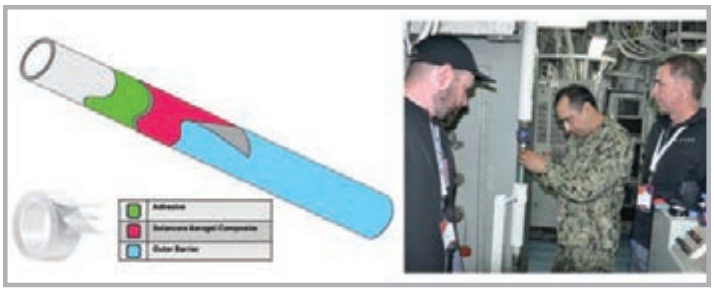

A common problem associated with traditional chill water pipe lagging is corrosion under insulation, or CUI. When chill water runs through piping on ships condensation builds up and drips on pipes as well as fittings and other components in the vicinity, causing costly corrosion to equipment requiring further work and repairs.

Solarcore's proprietary lagging alternative offers an easy to install solution which is fast and effective. The low-profile aerogel material eliminates the thermal transfer of energy with only a few millimeters of thickness attached directly to surface of the piping, elevating the surface temperature above the dew point away from the pipe eliminating condensation formation in critical areas. This is accomplished by taking advantage of the patented nano-porous aerogels with ultra-high internal surface areas of >300m2/g and providing properties to minimize conductive and convective heat transfer, providing unparalleled thermal insulation.

The multi-layer system lagging product consists of an inner dual sided adhesive which is UL 94 FR compliant, an inner Solarcore Nomex/Kevlar aerogel composite, and an outer surface barrier. This product is created for use in exact dimensions for precise fit on chill water pipes, as well as a universal tape solution which can be easily fitted to unexpected shapes and areas.

Current chill water pipe lagging is bulky and takes up valuable space on ships as well as a cumbersome installation process. Solarcore's materials provide improved thermal efficiency which equates to less use of energy to maintain proper temperatures, space savings from a thinner solution, and easy installation. Characterization data for the aerogel material shows performance gains with a lower profile than existing products and can be installed simply in a matter of seconds for readiness and repairs. Participation at previous Navy repair technology exercises allowed for the demonstration of this product.

These benefits can be used for not just Navy applications, but also in all DoW branches as well as the public domain. Transfer of this technology to the public sector can be easily realized. There are needs for pipe insulation in all aspects of modern infrastructure, home and commercial buildings would greatly benefit from more efficient and thinner insulation solutions reducing energy costs and maximizing useable interior space.

Testing and validation of the product was established by creating a strict protocol using relevant MIL specifications and standards working in coordination with NAVSEA 05T. At the same time the teams worked to create materials in sufficient quantities and configurations that could be used for application and performance analysis in operational environments. This allowed for the sequential advancement of a TRL 2/3 to 5/6; this will continue to be further advanced during future work in Phase IV Advancing Additive Repair Technologies for Sustainment of Maritime Assets.

To view a short video demonstration, scan the QR Code

Innovative Composite Tank Repair

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USS BOXER experienced recurring corrosion pinhole leaks in the steel hot water accumulator tank's watertight boundary. Previous attempts using external epoxy-based patches were applied with poor results due to pressurization and thermal expansion of the hot water system. Based on excessive interior pitting from previous surface preparation issues, a welding alternative was desired. Replacement of the accumulator tank presented major obstacles:

- Lead time for new tank
- Extensive interference removal and access cuts
- Significant shipyard resources and planning time
- Compressed availability constraints

When an emergent condition is assessed, composite repairs offer a convenient alternative. Internal composite repairs were determined to be an appropriate repair method based on previous success from the use of composite repairs on commercial accumulator tanks. Many tank lining companies had concerns with existing internal pitting surface; therefore, Southwest Regional Maintenance Center chose SUNREZ's unique fiberglass and resin system that offers a Vinyl-Ester, pre-impregnated, fiberglass fabric (already saturated with resin) that utilizes an Ultraviolet (UV)-Cure process. Key advantages included:

- Rapid application: full cure within 60 seconds
- Simplified process: pre-saturated fiberglass reduced handling complexity
- Durability: reinforced, corrosion-resistant liner capable of withstanding high-pressure hot water

The USS BOXER repair request combined a large volume repair with interior ship challenges. Working pressures and temperatures of this accumulator were within the SUNREZ composite design capability for a successful repair, and the repair was completed in one day. This repair not only restored watertight integrity to the steel accumulator tank for unrestricted operations but also provided a reinforced fiberglass composite liner. This repair method allowed the USS BOXER to meet operational commitments with minimal downtime. Even though water from this system was determined to be isolated from the ship's potable water system, SUNREZ did have their composite repairs materials submitted for National Sanitation Foundation 61 certification. The repair was also completed pier-side without requiring hot work repair or tank replacement. This repair technology saved a significant amount of time, labor, and financial investment for the navy. This opportunity will allow NAVSEA to continue evaluation of this technology's value and establish limited approvals for unrestricted use. Not only did this innovation option allow USS BOXER to maintain their operational commitment, but it also prevented unscheduled deployment extensions of other naval assets. Recently published NAVSEA Drawing 630-9014545 provides installation details of this product for smaller scale patches in limited areas. NAVSEA is also working on additional testing which will mitigate challenges of larger patch repairs and additional interior use.

To view a short video demonstration, scan the QR Code

Smart Autonomous Robots for MRO Finishing, Coating and Welding Operations

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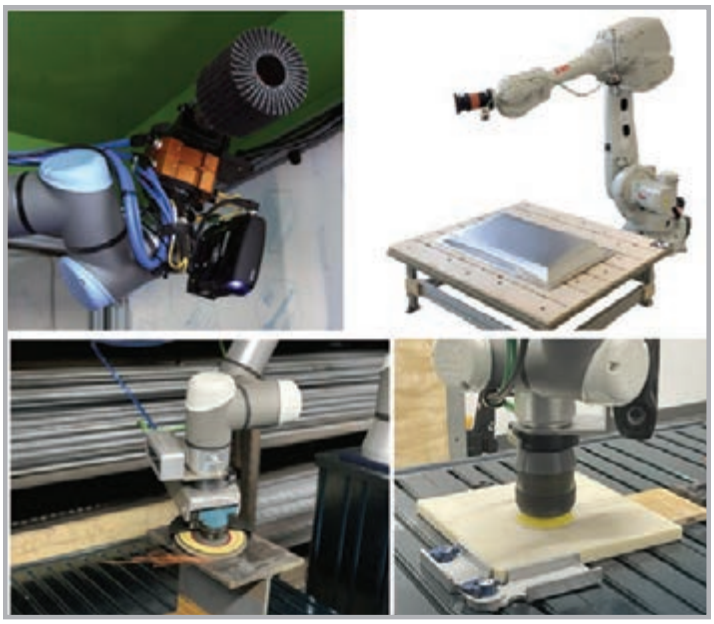

Traditionally, robotics solutions in maintenance and sustainment activities have been inflexible and expensive, requiring significant upfront costs along with manual programming for every setup and part. As a result, robotics usage in high-mix sustainment operations have been severely limited due to setup complexity and processing inflexibility. Despite necessary and critical investments for fleet sustainment and readiness, increases in the cost-per-flight-hour metric in recent years have raised concerns, with a 20% jump between FY21 and FY23. Additionally, maintenance bottlenecks contribute to grounded aircraft and assets that are not available to the warfighter and mission capability.

Cohesive Robotics delivers smarter robots for high-mix manufacturing and maintenance across diverse industries. Our core solution is Argus OS™, a proprietary, AI-enabled software stack that eliminates complex, time-consuming programming and integration for easier automation. Its flexibility supports a wide range of applications and OEM hardware, ideal for high-mix production requiring part variation and workflow flexibility.

Argus OS™ provides a truly autonomous, no-code, and no-teach experience, featuring:

- Support for topology-based applications (e.g., sanding, coating, welding, polishing).
- 3D vision-based AI part scanning and registration (with or without CAD data).
- On-the-fly, collision-free robot programming and motion planning for most robot OEMs.
- Key benefits for DoW mission needs include:
- Increased Productivity: Boosts production by 30% or more.
- Consistent Quality: Reduces rework/scrap rates by 80% or more through precision and consistency.
- Enhanced Safety: Automates dangerous tasks, reducing accidents.
- Greater Flexibility: The same workcell can adapt to perform multiple tasks (e.g., weld, grind, and polish a part).

Cohesive Robotics began internal research and development of Argus OS™ in 2022 and released its first complete turnkey robotic workcell powered by the software in early 2024. Sold directly to manufacturers across industries, the Smart Finishing Robotic Workcell supports a wide variety of material removal and surface finishing processes. The first production system is deployed to a commercial customer site in New York, increasing production throughput an average of 50% while protecting workers from hazardous metal dust and ergonomic tool vibration exposure. In July 2025, the Smart Welding Robotic Workcell was released, supporting a variety of welding processes in high-mix environments. The first production version of the system is configured for TIG welding. It was installed at a New York manufacturer in August and entered production usage in September, generating throughput improvements of 60% with further increases expected as the system is automatically optimized. A second system will be installed in late Q4 at a medical technology manufacturer in New Jersey.

To view a short video demonstration, scan the QR Code

Expeditionary Cold Spray

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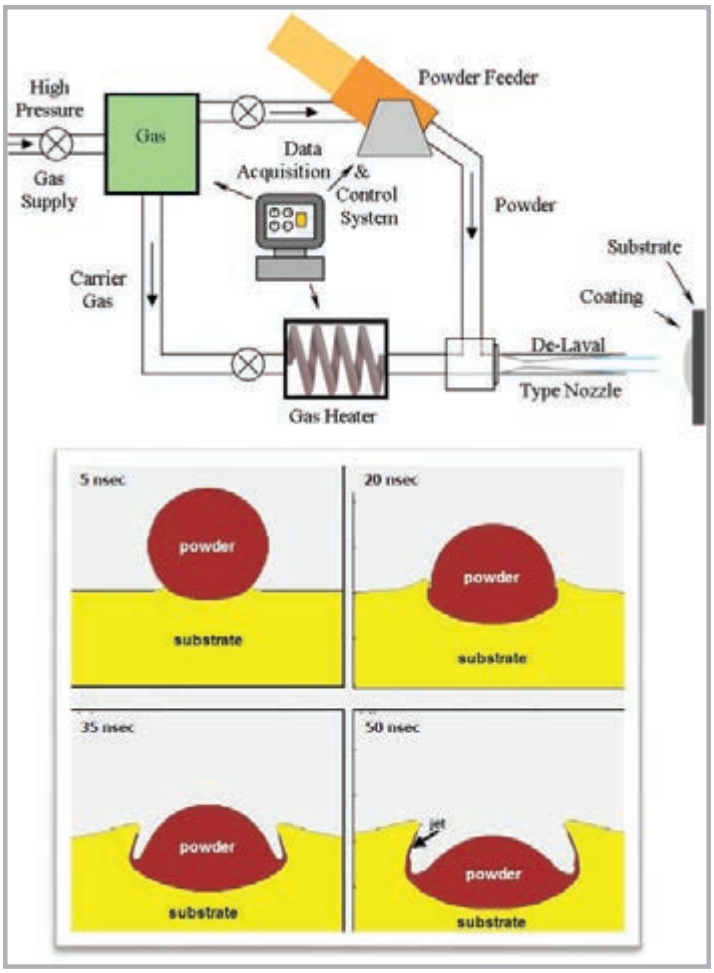

The U.S. Navy faces growing challenges in maintaining critical ship and submarine assets due to high operational tempo and an aging industrial base. Traditional repair methods such as welding, electroplating, and epoxy-based systems introduce risks like heat-induced warpage, poor adhesion, and prolonged dry dock periods. Cold spray technology offers a low temperature, solid state additive repair process using supersonic particles of metal which bond to substrates without melting. This enables dimensional restoration of components with minimal heat input, preserving base material properties while reducing repair time and cost.

Cold spray has rapidly transitioned from lab-scale development to active field deployment. Since 2020, NAVSEA has established multiple cold spray repair cells across the fleet, enabling expeditionary repairs to shipboard components. This technology has been used successfully aboard submarines and surface ships, demonstrating its readiness and versatility in real-world conditions.

One breakthrough repair was conducted in November 2022 aboard the USS Hyman G. Rickover. Cold spray was chosen over electroplating or component replacement, the latter requiring an unscheduled five-month dry docking, to repair damage to a component in a confined space. Completed in just eight days, this was NAVSEA's first shipboard cold spray repair allowing the team to learn valuable lessons including thermal monitoring for cold weather applications and improving powder chemistry for better crevice corrosion resistance.

In April 2023, another groundbreaking repair was performed for the USS Essex. Both port and starboard rudder stocks were removed with extensive damage requiring repair and potentially delaying undocking. Cold spray repair enabled structural restoration on both rudder stocks, avoiding 24 days of additional dry dock time. Not only did the repair event demonstrate cold spray's ability to meet or exceed structural and dimensional restoration standards under operational constraints but also allowed improvement in robotic integration, dust containment, and measurement techniques.

Utilizing lessons learned from above, Portsmouth Naval Shipyard recently achieved a deck plate repair of a component on the USS Virginia avoiding a 45-day unplanned docking. Drydock schedules are tight and adding an emergency dry docking usually affects multiple navy asset schedules. Prior to staging shipboard, the team conducted a mockup of the repair area allowing validation of space constraints, interferences and ventilation requirements.

Cold spray is proving to be a force multiplier for naval maintenance, combining innovative materials engineering with deck plate-level execution. It offers measurable improvements in readiness, cost avoidance, and mission continuity—transforming how the Navy approaches maintenance and sustainment in the modern era.

To view a short video demonstration, scan the QR Code

Millimeter/Micrometer Wave Inspection System for Thick Polymer Coatings

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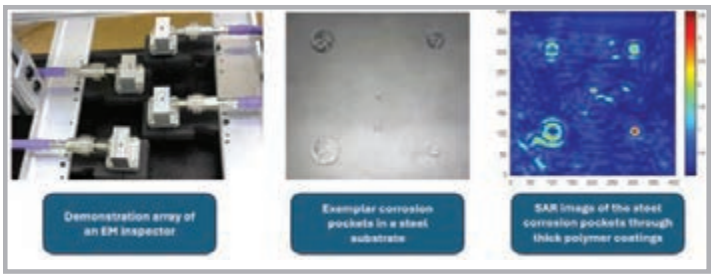

Problem Statement: There is currently no method for nondestructive testing (NDT) of metal substrate health through thick polymers applied to the hulls of different USN warships. Current methods for inspections through thick polymers involve the costly destructive removal of sections of the thick polymer generating hazardous waste and wasting time labor, time, and materials. A nondestructive imaging method for inspections of the metallic substrates through thick polymers is needed to reduce lifecycle costs, improve accuracy of initial maintenance work scoping, and increase operational readiness by reducing emergent maintenance issues in-field that were not discovered during scheduled maintenance.

Innovative Solution: Electromagnetic (micro/millimeter wave) imagers offer the ability to inspect through different materials in the high MHz to low GHz frequency range, including thick polymer coatings and build images of the substrate surface, including signs of corrosion and other defects. The inspection system uses synthetic aperture radar (SAR) produced by multiple custom designed antennas operating exclusively as transmitters or receivers with low noise amplification to form an overall inspection array. Corrosion patches have been successfully identified underneath polymer layers using this system on steel substrates of interest. Previous iterations of microwave/millimeter wave imagers such as these have been packaged and delivered to customers.

Benefits to the Military: Presently, there are no ways to provide maintainers with information about areas that may require maintenance under thick polymer coatings on metallic hulls. Electromagnetic imaging systems, such as the one being developed for USN for these targets, will provide maintainers information about areas of hulls that do need destructive removal of polymers for visual inspections. The ability to significantly cut down the amount of material removed offers large amounts of cost and time savings when qualifying these weapon systems during periodic maintenance. This will enable higher safe availability of USN weapon systems. In addition, variations of this technology can examine a wide range of different non-electrically conductive material systems, such as ablatives, coatings, composites, and many others.

Technology Maturity: This solution produced by TRI Austin has been demonstrated on various laboratory experimental setups as well as specimens provided by USN. As mentioned, the system can inspect through wide ranges of different material systems. Present iterations of this technology have reached TRL 5 (for highly fidelity testing of integrated laboratory components) with additional demonstrations of USN specimens of interest planned.

To view a short video demonstration, scan the QR Code

Concrete Impossible: Self-Heating, Self-Healing (SH2) Bendable Concrete for Defense Infrastructure

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Problem Statement: DoW installations suffer accelerated pavement damage from freeze-thaw cycles and thermal stress. Conventional concrete is strong in compression but brittle under tension, causing cracks for moisture and chemical penetration. This corrodes rebar, creates potholes, and causes joint failure. Current winter maintenance depends on aggressive plowing and heavy deicing salts, causing corrosion and increasing cost and downtime. Critical operations suffer iced airway delays, vehicle access, and slippery sidewalks that create safety hazards. The result is higher maintenance costs, longer repair cycles, and reduced mission readiness.

Innovative Solution: We've developed SH² Bendable Concrete, a single material that combines self-heating capability, ultra-high ductility, and autonomous crack healing. Our concrete achieves over 500× the tensile ductility of conventional concrete. Under stress, it forms tight microcracks (<150 μm) that self-heal, blocking moisture and chloride intrusion. Unlike traditional concrete, our material captures heat from sunlight and releases it when temperatures drop near freezing. As a result, it can melt snow and ice and reduce the need for chemical salts. The material can be cast-in-place for new construction, thin overlay for rapid upgrades, or precast panels for quick repairs at high-priority locations like maritime structures, bridges, and runways. We have demonstrated a two-inch slab of this material withstands heavy compaction equipment without steel reinforcement.

Benefits to DoW

- Reduced maintenance: Faster ice melting cuts plowing frequency, deicer use, labor hours, and reactive repairs
- Improved readiness: Less downtime on flightlines, reduced skid hazards, better access at gates and critical entry points
- Lower lifecycle cost: Microcrack control and self-healing reduce corrosion and deterioration, extending pavement life and reducing repair frequency
- Broad applicability: USAF aprons and taxiways, Army motor pools and bridges, Navy/USMC pier aprons, USCG facilities, DLA distribution yards

Challenges: Following challenges must be addressed for adoption: First, developing performance-based specifications aligned with ACI/ASTM standards to support qualification and acceptance. Second, training producers, ready-mix suppliers, precast plants, and paving contractors, for QA/QC procedures, mix handling, and electrical safety. MIC demonstration support can accelerate these efforts and reduce adoption risk.

Technical Maturity: Lab testing confirms compressive strength exceeding 50 MPa, repeatable tensile strain-hardening behavior, controlled crack widths with self-healing, and faster snow/ice melting versus conventional concrete. A provisional patent has been filed. A field pilot project with multiple SH2 bendable concrete slabs installed with thermal and strain sensors to capture the response to the winter season. Following the pilot, we'll conduct techno-economic analyses using field data to quantify ROI.

To view a short video demonstration, scan the QR Code

FireSight Robotic Fire Watch

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Hot work continues to be a leading cause of fires, with significant risks to facilities and personnel, especially in industrial environments where fire hazards are amplified. Recognizing the need for robust fire monitoring solutions, BlackStarTech and Fike Corporation collaborated to build an autonomous firewatch solution to meet the established FM 3270 Approval Standard for Hot Work Robots. This innovative solution addresses critical safety challenges and can be used for post-hot work monitoring, temporary fire protection outages, and high-risk areas.

The FM 3270-approved solution integrates cutting-edge technologies, including multi-spectrum infrared flame detection, video analytics-based smoke detection, and a fire alarm control panel, ensuring comprehensive fire monitoring and rapid detection. FM Global recommends this portable fire watch system to its insured customers, as outlined in datasheet FM 10-3 Hot Work Management delivering.

Enhanced Safety to Personnel: The system minimizes human exposure to dangerous post-hot work conditions by automating fire detection in hazardous or hard-to-access areas.

Rapid Detection and Response: Advanced technologies allow early identification of fire, ensuring swift action before escalation.

Versatility in Applications: Effective for post-hot work monitoring, areas where fire protection is offline, and temporary deployments in high-risk areas.

Compliance and Risk Mitigation: Meets FM Global's safety standards, ensuring regulatory compliance

The Automated Fire Detection System is deployed in a wide variety of industries enabling safety and risk mitigation capabilities. The mature, demonstrated solution provides similar benefits to the Department of War while providing technological expansion categories for numerous benefits and efficiencies.

This technical presentation will explore the system's technologies, including videos of actual events, operational features, and significant role in industrial fire safety. By adopting this innovative, FM 3270-approved solution; safety managers can protect personnel and assets, confidently mitigate fire risks, and streamline fire watch procedures to create safer, more efficient manufacturing operations.

To view a short video demonstration, scan the QR Code

Prime H2: Portable Renewable Integrated Modular Energy, Hydrogen

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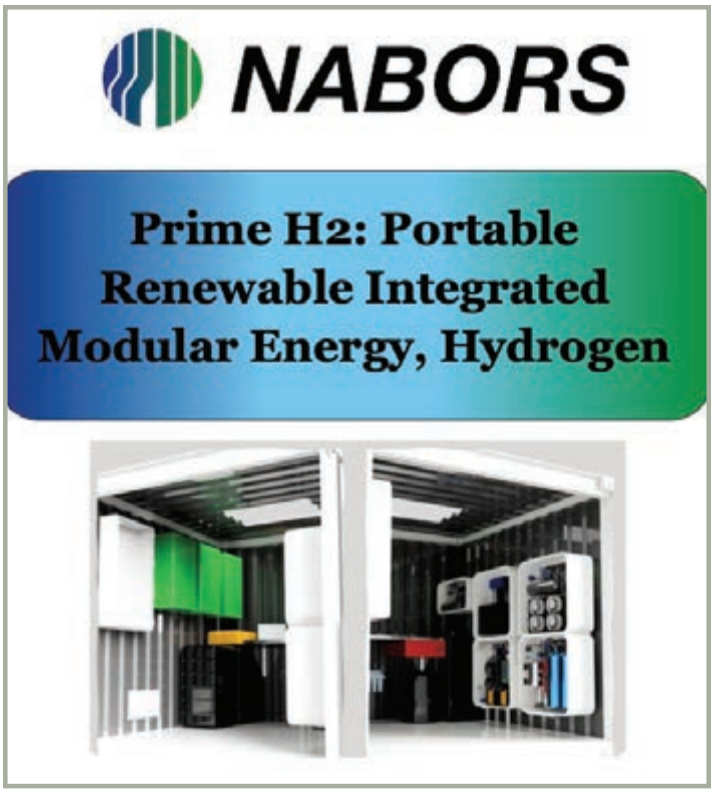

The Department of War requires reliable, non-hydrocarbon energy solutions to sustain operations at the edge while reducing logistics burdens. Nabors has developed Prime H2, a containerized Hydrogen & Electrical Generation System that produces on-demand electricity from water and solar inputs, completely eliminating reliance on diesel fuel. The system uses polymer electrolyte membrane electrolysis to generate hydrogen, which is then stored safely in advanced low-pressure hydrides. High-efficiency fuel cells, buffered by a battery bank, convert the stored hydrogen into electricity. This solution is modular and scalable, with configurations ranging from 4 kW to 1 MW to support everything from tactical field deployments to depot-level operations.

This innovation directly supports key DoW priorities by enhancing operational energy resilience and enabling expeditionary power generation. By producing fuel and power on-site, the system significantly reduces the need for vulnerable diesel resupply convoys, which in turn lowers emissions and increases mission endurance. The system also provides silent and reliable power, as demonstrated with NAVSEA. Furthermore, it offers dual-use benefits for disaster recovery, remote communities, and critical infrastructure resilience. The primary challenge is transitioning the current TRL 7 prototype into a fully production-ready platform. This requires planned upgrades to the hydrogen storage hydrides, control systems, and overall system autonomy to enable completely unattended operation in diverse environments. The technology has successfully reached Technology Readiness Level (TRL) 7. A fully functional 25 kW unit was demonstrated with NAVSEA at the SALV-EX exercise on Ford Island, HI. During this demonstration, the Prime H2 system powered multiple EMARC repair shops silently and reliably, proving its effectiveness in a relevant operational environment.

To view a short video demonstration, scan the QR Code

AI-Powered Robotic Maintenance Repair and Overhaul

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Maintenance, repair, and overhaul (MRO) of weapon systems, including aircraft, ships, vehicles, and submarines, remain among the most complex and labor-intensive operations in the Department of War. Fleet readiness is constrained by manual paint, corrosion-control, and inspection processes that rely on a shrinking skilled workforce. Surface preparation, coating, and inspection are often performed separately, creating multiple handoffs, long queues, and high manpower requirements. These workflows are slow, ergonomically demanding, and prone to variability, resulting in rework, extended maintenance timelines, higher sustainment costs, and reduced fleet availability.

Traditional robotic automation has failed to scale in these high-variability DoW environments because it relies on offline programming and part-specific teaching. GrayMatter Robotics (GMR) addresses this challenge through its AI-driven Scan–Plan–Act–Verify framework, which enables geometry-agnostic, adaptive automation without preprogramming. Scanning captures the geometry of any part; planning incorporates operator input and process preferences to generate optimal toolpaths; execution drives robotic sanding, blasting, spraying, or inspection with precision; and verification embeds inline quality checks for continuous feedback.

Building on this core framework, GMR delivers a suite of modular turnkey systems tailored to surface preparation, coating, and inspection:

- Scan&Sand™ standardizes surface finishes through adaptive force-controlled sanding.
- Scan&Blast™ integrates geometry-aware blasting and inline verification to ensure safe, consistent coating removal.
- Scan&Spray™ achieves uniform coatings via 3D localization, conformal path planning, and real-time quality monitoring.
- Autonomous Inspection combines multi-modal sensing and edge AI to deliver decision-quality metrology at production speed.

Together, these systems form a closed-loop, air-gapped robotic workflow that streamlines depot operations. Beyond automation, GMR's ecosystem of software and services ensures reliable deployment and sustained operational excellence:

- GMR-Guardian™ continuously monitors robotic cells for disruptions such as improper debris removal or tool misloads, adapting in real time to maintain uptime.
- GMR-ProcessPro™ optimizes process parameters across materials to extract maximum operational value.
- GMR-Insights™ transforms cell-level data into actionable intelligence on utilization and performance.
- GMR-Care™ provides 24×7 remote and onsite support to ensure sustained reliability and customer success.

GrayMatter Robotics (GMR) transforms DoW sustainment by uniting sanding, blasting, coating, and inspection in a single intelligent robotic ecosystem. The TRL-9 technology proven across 50+ deployed cells and 30 million square feet enhances safety, ensures full traceability, and scales from components to full aircraft or ships, reducing costs and boosting fleet readiness through AI-driven autonomy.

To view a short video demonstration, scan the QR Code

Grey Gecko Real-Time Inspection Tool (GRIT)

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Problem Statement: Hidden corrosion and structural flaws cost the DoW over $20B annually. Traditional inspection methods are labor-intensive, inconsistent, and often miss hidden defects under 20–25 mil coatings, resulting in an average repair cost of $12,000 and six days of lost mission availability per event. These risks are amplified by uncertain budgets, procurement delays, life-cycle extensions, parts shortages, and an escalating geopolitical deployment tempo that demands more sorties from aging fleets with fewer spares and tighter maintenance windows. In deployed or austere settings, these combined pressures threaten projection, readiness and aircrew safety across all services.

Innovation Solution: The Grey Gecko Real-Time Inspection Tool (GRIT) 125v2.5 is a rugged, handheld, battery-powered infrared imager that "sees through paint," detecting corrosion, cracks, voids, and moisture beneath coatings up to 25 mils thick without the need for chemicals, PPE, or external power. It delivers live, high-resolution images on a tablet and captures customer-dictated metadata (including time, location, tail number, and inspector ID) for instant report generation. A patented image-stitching algorithm expands inspection areas from ~1,200 mm² to 11,500 mm², dramatically increasing coverage. GRIT integrates directly with Aircraft Notebook, IADS/IETMS, and GCSS-Army for seamless condition-based maintenance (ANSI 4180 Compliant).

Benefits to the DoW: GRIT cuts corrosion-related downtime by ~25% and inspection labor by >50%, producing a 3–7-month ROI on fourth-generation aircraft. It is eye-safe, FCC-compliant, and eliminates toxic paint-removal processes. The U.S. Coast Guard Aviation Logistics Center adopted GRIT for HC-144 wing-joint inspections, reducing a 30-hour job to six hours; an 80% labor savings and elimination of hex-chromium exposure. Navy Fleet Readiness Centers, Air Force AFWERX "Flightline of the Future," Army aviation (including a flawless MH-60M tail-rotor inspection with the 160th SOAR(A)), and Lockheed Martin (F-16, C-130, U-2) have all demonstrated GRIT's cross-service impact, extending airframe life and boosting readiness.

Innovation Challenges: Current limitations include reduced efficacy on radar-absorbent/Low Observable coatings (effective depth ~3 mils), lack of intrinsic safety for explosive atmospheres, and the requirement for a 500k-image dataset to train GRIT's next-generation machine-learning module for automated defect recognition. These are active R&D targets, with planned upgrades for enhanced AI detection, HERO certification, and GRIT as a payload for autonomous inspections.

Technical Maturity / Demonstration Results: GRIT is at TRL-9 with 32,000+ inspection hours across Navy, Marine Corps, Air Force, Army, and Coast Guard fleets, and was down-selected by the National Center for Manufacturing Sciences as one of the Top 3 Innovative Sustainment Technologies, reinforcing its cross-service value and transition readiness.

To view a short video demonstration, scan the QR Code

Deployable Offline AI/ML Servers for Zero-Connectivity Environments with Interactive 3D Maintenance

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Problem Statement: DoW maintenance operations often occur in austere, disconnected, or classified environments where internet connectivity is limited or non-existent. In such settings, current digital maintenance systems fail to deliver mission-critical support due to their reliance on cloud access, lack of offline AI functionality, and dependence on static technical documentation. Technicians must frequently rely on outdated paper manuals, tribal knowledge, and trial-and-error troubleshooting. The absence of secure, interactive, and intelligent tools in these environments leads to increased downtime, reduced readiness, and higher sustainment costs across platforms and services.

Description of the Innovation Solution: The Edlore AI-Server is a ruggedized, edge-based computing platform that brings AI-powered maintenance intelligence directly to the point of need, without any requirement for internet or cloud connectivity. Designed to be mounted on mobile carts, toolboxes, or ultralight vehicles (UTVs), the server hosts an interactive 3D viewer, embedded technical manuals, and offline AI capabilities that allow users to search procedures, ask maintenance questions, access animations, and view parts metadata in real time. The system converts legacy tech orders into dynamic procedures with voice-assisted navigation, drag-and-drop editing, and embedded parts ordering. It also includes peer-to-peer synchronization for secure data sharing and records all service interactions, updates, and field-captured inputs such as notes and images. This solution ensures maintainers can access the full suite of technical data, even in communications-denied or cyber-contested environments.

Benefits to the DoW: The Edlore AI-Server significantly improves field-level and depot maintenance capabilities across the Services. It:

- Enables full functionality in offline conditions, supporting distributed operations and continuity of maintenance
- Reduces mean time to repair (MTTR) by delivering AI-driven troubleshooting guidance and interactive 3D models
- Enhances training and knowledge retention with visual, voice-guided, and hands-on procedural content
- Increases security through localized data storage and NIST-compliant architecture
- Fosters cross-platform and cross-OEM standardization by integrating legacy content into a unified platform
- Promotes faster onboarding of new maintainers with intuitive, user-centered interfaces

Innovation Challenges: Development of the Edlore AI-Server required overcoming key challenges, including:

- Delivering advanced AI models that function reliably without cloud access
- Designing intuitive user interfaces for low-distraction, gloved-hand, or voice-only interaction
- Ensuring modular hardware performance while meeting MIL-STD-810H ruggedization and thermal limits
- Synchronizing data securely across units via peer-to-peer protocols
- Integrating diverse OEM technical content and 3D assets into a universal architecture

Technical Maturity / Demonstration Results: The AI-Server platform is currently at TRL-6, with prototypes undergoing evaluation at Air Force sustainment facilities. Demonstrations have validated its ability to function fully offline, host interactive 3D maintenance workflows, and deliver AI-assisted troubleshooting and procedure-building tools. A cart-mounted concept is a continuation of the same project and the UTV-mounted variant as shown in the Graphics, is for a new Marine Corps project. User feedback from initial testing has shown measurable reductions in repair time, increased maintainer confidence, and demand for immediate field deployment. Future iterations will integrate wearable AR interfaces and biometric feedback to further enhance technician effectiveness and safety.

To view a short video demonstration, scan the QR Code

Accelerating Warfighter Readiness in Real-Time: AR-Enabled 3D Digital Damage-Mapping

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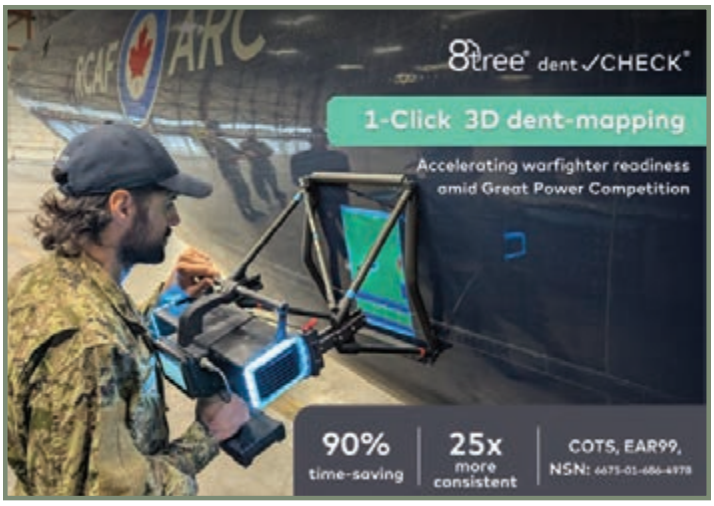

Problem Statement: Airframe structural damage impacts mission capability and availability. Battle damage, hail, foreign object debris, and bird strikes are frequent causes. Traditional inspection methods are subjective, inconsistent, time-consuming, and labor-intensive. This creates sustainment bottlenecks that compromise warfighter safety and readiness.

Description of innovative solution: To support faster recovery, 8tree developed dentCHECK – the world's first and only AR-enabled 3D damage-mapping tool that delivers real-time go/no-go answers. Its innovation rests in combining optical measurement and usability engineering to deliver 25× accuracy, 37× consistency, and 48x time-savings. dentCHECK is a structured light 3D precision scanner packaged as an easy-to-use tool for any skill level, from maintainers to engineers. Unlike traditional general purpose 3D scanners, which generate complex point clouds requiring extensive post-processing, dentCHECK delivers real-time actionable results.

Benefits to the DoW:

- Significant gains in accuracy and consistency that enhance safety
- Real-time go/no-go answers shrink Turn-Around-Time (TaT)
- Ease-of-use fosters multi-capable Airmen in an expeditionary force
- 100% digital workflow eliminates subjectivity and human error; permanent records for future reference
- Proven cost and readiness impact: 302 AW cited dentCHECK-enabled savings of $500K in manpower; aircraft returned to service in weeks, not months
- Cross-service relevance: Applicable to air fleets in any service branch

Innovation Challenges: Military maintenance demands solutions that work seamlessly in a range of environments. dentCHECK was built to operate in a variety of settings – depots, flight-lines and the field. Portability, tether-free operation, integrated AR, instant results, and 1-button operation, combine in a single tool to meet these challenges. Tests in harsh battlefield environments have yet to be conducted.

Technical Maturity/ Demonstration Results: dentCHECK is a TRL-9 COTS tool used by dozens of commercial aviation organizations. In DoW, it is a TRL-6/7 tool with evaluations ongoing. Within Defense, dentCHECK is already used by USAF 89 MXG, RCAF Sqn 435 and several Allied Forces and Defense contractors. Several more DoW units are actively exploring and supporting dentCHECK adoption to improve maintenance Quality and Fleet Readiness, including:

- AFMC/WR-ALC (402nd AMXG/CMXG) — issued memo supporting APFIT FY2026 submission
- NGB/ANG — presenting dentCHECK at WEPTAC 2025 for NGREA funding
- FRCE/NAVAIR/NavalX (Navy)
- USAF MFTO — evaluating for use across sheet-metal shops
- OASD Corrosion Office — guiding RSIP application

Industry case studies, including Aerospace Maintenance Council competitions, confirm dentCHECK's proven performance over traditional methods. Detailed case study available: 8-tree.com/amc_brochure_a5_03-2025/

To view a short video demonstration, scan the QR Code

Machine Learning & Novel Signal Processing for In-Water Inspection of Submarine Hull Coatings

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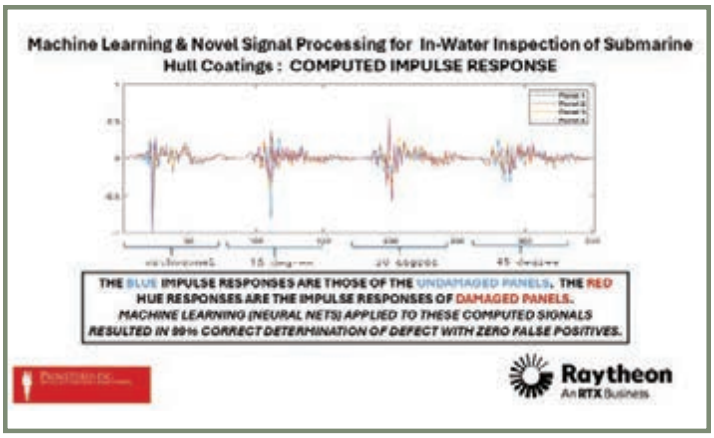

Hull coatings and their maintenance are critical for the submarine force. Here we describe Hardhead, a means to use novel signal processing and machine learning to detect and classify under-coating lamination defects caused by adhesive failure or surface corrosion. The method relies on collecting mid-frequency sonar signals at close range and does not require any contact with the coating. This will reduce the cost and duration of submarine hull coating inspection, a significant factor in overall submarine availability to the fleet. In turn, this will offer important cost savings and risk mitigation for the Navy.

We have adapted methods from previous work classifying elastic material properties from sonar returns in real time to enable the capability to perform in-water submarine hull coating delamination detection. Previously, our team's work for NASA Langley characterized aircraft composites using a data-driven method based on wavenumber images (spatial FFT), and the MIRK (Material Identification Reflectivity Kernel) technology. In parallel, research at NUWC by Dr. A. Hull revealed that the physics of delaminated coatings underwater yielded a scattering pattern strongly differentiated from fully-bonded coatings, motivating our research into acoustic methods for detection of delamination. Importantly, and distinctly from many NDE methods, Hardhead uses signals scattered from the coating surface; we do not need to 'penetrate' the coating with the sonar. Our method uses a combination of signal processing and physical feature generation and a variety of AI/ML algorithms to classify coating panels as defective or fully bonded.

We have validated the Hardhead classifier using two data sets: one set of panels manufactured by NAVSEA and tested at NUWC's ATF facility, and another manufactured by Collins Goodrich and tested at NUWC's Dodge Pond. On each panel, sites with varying sizes (zero to large) of delamination were created.

In the test tank, waveforms and angles of incidence were varied to generate the test data sets of several thousand independent measurements. Our analysis showed that the delaminated areas affected the scattered acoustic signal, and that this effect is reliably detected and classified, even in the presence of bio-fouling, both under the coating and under the epoxy paint layer. We achieved >99% accuracy in discriminating pristine panels from those where delamination was present.

We are conducting initial studies to integrate Hardhead onto ROV and UUV inspection platforms. This engineering work, validation with in-service Navy materials, and integration with submarine maintenance workflows, will be part of future work.

To view a short video demonstration, scan the QR Code

FIRstView – Enhanced Real-Time Thermography for Field NDI

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Problem Statement: Nondestructive Inspection (NDI) at the field level is the number one readiness degrader for DoW fixed and rotary wing aircraft*. Several critical inspections are manual, imprecise or time-consuming. Thermographic NDI (TNDI) is an effective inspection tool at the depot level. However, the cost, size, power consumption and complexity of current TNDI systems make them impractical for rapid deployment in field applications where electrical power may not be available or space constraints limit access to the inspection area. Although simple systems may address cost or footprint requirements, they lack sufficient detection sensitivity and provide subjective results that rely heavily on interpretation by the inspector. Existing battery-operated systems are unable to provide sufficient excitation for reliable NDI over the duration of an inspection.

A compact, battery-operated TNDI system that simplifies interpretation for the operator is required to address DoW field inspection requirements.

Our Solution: FirstView is a handheld, battery operated TNDI system that provides results to the inspector in real-time. The power unit can be worn as a backpack or mounted in a small roll-along case, and the lightweight imaging head (3 lbs) reduces operator fatigue common to COTS systems. Signal processing enhances subsurface defect indications and compensates for operator jitter and surface emissivity variations.

Benefits to the DoW:

- Improved safety and airworthiness – FirstView's small footprint and self-contained configuration will allow replacement of imprecise coin-tap inspection with full-field thermography in areas of the aircraft or ships where physical access is limited (e.g. ducts, bladders, bulkheads) or electrical power is not available
- Rapid response to unscheduled maintenance events – Portable system can be transported as carry-on baggage or stowed as onboard kit for emergency inspections
- Cost savings - Reduced inspection man-hours and time-on-ground as a result of continuous scanning and on-the-spot processing and analysis
- Lower investment cost – The use of COTS components and low-cost excitation and IR cameras make FirstView significantly less expensive than existing thermography solutions.

Innovation Challenges: Configuration for new inspection tasks requires coordination of scan rate and sensor-to-surface distance with material properties of the part. This procedure should be automated and made transparent to the operator.

Technical Maturity/Demonstration Results: FirstView has been successfully demonstrated on DoW samples in simulated field environments with composite impact damage, trapped water in honeycomb sandwich structures and corrosion under paint, using the scanning and spotlight configurations. It is currently TRL 6 and expected to be TRL 7 by Q4 2025.

* Maintenance and Availability Data Warehouse: A Cross-Cutting Case Study OSD71C1/Jul 2017. p3-7

To view a short video demonstration, scan the QR Code

InfrastructureGPT: A Scalable Multimodal Foundation Model for Intelligent Infrastructure Maintenance

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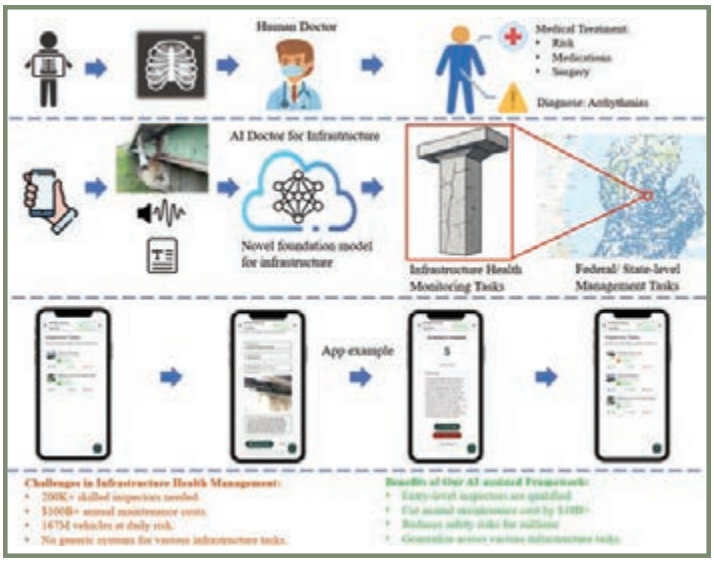

Problem Statement: Maintaining and preserving critical infrastructure, e.g., bridges, pipelines, and railways, is an urgent national challenge due to: (1) High-skill labor needs: over 200K experienced inspectors are required, (2) Aging assets: 45% of U.S. bridges and more than half of pipelines are over 50 years old, and (3) High costs: annual capital expenditures exceed $100B. Current inspection and management methods rely on custom, single-purpose models that fall short because they lack: (1) Scalability: each new task requires a separate model, raising costs and complexity, (2) Adaptability: novel failure types require retraining or new models, adding significant cost in data collection and labeling, (3) Policy alignment: narrow task-specific metrics fail to meet federal/state multi-scale decision-making needs, and (4) Efficiency: dependence on large labeled datasets makes deployment costly (>$100K per task) and slow (6+ months). These limitations prolong repair cycles, increase manpower needs, drive up costs, and reduce mission readiness.

Innovation Solution: InfrastructureGPT is an "AI doctor" system for infrastructure powered by foundation models. This scalable, adaptable, and multimodal framework generalizes across real-world tasks—from system-level monitoring (e.g., crack detection, remaining life, serviceability indices) to state/federal-level management (e.g., backlog reduction, cost estimation)—without retraining from scratch. Unlike conventional single-task AI, InfrastructureGPT uses transfer learning to support multiple tasks simultaneously and integrates heterogeneous data sources.

Benefits to the DoW: InfrastructureGPT can reduce maintenance costs by cutting reliance on high-skill inspections and minimizing downtime due to closures. It improves condition assessment accuracy and extends the lifespan of infrastructure. By integrating the emerging AI foundation model design with infrastructure maintenance expertise, it offers a scalable and commercially viable solution for infrastructure health monitoring and management, supporting multiple real-world tasks while reducing the rehabilitation backlog. If 10% of the poor infrastructure is rehabilitated through reinforcement instead of replacement because of discrete failures, $20B+ in capital expenditure can be saved.

Innovation Challenges: Key challenges include workflow integration, user training, and trust. To address this, we incorporate a human-in-the-loop approach for oversight and transparency. Cost is also a barrier, with >$500K needed for initial model training and comparable annual operating costs. Adaptive training, modular software, and phased deployment will mitigate adoption costs and risks.

Demonstration Results: We developed a mobile app and cloud server that allow entry-level inspectors to capture field data with smartphones. The system converts inputs into interpretable outputs such as condition ratings, crack density, and width, aligned with policy frameworks.

To view a short video demonstration, scan the QR Code

Satori XR – AI-Powered Augmented Reality Knowledge Base for Military Efficiency

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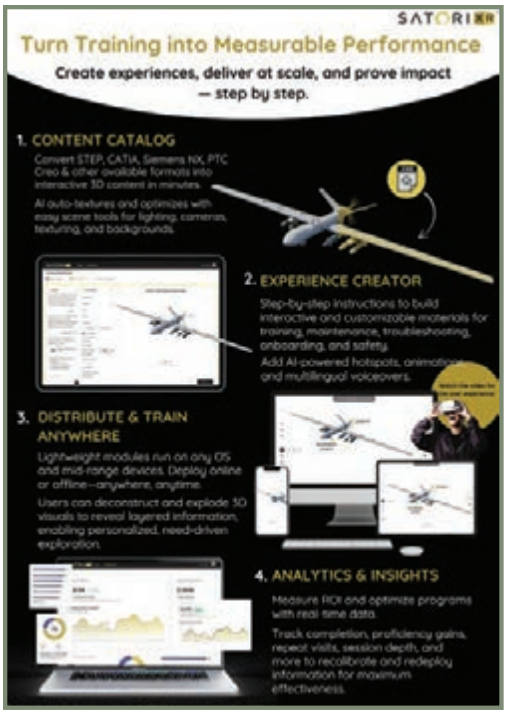

Defense assets are becoming increasingly sophisticated. Traditional maintenance tools like 2D manuals, static diagrams, and lengthy training programs fail to keep pace with system complexity and evolving configurations. These legacy approaches lead to longer maintenance cycles, higher costs, reduced operational readiness and may lead to high-impact critical errors.

Our product provides the DoW a secure, intelligent, and field-deployable solution to digitize maintenance expertise, ensure repeatability, and accelerate decision-making across platforms. Satori XR's Augmented Reality (AR) Guidance System acts as a real-time, visual co-pilot, guiding technicians through step-by-step inspection workflows using AR overlays projected on the physical asset thus improving understanding, decision-making, and procedural accuracy without any physical disassembly.

Our vision modules automatically detect components, verify presence and condition, and read serial numbers via OCR—even on curved, low-contrast, or partially obscured surfaces. Each action, image, and annotation is captured into a living knowledge base that links to maintenance history and supports predictive analytics. The interface adapts dynamically to user behavior, providing just-in-time visual cues to disseminate information.

Designed for secure deployment on DoW-approved on-premises or edge environments, it integrates with existing Engineering systems/PLM/ERP/CMMS/LMS, etc. to pull content from or to push content into. Satori XRs easy 4-step process (documented on the video) is as follows:

- Load your complex design files, brochures or specs into the application - Satori's "no technical expertise" required AI engine identifies and generates the 3D asset.
- Jump-start the "experience" creation with customizable workflows. Set-up "Hotspots" with voiceovers, animations, multilingual narration and descriptions.
- Distribute the content with secure access control using iOS, Android, PC, Web, VR headsets.
- React, Refine and Re-deploy using real-time analytics.

Key Benefits to the DoW are:

- Increased readiness: Reduces inspection time by 40%, improving asset availability.
- Error-proof operations: Enforces standardization and minimizes human error.
- Knowledge capture: Preserves expert insights through guided AR workflows.
- Data auditability: Creates a visual digital thread of every inspection for performance tracking and a continuous feedback loop for optimization.
- Scalability: Configurable for air, land or naval systems with the same process.

Satori XR aligns with the defense sector's push toward digital transformation, and predictive maintenance. The system has been validated in aerospace engine inspection trials to achieve >95% accuracy in component detection, >90% OCR success for serial number recognition and 30–40% reduction in inspection cycle time. In an environment where readiness and precision are mission-critical, Satori XR transforms complexity into clarity — anywhere, anytime.

To view a short video demonstration, scan the QR Code

DADTMA – Distributed Acquisition Digital Twin Maintenance Architecture

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There is an urgent need to digitize maintenance records for aging fleets of defense assets. The current process is inefficient, requiring time-intensive human-performed inspections and data collection before, during, and after maintenance tasks. The process frequently requires tedious and error-prone record keeping with pen and paper before transcription to a computer for access by other teams or departments.

FTL's DADTMA (Distributed Acquisition Digital Twin Maintenance Architecture) is a digital twin knowledge acquisition system that reduces manpower-intensive engineering costs associated with repair and maintenance inspections. DADTMA accelerates and automates inspection data collection, streamlines data sharing, and provides tools for predicting maintenance requirements. DADTMA revolutionizes maintenance and inspection decision making via a secure graph database utilizing big data mining and AI on a GovCloud web app that can be quickly accessible across departments, DoW components, or with outside manufacturers.

To enable the Navy and other DoW components to adapt to the increasing complexity of aircraft maintenance and quality assurance processes, DADTMA enables direct data-capture via USB digital tools, scanning, and modeling technologies to capture and organize digital maintenance data and automate workflow management. Of paramount importance is validation that all parts and assemblies are free of anomalies which could cause failures and increased life-cycle costs.

The optimal transition path for the DADTMA app would be for its continued use as FRC-SE with adoption across all FRCs and possibly Navy shipyards. DADTMA is data-agnostic and can be used to save maintenance time and manpower for any high value asset. FTL's DADTMA has been developed with direct input from aerospace manufacturers Lockheed Martin, Sikorsky, and Northrop Grumman, and ship service providers like Fairbanks Morse Defense. Applications include the U.S. Department of War and civilian aerospace and ship-building and maintenance markets and large-scale manufacturing, such as for heavy machinery, medical devices, and silicon chips. Northrop Grumman anticipates a 10% time-reduction in inspections and yields $10M savings in lifecycle cots for a single product.

The biggest challenge facing DADTMA is gaining DoW-wide ATO approval. To that end, FTL is working with 3rd party providers for quick implementation once the technology is adopted by an end user.

Navy's aircraft sustainment depots such as FRCSE, Jacksonville and FRCE, Cherry Point have expressed an immediate need for a comprehensive Maintenance Sustainment Tool. DADTMA has been DADMS registered and is currently undergoing testing and evaluating via time study trials on actual maintenance events. FTL Labs Corporation expects FRCSE to become the first DADTMA adopters and is excited to get DADTMA into the hands of other maintenance depots as well.

To view a short video demonstration, scan the QR Code

Orion: A Collaborative Robot Inspection System for Advanced Non-Destructive Inspection

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Problem Statement: The Department of War (DoW) faces significant maintenance challenges with its complex, high-value assets. Current non-destructive inspection (NDI) methods are often labor-intensive and time-consuming, requiring specialized technicians and leading to increased cycle times and reduced asset availability. Inspecting novel materials and complex geometries pushes the limits of conventional techniques, creating a critical need for enhanced inspection solutions.

Description of the Innovation Solution: Orion is a collaborative robot (cobot) inspection system designed to improve NDI efficiency and effectiveness. By integrating bond testing and single-element ultrasonic testing (eddy current planned for Q1 2026), Orion provides multi-modal inspection capability. Its core innovation is a proprietary, CAD-free path planning engine that uses a depth camera and custom algorithms to create inspection plans in minutes, eliminating the need for robotic programmers or coding. This allows Orion to rapidly adapt to high-mix maintenance environments. The system captures high-resolution data (down to 0.02 inches) at speeds up to 40 in/s, recording it in a true 3D, open-source HDF5 format that ensures data ownership and facilitates custom analysis.

Benefits to the DoW: Orion enhances maintenance readiness and reduces costs. Its rapid, automated planning dramatically shortens inspection cycle times. The system's precision and high-resolution data collection improves the probability of detection for critical defects, enhancing safety and asset integrity. Automating data collection reduces the need for specialized technicians on routine inspections, freeing them for complex data analysis and decision-making. The open-source data format supports the DoW's goal of data ownership and interoperability, enabling predictive maintenance and digital twin integration.

Innovation Challenges: The primary challenge was creating a robust, CAD-free path planning system for complex surfaces without prior geometric data. This required developing novel algorithms to process data from depth cameras. Future work will focus on expanding inspection techniques and developing additional analysis tools.

Technical Maturity/ Demonstration Results: Orion is technically mature and has been adopted for use by a traditional DoW rotorcraft supplier and a space craft manufacturer. Orion has been successfully demonstrated in relevant applications, detecting disbonds in composite sandwich structures, inspecting 3D-printed titanium structures, and detecting core crush and disbonds in UH-60 blades at an Army repair facility. These demonstrations validate its performance and ability to address pressing DoW maintenance needs. Orion has been prototyped, tested, and refined, confirming deployment feasibility in operational maintenance depots.

To view a short video demonstration, scan the QR Code

Collaborative Robot Integrated Nondestructive Inspection

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Problem Statement: Fleet Readiness Centers play a critical role in sustaining USN aviation readiness by maintaining, repairing, and overhauling naval aircraft and components. Automation and human augmentation streamline these processes, remove workers from hazardous environments, improve productivity, reduce turnaround, and enhance overall readiness. One area where automation/augmentation can reduce turnaround and improve readiness and outcomes is aircraft nondestructive inspection (NDI).

Innovative Solution: NDI of USN aircraft is required to identify hidden corrosion, cracking, delaminations, and other defects within aerostructures before requiring large scale repairs or cause in-flight failures with the loss of the aircraft and potentially the crew. Inspectors perform a taxing combination of physical/mental activities during an 8-hour shift of on-aircraft inspections. Augmenting inspectors with automation (such as collaborative robots, or cobots) that combine the best of a machine (controlled, highly repeatable motions, consistently displaying information in a controlled matter) and a human (interpreting highly complex and dynamic datasets) to perform the proper movements and orientations of an inspection to move sensors over inspection targets offer an area for significant improvement. Integrated machine vision permits the system to be moved to an inspection target, identify its location, orient itself to the inspection surface, and automatically perform the inspection regardless of the NDI modality. The inspector is then free to ensure the technique is performed properly and review inspection data in real time. As required, inspectors can control the cobot via a game console controller or manually in human-controller mode to perform checks on inspection sites.

Benefits to the Military: NDI integrated Cobots allow USN inspectors to realize the benefits of this technology without modifying existing inspection procedures. Results from aircraft have demonstrated that a cobot/inspector pair can achieve and surpass present probability of detection values (permitting a reduction in required system downtime for inspections), ensure 100% probability of inspection, enable spatial tagging and mapping of NDI data to aircraft models, and reduce physical stress on inspectors.

Technology Maturity: TRI Austin's solution contains COTS components integrated to produce solutions for different inspection types. It is highly versatile and can be adapted to any NDI modality (eddy current, micro/millimeter wave, ultrasonic, radiographic, and thermography). The system is most evolved for ultrasonic inspections (TRL 7 via on-aircraft demonstration of a T-38) and then for eddy current inspections (TRL 5 for high fidelity testing of integrated laboratory components). Further work will further evolve ultrasonic capabilities and multiple different eddy current capabilities (bolt-hole, edge, and surface inspections) in preparation for commercialization.

To view a short video demonstration, scan the QR Code

RepAR: AR Guided Fastener Hole Repair & Validation with Point of Action Data Capture

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Problem Statement: Aircraft sustainment teams face three compounding problems: (1) the need for extensive data collection and communication of inspection results, engineering evaluations, and repair actions—each requiring a wide range of skill sets and expertise associated with fastener hole repair, with some structures engineers spending upward of 90% of their time on fastener hole repair; (2) an accelerating shortage of expert maintainers; and (3) limited, auditable evidence needed to justify life-extension credit. The result is elevated MRO labor cost, longer turnaround time, and increased risk to fleet readiness.

Innovation Description: PartWorks' RepĀR repair system integrates structural fastener hole repair data capture, augmented reality (AR) work guidance, and AI-powered computer vision with handheld smart tooling and engineered hardware to standardize airframe hole repair, fastener installation, and cold expansion validation. The computer vision system, guided by the mechanic's designated AOI, identifies holes, assigns coordinates, and records before/after conditions. The system can capture data from any connected tool and user input at time of operation with data logging. Critically, RepĀR updates the digital twin and captures measurements at the "point of action," creating traceable evidence for airworthiness and A/C life extension credit.

Benefits to DoW: RepĀR directly improves sustainment efficiency by capturing verified data at the point of action—eliminating delays, transcription errors, and disconnected record-keeping. Mechanics can complete inspections, repairs, and installations while automatically generating structured digital records suitable for engineering review, airworthiness documentation, and digital-twin synchronization. This reduces the time engineers spend re-creating or validating field data, shortens repair cycles, and increases the repeatability of fastener hole repairs. By combining AR guidance, AI-based vision analytics, and data-enabled tools, RepĀR supports measurable improvement in throughput, sustainment cost, and higher confidence in overall sustainment processes.

Innovation Challenges: Near term focus areas include qualification data and validation of software and hardware interoperability; cross service interoperability of digital records; NDAA supply chain and cybersecurity compliance for AR devices and data workflows; and validating repeatability across varied depot/flightline environments.

Technical Maturity / Demonstration Results: AR guidance and automated hole identification/measurement has been demonstrated on representative structures; the system architecture is designed for COTS tablets, laptop as well current VR goggles and future VR glasses to provide hands free environment with minimal interruption to the workflow. System has been demonstrated to multiple military and commercial entities.

To view a short video demonstration, scan the QR Code

FLX BOT: Rapid Field-Deployable Robotic System for Confined Space Inspection, Diagnostics, and Repair

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Problem Statement: Maintainers across the DoW face recurring challenges when inspecting/repairing confined and hazardous spaces such as aircraft fuel tanks, ground vehicle engine compartments, and shipboard structures. These often require confined-space entry, teardowns, or reliance on specialized teams, which increase cycle time, risk, and reduce readiness. At the tactical edge, these delays can interfere with strategic tempo or force equipment abandonment. At depots, they contribute to growing inspection backlogs and parts procurement delays, further impacting fleet availability.

Solution: FLX BOT is a handheld robot designed for rapid deployment by operators in the field. It delivers "snake-like" maneuverability through modular links that articulate with 360° rotation and linear extension. At 1" in diameter, it can access tight spaces to perform non-destructive inspections (NDI) and maintenance without confined-space entry or teardowns. Its patented modular design allows rapid reconfiguration in length and function, while swappable end effectors (including cameras, sensors, and applicators) enable users to both detect faults and act in real time. Operated via handheld control or extension pole, the system requires minimal training and integrates into existing tool kits.

Benefits: Results in Navy pilots include 90% reductions in inspection times vs. current MRC methods, and successful corrosion mapping in hard-to-reach locations. FLX BOT units deployed at Ingalls Shipbuilding saved significant time/costs multiple times a month vs. traditional methods to answer mission critical questions in hard-to-access areas. In the first day of deployment alone, the FLX BOT saved multiple days of scaffolding moving/setup by answering a critical inspection question. During Navy Battlefield Damage Assessment exercises, FLX BOT was able to inspect where other tech could not, ensuring more rapid diagnoses during high pressure situations. During a transit pilot, the robot increased worker efficiency by 150% during a station inspection.

Challenges: Key challenges include scaling manufacturing for lower-cost procurement, integrating AI-enabled condition-based maintenance, meeting operation requirements for explosion-proof environments and ability to be submerged. Ongoing pilots are addressing integration with platforms and data-sharing to ensure smooth transition into existing maintenance ecosystems.

Maturity: FLX BOT is at TRL 6, with evaluation units deployed in paid pilots with the Navy and Air Force. Three systems are deployed with Ingalls Shipbuilding to improve QA efforts while lowering costs and increasing worker safety and productivity. Patents in place protect the architecture, securing FLX BOT's unique combination of precision, compact form factor, and dexterity. The system is available today for demos, with a clear roadmap to TRL 9 through current partnerships.

To view a short video demonstration, scan the QR Code

Automatic Inspections of Structures and Assets

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Shipyard and fleet sustainment activities depend on weld integrity across hulls, piping, and pressure systems. Today, inspection workflows are slow, expensive, and reactive, relying on radiography, dye penetrant, or ultrasonic testing that requires heavy equipment, specialized personnel, and post-process evaluation. These introduce delays that hinder readiness, increase rework, and risk undetected defects. The Navy requires a field-ready solution that ensures weld reliability, without relying on distant labs or scarce QA staff.

The Real-Time Weld Inspection Tool (RT-WIT, "rit-wit") delivers that capability. RT-WIT is a helmet-mounted, battery-powered inspection system that combines ultraviolet-visible spectrometry, augmented reality overlays, and onboard AI processing to identify weld defects as they occur. By analyzing the weld arc, RT-WIT detects porosity, contamination, gas coverage issues, and heat imbalance in milliseconds. Corrective cues are displayed inside the welder's helmet, enabling both seasoned shipfitters and junior maintainers to correct problems immediately instead of after job "completion." Unlike conventional systems, RT-WIT requires no internet and is highly portable, making it equally effective inside a submarine, at sea, or at a forward expeditionary site.

For the Navy, the benefits are immediate: reduced rework and scrap, faster turnaround, and higher first-pass yield on pressure-critical welds. RT-WIT strengthens hull integrity, reduces backlog at public and private shipyards, and enables safe, certifiable repairs in distributed maritime operations. The tool embeds expertise into standard PPE, helping less-experienced personnel achieve certified results while automatically generating digital records for compliance and traceability.

Challenges remain in scaling the spectral library across diverse naval alloys and weld geometries, and in hardening optics and electronics for shipyard vibration, dust, and EMI. User interface design must continue to balance actionable alerts with low cognitive load. These risks are being addressed through iterative trials, ruggedization, and ongoing feedback from end users.

RT-WIT is currently at TRL-6. Laboratory testing and trials with naval primes and commercial yards have validated defect detection accuracy above 99% in hull and piping applications. Demonstrations confirm portability, battery endurance, and operator acceptance in real-world conditions. It earned international recognition through NATO's DIANA accelerator and industry competitions, and development is backed by over $4.7 million in private and public investment. Upcoming demonstrations will focus on naval shipyards and fleet sustainment units, positioning RT-WIT for rapid integration into existing Navy maintenance workflows.

By moving quality assurance from after-the-fact inspection to real-time reliability assurance, RT-WIT offers the Navy a direct path to safer ships, faster repairs, and stronger fleet readiness.

To view a short video demonstration, scan the QR Code

Virtual Instrumentation for Enhanced Torpedo Repair

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Problem Statement: Outdated and costly testing hardware severely impacts the Navy's undersea weapons test and repair capabilities, creating operational risks. A 2021 Undersea Weapons Depot study led to a significant research investment in a virtual instrumentation testing system. This new system has improved efficiency, reduced downtime, enhanced test accuracy, and expedited weapon deliveries, setting new standards in testing technology and benefiting the warfighter extensively.

Description of the Innovation Solution: The Virtual Instrumentation project revolutionizes test and repair processes by leveraging software (primarily written in LabVIEW) to command, control, and configure physical instrumentation hardware. This system offers several key advantages:

- It uses a unified system to control all instruments, saving time and effort compared to separate, custom setups with complex programming.
- Its flexible interface adapts easily to different test needs, allowing for seamless interoperability and rapid development or replacement of components.
- This unique, adaptable approach enables dynamic reconfiguration of testing hardware, making it possible to conduct multiple tests using the same setup.

The rapid exploration and application of these solutions were greatly facilitated by leveraging the NUWC Keyport Innovation Center (KIC) test hardware and software contracts with National Instruments, as well as other government and academic partnerships.

Imagine you're on a boat and a failure occurs; having a single test stand capable of diagnosing and addressing all relevant failures is the vision this system strives to achieve, moving towards greater efficiency and reliability.

Benefits to the DoW: Implementing the virtual instrumentation system is projected to save the Navy at least $1 million annually while boosting undersea weapon inventory. This solution eliminates the need for high-maintenance test equipment, reducing repair turnaround times from several months to under one month. NUWC Keyport has expanded this capability to submarine platform repairs, enhancing operational readiness across the Navy.

Innovation Challenges:

- Culture Change: Overcame resistance to traditional designs and increased awareness of virtual instrumentation.
- Proving Concept: Established credibility through initial successes and secured funding.
- Stakeholder Buy-In: Secured support and trained personnel for the new system.
- Technical Integration: Ensured compatibility with existing infrastructure, addressing data fidelity and scalability.

Technical Maturity and Results:

- Achieved rapid fault identification, enhanced diagnostics, reduced maintenance times, and significant cost savings.
- Validated through prototypes for torpedoes and submarine components, demonstrating scalability and adaptability, reaching TRL 7.

Current Status: As of FY26, delivering advanced capabilities to Fleet's Regional Maintenance Centers, depots, and technical community, achieving TRL 8/9.

To view a short video demonstration, scan the QR Code

NESAR Distance Support Kit (DSK)

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Every day, hundreds of Subject Matter Experts (SMEs) travel globally to troubleshoot various complex systems and components, addressing mission-critical deficiencies. However, with increasing demand and limited SMEs, technical resources are overextended and disrupted by emergent work. Modernizing distance support is essential to maintain operational readiness and streamline assistance where it is needed most.

Deployable video telepresence provides the solution, offering instant connectivity in expeditionary environments where traditional methods falter, specifically in difficult locations inside the skin of a ship like shaft-alley and machinery spaces. This approach virtually assembles SMEs from global locations, enabling faster, more cost-effective solutions while freeing up personnel for other critical global events.

NAVSEA 05T's Navy Expeditionary Sustainment and Repair (NESAR) team developed the Distance Support Kit (DSK) that brings comprehensive connectivity anywhere within a ship, between ships, and from ship to shore.

Most recently, this capability was critical following a fire aboard an active Navy surface ship. Within 72 hours of notification, a single SME was deployed with the DSK to Okinawa, Japan, enabling live, high-definition walkthroughs of affected spaces. This allowed offsite personnel, including leaders in Washington D.C., to directly assess the damage, accelerating recovery by a full week. The system also previously proved its value by simultaneously connecting 66 participants across 10 global locations for a complex ship damage assessment.

The DSK integrates three proven technologies. Dedicated satellite broadband for the DoW ensures high-speed, encrypted connections with priority processing on the Starlink network. Secured wireless radios create high-throughput data mesh networks that penetrate signal-constrained areas on ships and also extend miles for long range needs. Finally, dedicated telepresence apps on DoW tablets enable high-definition global communications with advanced tools such as document sharing, step-by-step instructions, and on-screen annotations.

Designed for rapid deployment, the DSK can be set up in 15 minutes for immediate reach-back. As a man-portable system in airline-compliant cases, a single person can transport it anywhere, and it's compact nature also allows easy storage whether shipboard or in small compartments.

Growing use of the DSK is driving efforts to scale availability to meet the DoW's expanding needs as technical teams work to provide real-time support to their deployed assets. As demand for rapid, reliable support in forward and communication-constrained environments increases, the DSK stands out as the critical solution. By enabling real-time assistance, reducing downtime, and minimizing people in conflict zones, this system plays a key role in mission readiness and global operational superiority for U.S. military forces.

To view a short video demonstration, scan the QR Code

NDT Tracker: Automating UT Grid Inspections to Accelerate Sustainment Readiness and Strengthen Logistics Deterrence

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Cybernet's Non-destructive Inspection (NDT) Tracker (https://tracker.cybernet.com) in use at Tinker AFB

Problem Statement: In an era of global competition and contested logistics, ultrasonic (UT) grid inspections essential for aircraft sustainment at Maintenance, Repair, and Overhaul (MRO) facilities remain a major bottleneck to materiel availability. These slow, manual processes map corrosion and verify blended-area thickness using hand-drawn 0.25-0.5" grids, requiring two coordinated inspectors for readings and recording. Numerical results lack visual context, relying on imprecise sketches that cause miscommunication, re-inspections, and delays. This inefficiency erodes warfighter readiness, inflates costs, and constrains expeditionary sustainment as a key logistics deterrent.

Solution: Developed by the U.S. Air Force and Cybernet Systems Corporation, the NDT Tracker is a camera-based, mobile tool that automates UT grid mapping and recording. Patent-pending AutoClick Combo-Filtering enables automated thickness selection and visual data fusion, cutting labor by 2 to 1 while boosting speed up to 10x (from ~20 to 2 seconds/cell). Real-time, color-mapped C-Scan overlays correlate UT data directly to the inspection area, eliminating ambiguity and rework. The result: faster, higher-quality sustainment decisions and throughput across both organic and industrial partners.

Benefits to the DoW Sustainment Enterprise: The Tracker boosts readiness and industrial base resilience by accelerating materiel availability and expeditionary sustainment at best cost:

- Enhanced Efficiency: Streamlines NDT inspections, reducing cycle time and labor to increase aircraft availability across depots and field units.
- Improved Training & Coverage: Real-time visual feedback elevates inspector proficiency and Probability of Inspection (POI), vital for high-tempo sustainment in austere environments.
- Superior Communication & Risk Reduction: Digital PDF/Excel outputs with intuitive color maps prevent manual errors, ensuring data continuity under pressure.

Innovation Challenges Overcome:

- Expeditionary Portability: Lightweight (28 lb) system deployable from a rolling case in 5-10 minutes delivers a rugged, intuitive tool for field use.
- Balanced Automation: Preserves inspector judgment with accountable speed and precision.
- Transition Readiness: Overcame adoption barriers via Air Force depot validation, bridging R&D to scalable field deployment.

Technical Maturity & Cross-Service Applicability: Now deployed at Tinker and Robins AFBs, with adoption by global MROs (Aeroman, ST Engineering) confirming reliability and ROI. Boeing, Airbus, and Gulfstream are also pursuing integration, demonstrating scalability to Air Force, Navy, Army, Marine Corps, Space Force, and DLA platforms. Winner of the 2025 CTMA Technology Award, 2024 A4A/SAE International NDT Innovation Award, and 2024 ASNT Cool New Ideas Award, the NDT Tracker modernizes UT gridding to fortify sustainment agility, showing any adversary that the U.S. can sustain the fight, anywhere, anytime.

To view a short video demonstration, scan the QR Code

LC Comm Cord Tester

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Multi-platform Comm cord tester currently works with C-130s, V-22 across 3 bases. Development is in work for U-28, H-1, HH-60, C-17. Expansion to all airframes is possible.

This tester is capable of testing any aircraft comm cord and the end goal is to have this tester as the universal standard for comm cord testing. Testing of cords with this takes less than 2 minutes, and with adapter cables, we could ensure the capability across the DoW's fleet, with potential for allied nations and commercial use. Some units have their own locally manufactured tester, but from what I've found, a lot of the testers just test what the maintainer thinks they need, and not everything they need. We either use the engineering drawing or when they aren't available we reverse engineer the cords, and test all functions, not just the ones that the maintainer uses. This coupled with a periodic inspection on the comm cords on the aircraft could enable repair and prevent bad cables delaying pre-flight inspections.

To view a short video demonstration, scan the QR Code

Method for Use of Self-Locking Fasteners on Aluminum

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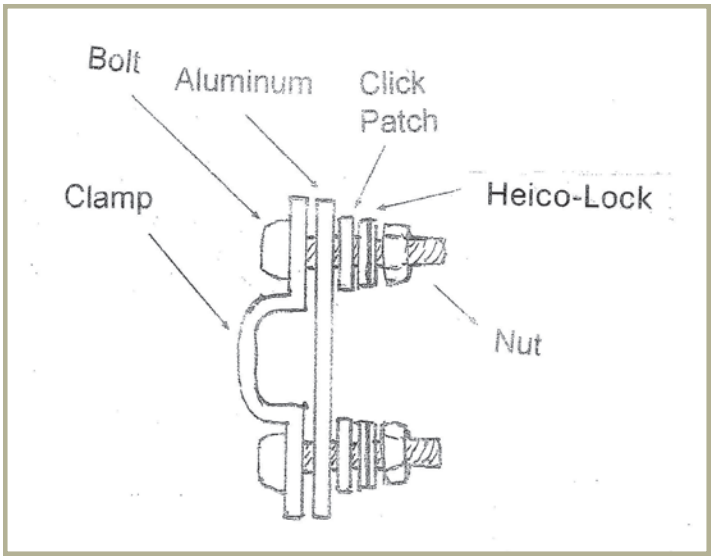
757-996-0479



Problem Statement: Securing fasteners on aircraft structures are limited to a limited number of alternatives; safety wire, safety cable, and cotter pins. Not used are nylon insert nuts, distended thread nuts, to their inability to address vibration. Heico-Lock wedge locking washers are not considered due to the damage that they would impart to aluminum which would result in the potential for generation of stress cracks in the aluminum.

Proposed Innovative Solution: The solution involves the marriage of two existing technologies; the Enfasco "Click Patch" with the Heico-Lock wedge locking washers. The "Click Patch" is accepted technology as is the adhesive used to bond it to aluminum. The modification to the "Click Patch" would be adding a hole in the center of the patch through which a threaded fastener would pass. The modified patch would be bonded to the aluminum, a removable plug would hold the patch in place until the adhesive sets. The Heico-Lock washer rests on the patch which would absorb the indentations from the Heico-Lock washer and provide a secure method of bolt locking.

Benefits to the DoW: This solution would provide a alternative solution to bolt securing in areas of the airframe where space is limited or use of lock wire or locking cable is difficult. The solution is also re-usable and eliminates the potential of FOD hazards from safety wire pieces from either the installation or removal process.

Innovation Challenges: Testing, two steps – Proof of concept followed by intense vibration testing.

Proof of Concept: Fabricate a bolted joint with a section of aluminum drilled to accept a ¼" and a ¾" stainless steel bolt, install and bond two patches – one for each bolt size. Install one bolt of each size with a wedge locking washer in contact with the patch, torque to a standard torque for the bolt size. Disassemble and examine the aluminum for damage. If no damage is observed, proceed to vibration testing.

Intense vibration testing: Assemble several bolted joints that simulate bolted joints as they might be used on an airframe. Conduct vibration testing per DIN 65151, DIN 25201-4, or NASM 1312-7.

Technical Maturity/Demonstration Results: This has not been accomplished as there is test plan and funding required. Additionally, there are other configurations to be looked at to include bonding the wedge locking washers to the patch.

To view a short video demonstration, scan the QR Code

E-Drill: Precision Fastener Removal for F-15 Readiness and DoW-Wide Impact

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Problem Statement: USAF F-15 depot maintenance faces critical challenges during wing and structural teardowns, where traditional drilling to remove high-strength fasteners (e.g., titanium, nickel alloys) frequently damages holes. These mishaps cause costly repairs, extend aircraft downtime by days, increase foreign object debris (FOD) risks, and demand intensive technician effort, leading to repetitive strain injuries. In high-tempo operations or contested environments, these delays jeopardize aircraft readiness, inflate sustainment costs, and strain limited depot resources, undermining mission agility, and operational effectiveness.

Description of the Innovation Solution: The E-Drill is a patented, hand-held electro-discharge machining (EDM) tool from Perfect Point EDM, that radically transforms fastener removal. It employs spark erosion with a high-flow water bath for cooling and debris flushing, cutting through fastener heads or tails in seconds. User-friendly fixtures ensure precise alignment, preventing structural damage. Compact, portable, and requiring no specialized infrastructure, the E-Drill is optimized for F-15 depot and field maintenance, enabling rapid, damage-free operations in diverse environments.

Benefits to the DoW: Authorized for limited use on F-15 wings in non-critical areas, the E-Drill delivered immediate impact: reducing fastener removal time by 90% (seconds vs. minutes), nearly eliminating hole damage, minimizing FOD risks, and easing technician physical strain, enhancing safety and morale. In F-15 depot trials, it reduced man-hours and repair costs, saving an estimated $1M annually for a single depot. Scalable across DoW sustainment, with millions of fasteners removed daily across platforms like B-52, B-1, and F-18, the E-Drill could revolutionize this overlooked process, potentially saving $MM yearly enterprise-wide by boosting readiness, cutting downtime, and reducing costs. Its agility supports DoW's push for efficient, resilient sustainment in contested logistics scenarios.

Innovation Challenges: Challenges include ensuring precise alignment to avoid minor EDM marks (mitigated by enhanced fixtures and streamlined training protocols) and integrating the E-Drill into existing maintenance workflows. Further testing and analysis is required for adoption of the technology on fatigue critical structure.

Technical Maturity/Demonstration Results: TRL-9: The E-Drill is fully commercialized and proven in F-15 depot operations. Trials demonstrated 90%-time savings per fastener, meaningfully reduced instances of damage, and substantial cost reductions. The USAF F-15 program is deploying 10 E-Drill systems in 2025, establishing benchmarks for DoW-wide adoption.

To view a short video demonstration, scan the QR Code

AirBoss' Enhanced Durability Track Pads for Bradley Fighting Vehicles: A Cost-Effective Solution for Improved Readiness

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Problem Statement: The Bradley Fighting Vehicle (BFV) is a critical combat platform in the United States Army, yet readiness is constrained by premature wear and limited-service life of current track pads. Although specified to last 1,500 miles, pads often fail sooner under operational conditions. Harsh environments—desert heat, abrasive sand, and extended road marches—accelerate degradation and pad separation. These early failures drive frequent replacements, higher sustainment costs, and reduced availability. The Army requires a more durable, cost-effective pad solution to extend service life, cut maintenance demand, and improve overall readiness.

Description of the Innovation Solution: AirBoss of America has developed a next-generation rubber formulation and manufacturing process for the T161 track pad (NSN 5340-01-587-6763) used on the BFV. Advanced elastomer compounding, improved bonding, and tightly controlled molding deliver a pad that exceeds Army specifications. Formal testing at Aberdeen and Yuma Proving Grounds demonstrated service life more than 50% longer than the Army's 1,500-mile threshold, reducing replacements by as much as 35%.

Benefits to the DoW: For approximately 3,000 active BFVs, each requiring 82 pads, standard operations would consume ~246,000 pads per full fleet cycle. Next-generation AirBoss pads would require only about 160,000—a 35% reduction, avoiding ~86,000 replacements. Based on the Army's BFV track pad procurement cycle, pads are typically replaced every 2–3 years; with AirBoss pads, this interval could extend to 3–4 years. In financial terms, at a notional $20 per pad, savings exceed $1.7M per fleet cycle. Across ~12,000 active tracked vehicles—including BFVs, M113, Armored Multi-Purpose Vehicle, M1 Abrams, M109 Paladin, M270 MLRS, and various recovery and engineer vehicles—pad demand would drop from ~984,000 to ~640,000 per cycle, avoiding ~344,000 replacements. At a notional $20 per pad, this equates

to ~$6.9M in cost avoidance per cycle. Fewer replacements also lower maintenance labor, logistics burden, and vehicle downtime, strengthening readiness.

Innovation Challenges: Adoption requires qualification testing, technical data, source approval, and proof of certified quality systems with MIL-STD compliance. AirBoss has achieved these standards on other defense products and has the capacity, systems, and scalability to support program requirements.

Technical Maturity / Demonstration Results: The AirBoss pad has been validated through Army testing at Aberdeen and Yuma and is assessed at TRL 7 and MRL 7, representing a production-representative prototype demonstrated in an operational environment. With ISO 9001, IATF 16949, and ISO 14001 certifications, AirBoss maintains robust quality systems and scalable production. This U.S.-manufactured solution delivers a qualified, durable, and cost-effective track pad that enhances readiness while reducing total ownership cost.

To view a short video demonstration, scan the QR Code

COAST Airfield Autonomy Initiative (AAI): Certified, Multi-UGV Command and Control for DoW Flight Lines

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Problem Statement: DoW airfields must keep ramps, taxiways, and perimeters safe and sortie-ready despite shrinking manpower, high FOD risk, and vegetation. Mowing, perimeter patrols, and FOD sweeping are episodic and labor-intensive, exposing maintainers to hazards. Sustainment needs a scalable, tower-aware automation layer for continuous, safe, affordable operations.

Description of the Innovation Solution: COAST delivers a cloud-based Command and Control (C2) platform that provides a common operating picture and governs multiple unmanned ground vehicles (UGVs) through one interface. It supervises COAST ARM for FOD sweeping, Pratt Miller's FRP-L for perimeter surveillance, and Renu's Renubot for mowing. The platform applies geofencing, pause, recall, terminate, and emergency stop authority. It integrates third-party maps/APIs with bidirectional data exchange, and provides encrypted, fault-tolerant comms with failover across Wi Fi/LTE/5G/DSRC.

Benefits to the DoW: AAI executed 1,763 autonomous missions with a 99.55 percent success rate, including two weeks at 100 percent, with zero incidents or violations. The team redeployed between ACY and NAPMRC, reaching a new site within hours and restarting a known site in under one hour.

Results: higher mission availability, fewer mishaps, reduced labor burden, and a repeatable path to scale at DoW and commercial airfields.

Innovation Challenges: The effort addressed interoperability across autonomy stacks and maps, orchestration of multi UGV and multi mission schedules, operations in heavy rainfall, and CMA boundary behaviors with tower coordination. COAST mitigated risk through pre-integration and off-site rehearsals, digital checklists, geofenced corridors, and human in the loop e stop authority.

Technical Maturity and Demonstration Results: From 29 April to 20 June 2025, COAST operated at ACY and NAPMRC, running mowing, FOD sweeping, and perimeter missions under centralized C2. A live remote event showed one operator commanding robots in FL, TX, and MI. Subsystems are at TRL 8 to 9. Interoperability and safety were validated with high mission success and zero incidents. Cybersecurity was independently confirmed by Embry-Riddle; safety packages completed SRM and SMS reviews.

Next Steps for Coast: If awarded the $50,000 MIC prize, COAST will apply the funds toward early demonstration activities for tower-integrated autonomy at DoW airfields.

- Integrate ASDE-X, digital NOTAMs, and ATC feeds for real-time situational awareness.
- Conduct a limited, tower-observed pilot to validate predictive holds/releases near high-traffic areas.
- Lay groundwork for expansion into movement areas during off-peak windows under ATC oversight.
- Develop a dual-airfield exercise plan to stress scheduling, telemetry, and logistics.

Benefit to DoW: Reduces congestion and fuel burn, increases resilience, and builds a scalable pathway for autonomy across DoW airfields worldwide.

To view a short video demonstration, scan the QR Code

COPA 500: Intelligent Industrial Automation Control for Maintenance Operations

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Problem: Across the DoW, the infrastructure that runs maintenance bays and depots is running on industrial control systems that are 20-30 years old. These systems were never designed for modern cybersecurity, remote access, or scalable automation. Updates, patches, and configuration changes often require on-site technicians using vendor-locked tools, driving up maintenance costs and extending downtime. These systems are inefficient in their amount of unscheduled downtime and dangerously insecure against Russian or Chinese cyber-attacks, which often target supply chain infrastructure.

Description of the Innovation Solution: The team at CPLANE.ai has built COPA 500, an industrial control system built to increase uptime and eliminate vendor lock-in, with built-in cybersecurity for zero trust environments. It combines open, modular hardware with a tightly integrated, proprietary software stack that allows for centralized control, remote management, and resilient operations. COPA 500 can maintain industrial operations during device failure and system maintenance. CPLANE.ai has a provisional patent in progress for the orchestration and management of multi-vendor control systems, which allow maintenance bays and depots to be upgraded with hardware from any manufacturer that complies with the industry-created Open Process Automation Standard, as often as needed.

Benefits to the DoW: COPA 500 eliminates the need for legacy hardware and by running all control logic and security in a containerized environment orchestrated across modular hardware. It provides maintainers the ability to securely monitor, diagnose, and update remotely or from a central location. COPA 500's open architecture typically costs 50% less compared to proprietary options. Remote access, affordability, and cybersecurity provides a path for users to deploy, operate, and maintain advanced maintenance systems that meet modern security and operational needs.

Innovation Challenges: Our primary risk is integration. Many industrial sites have non-standardized or legacy equipment and unique configurations that can make system integration challenging. To mitigate this risk, COPA 500 is designed with modularity in mind. It can be deployed in phases, connected to existing hardware and tailored to specific infrastructure types using interoperable, standards-based components like CODESYS and Ignition.

Technical Maturity/Demonstration Results: COPA 500 is currently at TRL 6. CPLANE.ai has secured multiple paying customers across the energy and industrial sectors who are actively deploying or testing the COPA 500 platform. ExxonMobil is the largest customer to date, with COPA 500 systems in use at their large chemical terminal in Louisiana. Other major clients include BP, Equinor, Petrobras, and Trailblazer Critical Minerals, each of whom has invested in the COPA QuickStart program that evaluates the platform's capabilities in operational environments.

To view a short video demonstration, scan the QR Code

Null Zone Magnetic Sensor (NZMS) for Advanced Debris Detection in Fluid Systems

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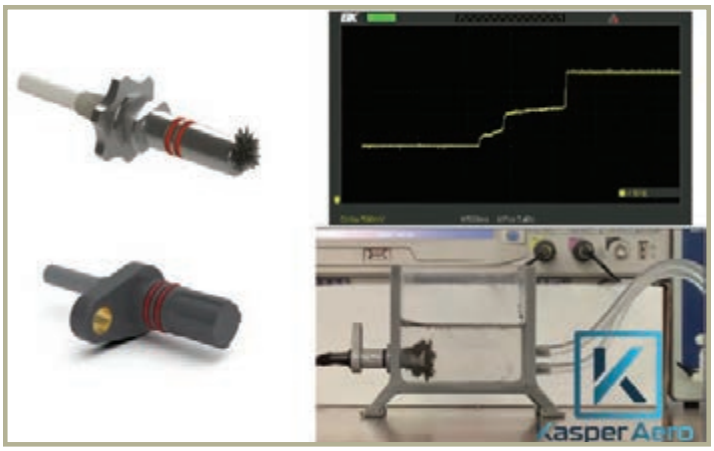

Fluid systems in ground vehicles, support equipment, naval vessels, and aircraft used for Defense Operations are currently unmonitored and early warning signs of failure are missed resulting in unplanned downtime, safety risks, and costly repairs. In nearly all cases, small amounts of ferrous debris are the earliest and most reliable indicators that pumps, bearings, or gearboxes are beginning to degrade. Existing debris sensor solutions do not meet the needs of the Department of War and have therefore not been widely adopted. As a result, maintenance personnel are often forced to react to failures only after they become imminent, leading to unplanned downtime, higher sustainment costs, and reduced mission readiness.

KasperAero developed the patent-pending Null Zone Magnetic Sensor (NZMS), an active ferrous debris detection technology that addresses the shortcomings of legacy sensors. Rather than relying on capacitive, ultrasonic, or spectroscopic methods the NZMS operates on a new sensing principle using magnetic field distortions from ferrous debris.

The NZMS has four primary components: a housing, printed circuit board, permanent magnet, and a magnetic field sensor. The sensor's simplicity enables cost effective and compact designs while providing superior sensitivity. This compactness and cost effectiveness makes the NZMS suitable for both retrofit applications and integration into new systems.

By identifying critical component wear at the earliest stage, the NZMS makes predictive maintenance possible by providing real-time, quantitative feedback about the health of critical fluid systems. For the Department of War, this capability means:

- More efficient use of maintenance resources
- Catastrophic failure warnings for DoW Vehicles
- Improved safety for personnel and equipment

The main challenges in bringing the NZMS to market are environmental validation, scaling for production, and integration with existing maintenance frameworks. Integration will require connecting the NZMS output to existing onboard computers and DoW predictive maintenance dashboards and data systems. The unique operating principle of the NZMS creates challenges in the sensor's assembly that must be resolved to achieve production-scale output.

The NZMS has been prototyped and is at TRL 4. Initial bench testing has shown a high sensitivity to as little as 0.015 grams of 10-micron ferrous debris and extreme thermal stability. Next steps involve environmental testing per DO-160G and MIL-STD-810 standards. Testing must be performed to characterize the sensor's output in relationship to the total mass of debris collected, ensuring actionable data for end users.

The Null Zone Magnetic Sensor addresses a critical gap in fluid system health monitoring. With its combination of sensitivity, durability, and low cost, it offers the Department of War a practical pathway to reduce maintenance costs, improve safety, and increase readiness across its vehicle fleets.

To view a short video demonstration, scan the QR Code

Automated Wire Test Set (AWTS): Transforming F-16 Electrical Maintenance and Sustainment

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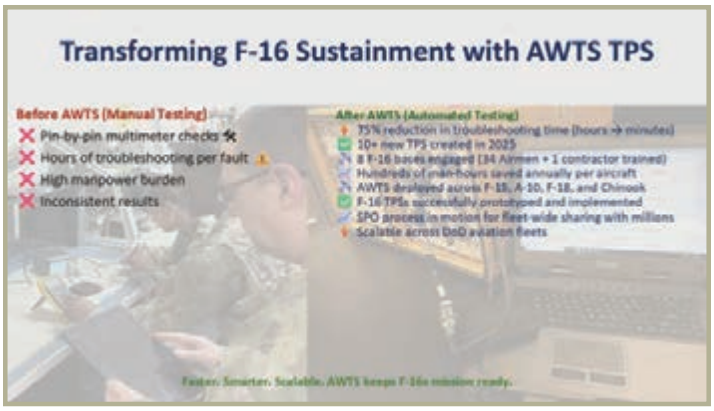

Modern F-16 electrical troubleshooting relies on slow, pin-by-pin multimeter checks of wiring harnesses and avionics components. These manual processes are labor-intensive, error-prone, and cause excessive aircraft downtime. Fault isolation can take hours, wasting man-hours and sortie generation time. This inefficiency increases sustainment costs, reduces readiness, and impacts all F-16 units worldwide.

The Automated Wire Test Set (AWTS) is a software-programmable, automated platform that modernizes F-16 electrical troubleshooting. Instead of hours of manual testing, AWTS uses Test Program Sets (TPSs) to perform resistance, capacitance, and voltage checks in minutes. It delivers fast, accurate fault isolation and allows less-experienced maintainers to complete advanced diagnostics through standardized procedures. AWTS reduces troubleshooting time, cuts costs, and boosts mission readiness.

In August 2025, eight F-16 Airmen developed five TPSs for critical systems—the Pilot Stick Grip, T-Grip, 5-Mod Panel, IFF Control Panel, and Miscellaneous Panel. The T-Grip TPS was validated the same day on a faulty unit, showing immediate value. This effort is projected to save hundreds of man-hours annually and has already expanded across Holloman, Andrews, Aviano, Toledo, Nellis, Fort Wayne, and Atlantic City, producing over ten TPSs.

Key contributors include Dr. Robert Norcross II (Langley-Eustis VA), MSGT David Williams (Robins AFB GA), SSGT Raelynn Navarro (Toledo ANGB OH), TSGT Matthew Crawford (Toledo ANGB OH), SSGT Peter Daigle (Andrews AFB), TSGT Nizam Khan (Holloman AFB), TSGT Denzel Ramdhanie (Holloman AFB), TSGT Tyler Bevard (Andrews AFB), TSGT Alex Mix (Ft Wayne ANGB IN), and SMSGT Jeremy Bender (Ft Wayne ANGB IN).

Benefits to the DoW

- 75% reduction in troubleshooting time—hours to minutes.
- Saves dozens of man-hours per aircraft annually.
- Improves safety, reliability, and readiness.
- Reduces dependence on experts and extends legacy part life.
- Allows less-proficient technicians to test components using standardized steps.
- Scalable and reproducible: 34 trained Airmen with SPO support expanding TPS development enterprise wide.

Challenges of Innovation

- Code validation requires coordination between maintainers and engineers, mitigated through peer review, shared code libraries, and contractor support.
- Connector shortages addressed via standardized sourcing databases and base collaboration.

Technical Maturity / Demonstration Results

- AWTS operates across F-15, A-10, F-18, and Chinook platforms.
- F-16 TPSs prototyped, demonstrated, and implemented at eight Air Bases.
- F-16 SPO developing TPS approval and sharing process with millions funded for expansion.

This Airmen-led innovation, the F-16 community's largest TPS initiative; enhances sustainment by improving diagnostics, reducing costs, and increasing readiness. It fully supports the MIC mission to make sustainment more agile, effective, and affordable.

To view a short video demonstration, scan the QR Code

MassXR: Accelerating Readiness and Reducing Sustainment Costs Across the DoW

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Problem Statement: The DoW must maintain fleet readiness while controlling costs. Traditional training is limited by aircraft availability, driving bottlenecks, higher costs, and reduced operational use. Retraining due to skill decay further strains readiness. The DoW needs solutions that accelerate training, reduce reliance on aircraft, and strengthen the sustainment workforce.

Innovative Solution: MassXR® is an enterprise-grade XR ecosystem with interactive 3D environments and performance analytics that boost training speed and effectiveness. Covering 32+ aircraft and 9 vehicles, it delivers scenario-based, hands-on training in realistic environments. Maintainers safely practice preflight, hydraulics, weapons loading, and more in scalable, repeatable modules.

Vendor-open and LMS-integrated, MassXR® supports single- and multi-user training aligned with AFSCs and technical orders. Fielded across 200+ units, it delivers enterprise-wide readiness gains with adaptable curriculum-driven modules.

Proven Benefits:

- 45% faster course completion, 30% higher throughput
- 72% reduction in retraining, mitigating skill decay
- 50% fewer aircraft required, preserving mission assets
- $30M in fuel savings in 2024

Innovation Challenges: Initial barriers included system integration, alignment with technical data, and adoption in secure environments. MVI overcame these with an open architecture, rapid deployment timelines, and LMS-driven analytics that measure performance and cost avoidance.

Technical Maturity: MassXR® is operational with 845 modules across 31K annual Air Force users. Training has been developed and delivered on nearly every USAF aircraft. Independent evaluations confirm reduced costs, preserved assets, and higher readiness. MassXR® is a mature, fielded solution delivering sustained impact at scale.

Cross-Service Expansion: In 2025, the U.S. Army awarded MVI its first immersive sustainment contract, deploying at Fort Bliss to accelerate training on advanced sensor systems. This same year, NAVSEA selected MassXR® as winner of the Portsmouth Naval Shipyard XR Prize Challenge for shipboard firefighting training, demonstrating mission-critical impact across Services and domains.

Conclusion: MassXR® accelerates training pipelines, preserves assets, and reduces costs. This proven ecosystem directly supports DoW sustainment priorities and delivers long-term ROI.

To view a short video demonstration, scan the QR Code

Voice-forward Intelligent System for Training and Immersive XR (VISTIX)

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VISTIX (Voice-forward Intelligent System for Training and Immersive XR) is a voice-forward platform that unifies speech intelligence, AI, and XR to support multiple stakeholders and diverse maintenance use cases. Developed by Cobalt Speech and Language in collaboration with Mixta Re's expertise in learning engineering and XR, VISTIX directly addresses critical DoW sustainment challenges by reducing training time by 20%, decreasing instructor course-prep workload by 80%, and enhancing readiness by shortening qualification cycles from three weeks of off-site training to self-paced modules conducted on-site during flight line downtime.

Air Force Global Strike Command (AFGSC) is currently testing VISTIX prototypes on the B-52H at Barksdale AFB:

- Virtual Maintenance and Training Assistant (VMTA, TRL 5–6): immersive, self-directed XR training for technicians.
- Voice-Directed Inspection Reporting System (VDIRS, TRL 6–7): hands-free, voice-enabled inspection and reporting in noisy environments.

Both prototypes demonstrate the power of voice-first interaction with technical content, freeing personnel from the need to use screens and paper while improving efficiency and accuracy. Unlike current XR systems that rely solely on visual or gesture inputs, VISTIX introduces natural voice interaction in noisy flight-line environments and affect-aware feedback to track trainee stress and confidence, enabling adaptive coaching and reliable assessment.

DoW-first, commercially reinforced: VISTIX is designed to serve DoW training priorities first, with secondary applications in the $81.5B aircraft MRO market, which faces identical readiness and reskilling challenges. Leveraging this commercial parallel ensures the Department of War achieves scalable, cost-effective solutions.

Technical maturity and roadmap: While Cobalt's speech engines operate at TRL 8–9, the integrated VISTIX platform currently operates at TRL 4/5. Phase II demonstrations with AFGSC inspectors will validate the system in operational conditions and advance it to TRL 6–7, ensuring low technical risk and a clear transition pathway.

Cross-service applicability: Though piloted with AFGSC on the B-52, VISTIX's modular design enables rapid adaptation across platforms such as the F-16 and F-35, as well as sustainment-intensive Navy and Army systems and DLA inspection workflows, providing a DoW-wide solution for immersive, voice-enabled training and inspection.

By combining quantified impact, originality beyond XR-only solutions, and a clear path to TRL 6–7, VISTIX delivers a secure, scalable training ecosystem that strengthens readiness, reduces maintenance errors, and ensures mission-capable aircraft and systems across the DoW enterprise.

To view a short video demonstration, scan the QR Code

Virtual Reality Paint Trainer (VRPT)

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Problem Statement: The DoW spends an estimated $327 Billion annually on operations and maintenance, with aircraft paint maintenance costing $1 Million per day. The lack of consistent quality from painters contributes to excessive costs, waste, and increased exposure to hazardous materials.

Description of the Innovation Solution: The Virtual Reality Paint Trainer (VRPT) incorporates technical and process orders to establish a standard set of guidelines based on Air Force regulatory requirements. The solution enables painters to effectively receive individual and multi-user team-based training for specialized processes and tooling such as aircraft painting, depainting, Aqua Miser pressure washer, paint gun set up, man lift operation, and pressure manifold configuration.

The solution integrates mixed reality and AI technology to virtually simulate painting environments and military assets like the C-130, Global Hawk, C-5 Galaxy, F-15, F-16, A-10, C-17, KC-46, KC-135, radomes, off-airframe components, and more. To ensure effective training, students receive real-time feedback through visual markers indicating accuracy based on aircraft curvature, painting distance and speed.

Benefits to the DoW: Utilizing Commercial Off the Shelf (COTS) hardware, the VRPT facilitates cost effective training and reduces the amount of time, labor, and money spent on aircraft painting rework. This innovative solution especially trains on and encourages compliance with critical health and safety regulatory requirements, ensuring the workforce performs all activities with a safety-first mindset.

Innovation Challenges: Before the VRPT was developed, other existing technologies failed to provide the level of detail necessary to improve the inefficient training processes facilitated by the DoW. There was a need for training that incorporated realistic aircraft and environments, utilizing paint guns, paint carts and paint Safety Data Sheet (SDS) information to include viscosity, and measuring paint thickness measurements (mil) linked to a Learning Management System (LMS).

Technical Maturity/Demonstration Results: The VRPT solution continues to evolve to meet customized DoW requirements. The USG has leveraged the investment to deploy this solution at multiple Air Force Bases to include Robins AFB, Tinker AFB, Hill AFB, and Little Rock AFB. The LMS reports indicate the proficiency of painters has increased by 30%, yielding an observed cost savings of $114 Million in flow days and paint materials within the past two years.

To view a short video demonstration, scan the QR Code

Notes

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