DEPARTMENT OF DEFENSE

MANUFACTURING TECHNOLOGY PROGRAM

Annual Report
2025

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INTRODUCTION

As we close out 2025, I am proud to present the Department of Defense Manufacturing Technology (DoD ManTech) Program's Annual Report, a comprehensive overview of our achievements, initiatives, and impact over the past year. This report highlights the critical role DoD ManTech plays in advancing manufacturing technologies, strengthening the defense industrial base, and ensuring our warfighters have the capabilities they need to deter and win wars. From groundbreaking innovations to strategic collaborations, 2025 has been a year of progress and resilience in the face of evolving global challenges.

Inside, you will find detailed accounts of our efforts across the Military Services, Defense Agencies, and Manufacturing Innovation Institutes (MIIs), showcasing how we are driving advancements in areas such as additive manufacturing, biomanufacturing, and workforce development. As we look ahead to 2026, this report serves as both a reflection of our accomplishments and a roadmap for the future, ensuring that DoD ManTech continues to deliver on its mission to support national security through cutting-edge manufacturing solutions. Thank you to our partners and stakeholders for your continued collaboration and commitment to innovation.

Keith DeVries

Director, DoD ManTech

DEPARTMENT OF DEFENSE MANUFACTURING TECHNOLOGY PROGRAM OVERVIEW

WHAT:

The Department of Defense Manufacturing Technology (DoD ManTech) Program was originally created in 1956, and falls under Section 4841 of Title 10, United States Code (USC), to further national security objectives through the development and application of advanced manufacturing technologies and processes. The program is composed of the Military Service and DoD Agency (or "Component") ManTech investment programs executed by the Army, Navy, Air Force, Defense Logistics Agency (DLA), and the Office of the Secretary of Defense (OSD).

WHY:

The U.S. Military capability depends on our ability to ensure technological advantage over our adversaries. We must constantly respond to world military challenges in a manner that is innovative, agile, robust, resilient, and affordable. The DoD ManTech Program meets these challenges with a focus on cost-effective, risk-mitigated manufacturing development, and sustainment of defense systems.

VISION

A responsive world-class manufacturing capability to affordably and rapidly meet warfighter needs throughout the defense system life cycle.

MISSION

The DoD ManTech Program anticipates and closes gaps in manufacturing capabilities for affordable, timely, and low-risk development, production, and sustainment of defense systems.

GOVERNANCE

- Oversees Department of Defense Manufacturing Technology Program
  - Principal on the Joint Defense Manufacturing Technology Panel
    - Manages the Manufacturing Science and Technology Program
      - Leads public-private partnerships with DoD Manufacturing Innovation Institutes
        - Advances DoD Manufacturing Education and Workforce Development
        - Collaborates with Federal agencies on domestic manufacturing initiatives

JOINT DEFENSE MANUFACTURING TECHNOLOGY PANEL (JDMTP)

The Office of the Secretary of Defense Manufacturing Technology Program (OSD ManTech) is responsible for providing central guidance direction, and support to the component ManTech Programs (10 U.S. Code § 4842). To execute this mission, OSD ManTech operates an investment portfolio and collaboration engine. The Joint Defense Manufacturing Technology Panel (JDMTP) is chartered to identify and integrate requirements, conduct joint program planning, and develop joint strategies.

MISSION

Anticipate and close gaps in manufacturing capabilities for affordable, timely, and low-risk development, production, and sustainment of defense systems through technology development and adoption and training.

Responsive, world-class manufacturing capability to affordably and rapidly meet warfighter needs throughout the defense system life cycle.

MEMBER COMPOSITION

The JDMTP panel comprises directors and senior managers from DoD ManTech components, listed below, with a rotating chairmanship. It also includes non-voting, ex officio representatives from various agencies.

Secretary of Defense Manufacturing Technology Program

- Army Manufacturing Technology Program
- Navy Manufacturing Technology Program
- Department of the Air Force Manufacturing Technology Program
- Defense Logistics Agency Research and Development

Ex Officio Members

- Missile Defense Agency
- Department Of Commerce
- Department Of Energy
- Defense Advanced Research Projects Agency
- National Aeronautics & Space Administration
- United States Coast Guard

ARMY MANUFACTURING TECHNOLOGY
PROGRAM OVERVIEW

OVERVIEW

The U.S. Army Manufacturing Technology (ManTech) program's mission is to support Army readiness and modernization priorities by improving and maturing manufacturing technologies to ensure strategic overmatch and fulfill national security objectives. Funded via Budget Activity 7, the Army ManTech Program addresses manufacturing solutions that enable and improve manufacturing and producibility processes to advance the Army's technological capabilities while reducing life-cycle costs for current and future Army acquisition programs. Army ManTech advances manufacturing technology and processes from a Manufacturing Readiness Level (MRL) 4 through MRL 7.

The program has three objectives:

1. Promote material development to meet performance requirements
2. Improve manufacturability and reduce the cost to programs of record (PoR)
3. Advance the organic industrial base (e.g., arsenals)

The Army ManTech Program accomplishes critical technology maturation and transition by leveraging effective, efficient, affordable, and adaptable manufacturing processes resulting from coordinated efforts between the Program Acquisition Executive (PAE), key industry and academic partners, and the organic industrial base.

U.S. ARMY MANUFACTURING TECHNOLOGY

ARMY MANUFACTURING TECHNOLOGY

ORGANIZATION

The Army ManTech Program supports Army-wide manufacturing requirements through coordinated efforts across the Assistant Secretary of the Army for Acquisition, Logistics and Technology (ASA(ALT)); U.S. Army Materiel Command (AMC); Army Transformation and Training Command (T2COM); U.S. Army Space and Missile Defense Command (SMDC); U.S. Army Medical Research and Development Command (MRDC); and the U.S. Army Corp of Engineers (ACE). The Deputy Assistant Secretary of the Army for Research and Technology (DASA(R&T)) provides oversight and management of the Army ManTech program on behalf of the ASA(ALT).

INVESTMENT STRATEGY

The U.S. Army Manufacturing Technology (ManTech) Program is an industrial preparedness program that seeks solutions to address end-item efficiency and affordability of manufacturing processes to advance the Army's technological capabilities. These improved processes are intended to reduce life-cycle costs for current and future Army acquisition programs within the following portfolio areas:

- Command, Control, Communications & Intelligence (C3I)
- Ground
- Aviation
- Soldier
- Weapons

The Army ManTech Program coordinates with key partners across the defense industrial base to develop manufacturing processes and apply manufacturing technologies that will reduce acquisition and sustainability costs, as well as repair cycle times, of defense weapons systems in direct support of Army warfighting capabilities critical for our Soldiers' success.

Advanced Manufacturing Cell for Missile Fins and Components

Manufacturing Challenge

Missile casting production faces challenges from outdated processes, limited foundry capacity, and a declining workforce, leading to delays and difficulty meeting the growing demand for advanced missile systems. This project focuses on using automation and modern technologies to boost production speed and improve quality.

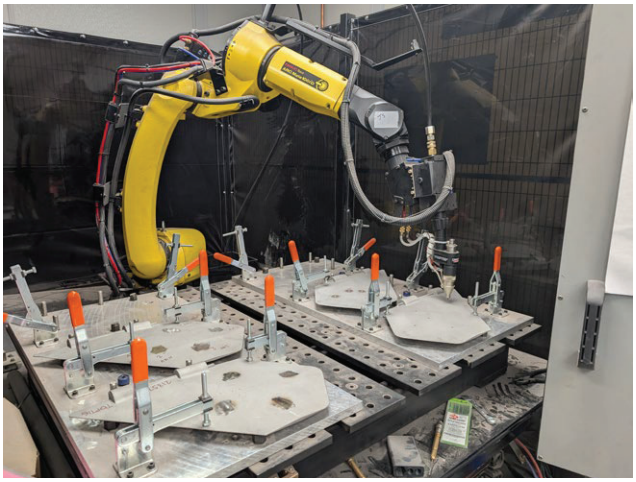
ManTech Response

- Created a cellular manufacturing environment that uses automation, advanced technologies, and non-destructive testing (NDT) to increase production speed and capacity for missile fins and components.
- Invested $17 million through Army Tech to advance this initiative.

ManTech Impact & Benefits

- Developed an automated robotic system for cutting, grinding, and finishing, reducing process time by 60% (from 21 minutes to 8.5 minutes) and improving quality.
- Integrated robotic welding and automated inspection, cutting processing time by 70% and tripling production capacity for missile fin castings.
- Upgraded simulation tools and introduced smart manufacturing technologies to streamline critical processes.
- Provided workforce training in advanced non-destructive testing (NDT) techniques.
- Supported multiple DoD programs including the Army Tactical Missile System (ATACMS), the High-Mobility Artillery Rocket System (HIMARS), the Patriot missile, and the Navy Standard Missile 6 (SM-6).

Robotic Cut-off and Finishing Cell



Robotic Weld Fins

Overall, the production capacity and responsiveness for advanced, low- to medium-volume DoD missile fin and component castings have significantly improved, supporting the DoD's mission with more efficient, timely, and reliable manufacturing capabilities.

Manufacturing Processes of Composite Rubber Track for Heavy Combat Vehicles

Manufacturing Challenge

Steel tracks are heavy, made of hundreds of parts, and require extensive maintenance and time to replace worn components. While Composite Rubber Track (CRT) offers significant advantages, its manufacturing processes were not fully developed to ensure the durability needed for heavy combat vehicles.

ManTech Response

- Refined the CRT manufacturing process for the Armored Multi-Purpose Vehicle (AMPV), achieving durability of over 4,000 miles.
- Formed a cross-functional team to address all aspects of technology implementation, including training, logistics, and facility readiness, to support the Army's transformation of tracked vehicle mobility.
- Invested $6.55 million through Army ManTech to advance this initiative.

Composite Rubber Track

ManTech Impact & Benefits

- Achieved weight savings of over 1,500 lbs, improved fuel efficiency by more than 25%, enhanced durability, reduced maintenance needs, lowered life-cycle costs, and minimized vibration and noise.
- Successfully completed durability testing and transitioned the CRT technology to the Program Executive Office Ground Combat Systems (PEO GCS) for implementation on the AMPV.

Participants: *Army ManTech, PEO GCS, PM MAV, U.S. Army Combat Capabilities Development Command (DEVCOM) Army Research Laboratory (ARL) and Ground Vehicle Systems Center (GVSC), Deputy Assistant Secretary of the Army for Plans, Programs and Resources (DASA(PPR)), Army Futures Command (AFC) Army Maneuver Center Concepts Development Division (CDD) and Sustainment Capability Development Integration Directorate (CDID), Combined Arms Support Command (CASCOM), Army Test and Evaluation Command Yuma Test Center, Corvid Technologies, Soucy Defense, BAE Systems*

Enabled implementation of fundamentally new armored vehicle track technology to the Army that significantly improves mobility, durability, and operational costs.

Advanced Fuze Piston Actuator Production Through Automation

Manufacturing Challenge

The medium-caliber piston actuator design for the 30mm XM1182 High-Explosive Airburst with Tracer (HEAB-T) and 50mm XM1204 HEAB-T fuzes are not optimized for automated manufacturing. The current production process relies heavily on skilled manual labor, leading to high scrap rates and low throughput, which directly impacts cost targets for both current and future medium-caliber HEAB munitions.

ManTech Response

- Conducted a trade study to design an automation-friendly pilot line, improving the manufacturability of the piston actuator assembly.
- Created a manufacturing environment with robotic arms, vibratory feeders, robotic dispensing, driven track conveyors, and a 3D vision system for in-line quality control, all integrated into a single manufacturing cell to reduce reliance on skilled technicians.
- Validated and verified the pilot line's robustness to ensure it meets manufacturing requirements.
- Invested $3.1 million through Army ManTech to support this initiative.

ManTech Impact & Benefits

- Increased piston actuator unit production capacity by 500% per month using automated manufacturing equipment.
- Reduced production costs per unit by 50%.
- Enhanced product quality by minimizing manual labor in the manufacturing process.

High-Volume Curing Oven

Robotic Arm

Participants: *Army ManTech, U.S. Army Combat Capabilities Development Command (DEVCOM) Armaments Center (AC), Joint Program Executive Office Armaments & Ammunition (JPEO A&A), Project Manager Maneuver Ammunition Systems (PM MAS), Leidos, EaglePicher Technologies*

Increased production capacity of piston actuators for medium-caliber fuzes to meet the demand and cost objectives of the 30mm XM1182 HEAB-T and 50mm XM1204 HEAB-T Programs of Record (PoR), and future medium-caliber airburst munitions.

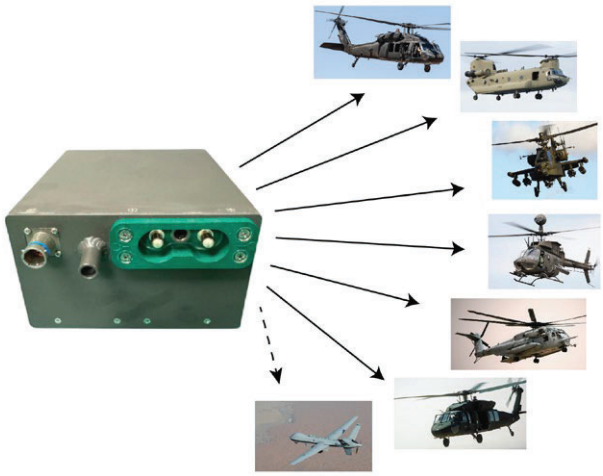
Manufacturing Processes of Next-Generation Lithium Battery Technology

Manufacturing Challenge

Aging battery technologies like Sealed Lead Acid (SLAB) and Nickel-Cadmium (NiCd) systems are expensive to maintain and face manufacturing challenges, including low production yields, strict environmental handling requirements, and outdated, labor-intensive processes. The supply chain is overly complex, with numerous unique batteries supporting the Army fleet and relying heavily on foreign-sourced materials.

ManTech Response

- Developed and improved the manufacturing process for next-generation lithium battery technology as part of the Army Aviation Common Lithium-Ion Battery (AACLIB) project, enhancing power efficiency, reliability, safety, and scalability for legacy Army rotary-wing platforms.
- Reduced costs through design simplification and automation by eliminating unnecessary parts, integrating automated manufacturing processes, and consolidating three circuit boards into a single unit, which removed numerous wires and connectors to improve reliability and simplify assembly.
- Invested $8.2 million through Army ManTech to support this initiative.



Nine (9) Different Batteries Replaced by One (1) Greater Energy Capacity at Equal or Lesser Weight

ManTech Impact & Benefits

- Increased battery capacity by 300%, from 5 ampere-hours (Ah) to 20 Ah.
- Boosted energy density by nearly 300%, from 22.6 Watt-hours per kilogram (Wh/kg) to 90.1 Wh/kg.
- Extended emergency power by more than 150%, from 12 minutes to over 30 minutes.
- Reduced battery weight by nearly 10%, from 15 lbs to 13.7 lbs.
- Cut unit cost by 50%, from $12,000 to $6,000.

AACLIB

Participants: *Army ManTech, U.S. Army Combat Capabilities Development Command (DEVCOM) Aviation & Missile Center (AvMC), Program Executive Office (PEO) Aviation, Universal Solutions International, EIC Labs*

This technology supports the Army's Operational Energy Innovation (OE-I) efforts by reducing logistical challenges of legacy batteries and improving mission readiness for rotary-wing platforms in various operating environments.

AIR FORCE MANUFACTURING TECHNOLOGY
PROGRAM OVERVIEW

OVERVIEW

Throughout its rich history, the Department of the Air Force (DAF) ManTech program has served a foundational role in maturing critical technologies and modern business practices for the defense industrial base, including numerically controlled machining, organic matrix composites, lean manufacturing, and manufacturing readiness levels. DAF ManTech has also worked closely with Programs of Record within Advanced Aircraft, Fighters & Bombers, Weapons, Space Systems and other Program Executive Offices to deliver billions of dollars in acquisition and sustainment cost savings and avoidance. Over the last twenty years, there has been a dramatic reshaping of the manufacturing sector, and DAF ManTech remains at the forefront of the 4th Industrial Revolution (or Industry 4.0), characterized by an infrastructure built on digital manufacturing tools, such as robotics, Industrial Internet of Things (IIoT), and additive manufacturing.

ORGANIZATION

The DAF ManTech program is managed by the Air Force Research Laboratory's Manufacturing, Industrial Technologies and Energy Division within the Materials and Manufacturing Directorate. Sources used to build the program include strategic policy documents, DAF Programs of Record, AFRL's technical directorates, industry roadmaps, the Joint Defense Manufacturing Technology Panel (JDMTP), and technical interchange meetings (TIM) with government/industry/academia stakeholders. All DAF ManTech projects are captured in technology roadmaps that are reviewed throughout the year to ensure alignment with our Warfighters. The program is funded with core 6.3 funds and by leveraging resources of other partners, such as the OSD Manufacturing Science & Technology Program, Manufacturing Innovation Institutes (MIIs), and the Industrial Base Assessment program that is executed on behalf of the Secretary of the Air Force for Acquisition. The Division also acts as the Defense Production Act (DPA) Title III Executive Agent Program Office, effectively executing over $1B in DPA funding as directed by the Director, Manufacturing Capability Expansion and Investment.

AFMANTECH
DEPARTMENT OF THE AIR FORCE

AIR FORCE MANUFACTURING TECHNOLOGY

INVESTMENT STRATEGY

Based on both the DoD demand signals and the technology trends driving rapid manufacturing innovations. DAF ManTech aligns its investments and competencies into 12 enduring manufacturing technical areas. The DAF ManTech technical staff understands the demands and opportunities for manufacturing technology to bring capability to the warfighter, the state of the art of the technical areas which they represent, and the community of investors and innovators that can help bring concepts to a reality. They use that knowledge, accumulated with continuous interaction with the S&T, operational and industrial base communities to maintain a single integrated capability roadmap for each technical area.

These technical areas include typical material and manufacturing competencies to solve pacing DAF operational challenges, such as manufacturing for high speed and propulsion systems, for lightweight structures, for specialty coatings, for survivability in space environments, and for critical materials for Defense. Technical areas associated with mission systems and sensors are organized by the capability they offer, such as ISR, communications and navigation, and spectrum warfare. Lastly, other pervasive technical areas that leverage Industry 4.0 technologies are also maintained, including agile manufacturing approaches and research that modernizes data architectures for manufacturing.

In all cases, DAF ManTech investments address pervasive manufacturing needs that serve multiple transition customers, including near-term transition opportunities to programs of record, with substantial return- on-investment (ROI) in the form of reduced cost, increased platform availability, and/or accelerating capability to the field through targeted manufacturing risk reduction of emerging technologies which may not have a current baseline capability in the DAF.

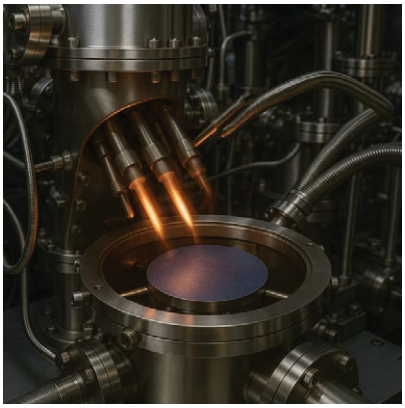
Manufacturing Epitaxial Ohmic Contacts

Manufacturing Challenge

Legacy Radio Frequency (RF) systems are unable to counter evolving threats to Department of the Air Force (DAF) systems. Advancing RF Gallium Nitride (GaN) capabilities above 26.5 GHz is critical for next-generation RF systems. However, higher frequencies are limited by challenges in gate scaling and epitaxial ohmic contact optimization. This AF ManTech project addressed both limitations through manufacturing process improvements on a production-level reactor.

ManTech Response

- Partnered with MACOM Technology Solutions to transition an epitaxial GaN ohmic regrowth process from laboratory development to high-volume manufacturing, ensuring repeatability, scalability, and compatibility with existing GaN component process flows.
- Matured and demonstrated a low-resistance, regrown ohmic contact process on GaN-on-SiC epitaxy, with production-scale runs performed in a reactor capable of processing 16,000 × 100 mm wafers per year.
- AF ManTech invested $2.5 million to support this initiative.



ManTech Impact & Benefits

- Achieved uniform, reproducible contact resistance compatible with advanced GaN designs, reducing device parasitics and enabling performance gains at Ka-band and higher frequencies.
- Increased power density by 50% and power efficiency by 10%, enhancing jamming capabilities for air borne EW systems, extending range for ground-based radar, and improving SATCOM system mission life.
- Reduced operational temperatures by up to 20°C, improving SAR imaging resolution and airborne AESA radar system performance.
- Achieved 10x lower contact resistance and 10% wider bandwidth, enhancing communication system reliability in contested environments. These improvements also enable smaller seeker antennas with the same performance, enhancing high-speed target tracking for munitions.

Participants: *Air Force Research Laboratory's Materials and Manufacturing Directorate and Sensors Directorate, MACOM*

Domestic Production of Lab-to-Fab RF Devices.

Innovative, Automated Inline Inspection for High Quality, High-Rate Production of Braided Composite Components for Hypersonics and Military Aircraft

Manufacturing Challenge

The Department of Defense (DoD) faces an urgent need for a rapid, cost-effective, and high-rate production process for airworthy composite structures to support advanced platforms like Collaborative Combat Aircraft (CCA) and hypersonics. However, validating the quality of complex 3D multi-layer preforms is challenging, since the current inspection method is a manual inspection. This time-consuming inspection includes confirmation of the preform bias angles, validation of the proper placement of ply builds and drops and the thickness of individual over-braid plies. Additionally, these manual inspections are plagued by decreased accuracy and precision and often fail to detect critical internal defects, including Foreign Object Debris (FOD) as small as 1/8th inch leading to reliability concerns and higher preform costs.

ManTech Response

- The Air Force ManTech program, through a Small Business Innovation Research (SBIR) contract, developed an innovative in-situ, automated Artificial Intelligence (AI) in-situ inspection system.
- This system adapted A&P Technology's existing 2D inspection capabilities for real-time quality assessment of 3D composite preforms during the over-braiding process, enabling precise measurement of braid characteristics, verification of ply features, and defect detection for 8" or less diameter preforms.
- The AI-powered inspection system operates seamlessly without halting or slowing the over-braiding production process, allowing for continuous, high-rate manufacturing and providing high confidence in braided preform quality with data rich reports.
- A&P conducted a Gage R&R analysis of the inspection system against legacy human inspectors, while Acuren provided third-party verification of defect detection, validating the technology's improved accuracy and precision.
- A follow-on Air Force ManTech led SBIR is currently maturing this in-situ inspection system for large preforms (≤60" diameters).

ManTech Impact & Benefits

- Increased Production Rate & Reduced Cost: The system measures critical preform features and detects Foreign Object Debris (FOD) during normal over-braiding processes and enables immediate braid machine shut down in the event of non-conformance or FOD detection. This significantly reduces operator labor and manufacturing times resulting in substantial cost savings for the DoD.
- Enhanced Reliability & Performance: The system delivers superior precision, with an average standard deviation of 0.029 degrees for bias fiber angle, outperforming manual methods. It accurately identifies FOD as small as 1/8th inch, which conventional manual inspections often miss, ensuring higher reliability and airworthiness for critical components.
- DoD Mission Alignment: This technology supports USAF and Advanced Air Mobility (AAM) initiatives, including Collaborative Combat Aircraft (CCA), M-series weapons, and hypersonic vehicles, by enabling cost-effective, high-quality, and reliable manufacturing of next-generation defense systems. It directly benefits the Warfighter by delivering more capable and affordable assets, scaling manufacturing capabilities and strengthening the defense industrial base in alignment with current administration priorities.

Participants: *Government Organization: Air Force Research Laboratory (AFRL/RXMS), Prime Private Sector Organization: A&P Technology, Key A&P Technology Project Team, Hawthorn Composites (molding), Acuren (defect verification).*

Precision in Every Fiber: AI-Powered, Real-Time 3D Inspection for Reliable, High-Rate Production of Advanced Composite Components.

NAVY MANUFACTURING TECHNOLOGY
PROGRAM OVERVIEW

OVERVIEW

The U.S. Navy Manufacturing Technology (ManTech) Program is an industrial preparedness program focused on manufacturing improvements for key naval platforms. Navy ManTech sponsors projects and develops manufacturing technology, such as new processes and equipment, for DoW weapon system production lines that deliver the highest impact to benefit the fleet when implemented. Focused on affordability, expanded throughput, and enhanced capability, Navy ManTech supports industry's ability to expand production at scale throughout a weapon system's life cycle. Ancillary impacts include supply chain enhancement, productivity improvements, span time reduction, and operational availability.

ORGANIZATION

Navy ManTech executes through seven Centers of Excellence (COEs), which provide a focal point for the development and transfer of new manufacturing processes and equipment in a cooperative environment with industry, academia, and the Naval Research Enterprise.

- Center for Naval Metalworking (CNM)
- Composites Manufacturing Technology Center (CMTC)
- Electronics Manufacturing Center (EMC)
- Electro-Optics Center (EOC)
- Energetics Manufacturing Technology Center (EMTC)
- Institute for Manufacturing and Sustainment Technologies (iMAST)
- Naval Shipbuilding and Advanced Manufacturing (NSAM) Center

NAVY MANUFACTURING TECHNOLOGY

INVESTMENT STRATEGY

Navy ManTech will execute an investment strategy in FY25 – FY29 based on the direction of Office of Naval Research (ONR) leadership and determined by total acquisition funding; stage in acquisition cycle; platform goals for cost-reduction, throughput, and capability; cost-reduction potential for manufacturing; and other factors primarily associated with the ability of Navy ManTech to deliver the technology when needed. Over the next five years, Navy ManTech will deliver manufacturing improvements for Navy platforms critical to the future force, focusing resources on the VIRGINIA Class submarine (VCS), COLUMBIA Class submarine (CLB), CVN 78 Class aircraft carrier, DDG 51 Class destroyer, and F-35 Lightning II aircraft. Navy ManTech also supports PEO Integrated Warfare Systems (IWS) weapon systems for the ship classes. Navy ManTech helps these programs achieve their manufacturing goals by transitioning advanced manufacturing technology.

Navy ManTech investment in platforms typically ranges from $3M-8M annually and varies from year to year based on many factors, such as funding required for existing projects, past implementation record, cost savings, and potential of planned projects. Strategic planning for Navy ManTech is an ongoing effort. Navy ManTech annually analyzes acquisition scenarios and plans to determine major acquisition programs for potential investment. As the current platforms that ManTech supports mature through their respective acquisition cycles, ManTech's investment targets change. In FY25 – FY29, Navy ManTech will develop enabling manufacturing technology – new processes and equipment – for implementation on Navy weapon system production lines.

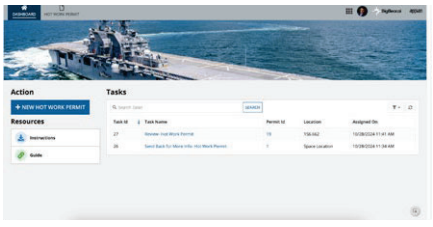
Modernized Ingalls' Temporary Services Will Reduce Costs by More than $10M

Manufacturing Challenge

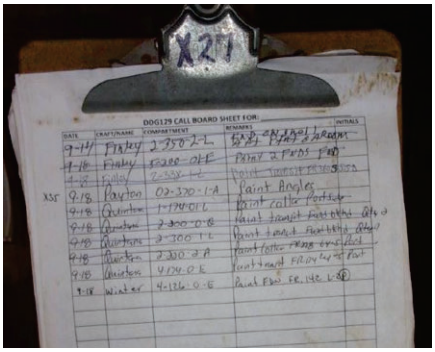
Scheduling temporary services at Huntington Ingalls Industries - Ingalls Shipyard (Ingalls) - relied on manual, paper-based requests, which limited traceability, slowed response times, and hindered real-time coordination. This outdated process led to inefficiencies, inconsistent execution, reduced visibility, and a higher risk of human error—creating potential delays and safety concerns in high-tempo, resource-constrained environments. To address these challenges, Navy ManTech developed a centralized, data-driven system designed to enable proactive planning, optimize labor use, and ensure steady production.

ManTech Response

- Navy ManTech's Naval Shipbuilding and Advanced Manufacturing (NSAM) Center modernized and streamlined temporary service management in shipyards by developing a centralized, intelligent data management tool that replaced fragmented, manual processes with an integrated digital solution to improve efficiency, traceability, and safety.
- Created purpose-built software for digital submission and tracking of Hot Work chits, painting, and other temporary services, reducing paperwork, delays, and ambiguity.
- Added functionality to log and monitor combustible and flammable materials entering or leaving shipboard spaces, enhancing accountability and hazard control.
- Combined request and combustible data to provide real-time alerts for conflicting tasks or elevated risks, particularly in adjacent compartments, improving safety and operational awareness.
- Enabled proactive, data-driven service coordination to support production continuity, personnel safety, and digital modernization across shipyard operations.
- Fully implemented the solution at Ingalls Shipyard in Q4 FY25.



Improved Temporary Service Call Board application. Photo Credit - BigBear.AI



Legacy manual temporary service tracking. Photo Credit - HII Ingalls

ManTech Impact & Benefits

- Advanced Navy ManTech's ability to deliver scalable, data-driven solutions across the shipbuilding enterprise, building on past successes and collaborations.
- Reduced DDG temporary services planning labor-hours by 2.5%, saving $1.2 M annually for the DDG 51 platform and $2.1M across all Navy platforms at Ingalls.
- Projected five-year savings of $6.9M for DDG 51 and $10.3M across all Navy platforms at Ingalls, achieving a 9.9:1 return on investment (ROI) and demonstrating the financial value of digital process integration.
- Improved real-time visibility and workforce efficiency through the call board system, with plans to extend the tool to other shipyard use cases, accelerating digital transformation across public and private yards.

Participants: *Office of Naval Research Navy ManTech, Advanced Technology International / Naval Shipbuilding and Advanced Manufacturing (NSAM) Center, Ingalls Shipbuilding, Big Bear.ai*

Navy ManTech leveraged digital data to modernize and optimize a manual process that will save Ingalls more than $10M over five years.

Novel Initiating Explosive Provides Warfighter with Safe, Lightweight, and Reliable Weapon System Initiation

Manufacturing Challenge

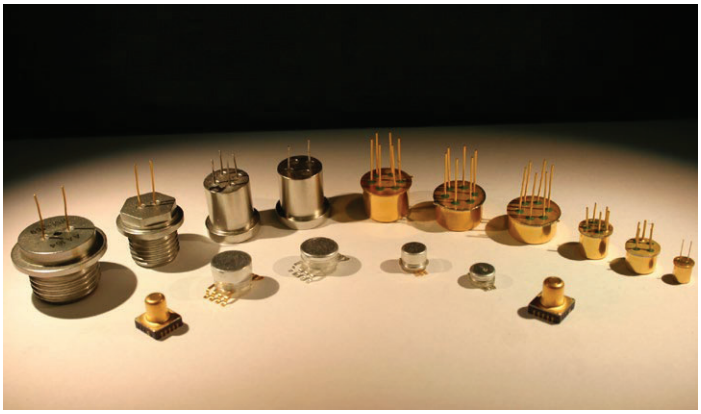
Navy warfighters need smaller, lighter ordnance that is both reliable and safe for storage, handling, and use. Future in-line safe Exploding Foil Initiation systems must minimize energy consumption, volume, and weight while maintaining safety. Incorporating submicron CL-20 into these systems has the potential to reduce mean firing energy by approximately 20% and decrease firing voltage variability. These advancements offer broad benefits across multiple weapon systems. Navy ManTech successfully demonstrated the reproducible advantages of this novel explosive in a Low Energy Exploding Foil Initiator (LEEFI).

ManTech Response

- Navy ManTech's Energetics Manufacturing Technology Center (EMTC) at Naval Surface Warfare Center (NSWC) Indian Head Division (IHD), in collaboration with Naval Air Warfare Center (NAWC) Weapons Division (WD), developed a new sub-micron CL-20 manufacturing process to support low energy exploding foil initiators (LEEFIs).
- Transitioned the novel explosives manufacturing process and technology to industrial collaborators for large-scale production.

ManTech Impact & Benefits

- Reduced fireset device costs by approximately 90% compared to state-of-the-art initiators.
- Achieved low-rate initial production (LRIP) of both the explosive and the ultra-low energy exploding foil initiator device.
- Scheduled delivery of 1,000 initiators to the warfighter beginning in FY26.
- Potentially eliminated the need for wetting and drying small particle size nitramines.
- Enhanced lethality through deeper magazines and greater design flexibility.
- Improved long-range fires by reducing energy demand during the end game.



An ultra-low energy exploding foil initiator (uLEEFI) enables safer, more reliable ordnance and facilitates developing advanced weapon systems with increased lethality for the warfighter.

Participants: *Office of Naval Research Navy ManTech, Energetics Manufacturing Technology Center (EMTC), NAWC-WD, NSWC-Crane, Northrop Grumman, Reynolds Systems Inc.*

This Navy ManTech effort represents the first industrial capability to make submicron CL-20. The technology reduces the cost of modern initiation systems, while maintaining critical safety and reliability features.

Manufacturing Technologies and Inspection Techniques for Boot Disbond Process, Saving F-35 Program $6.4M

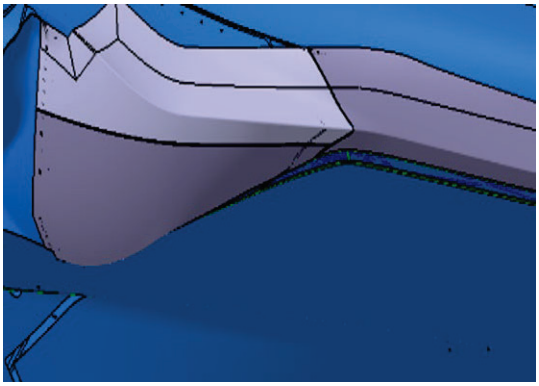
Manufacturing Challenge

The application of boots—coating-type materials bonded to F-35 doors and panels—is a complex, labor-intensive manual process. The variety of boot profiles, materials, and adhesives makes this task highly challenging. Additional factors, such as complex boot bonding, disbond identification and classification, and material mixing, further complicate the process. To address these challenges, the Composites Manufacturing Technology Center (CMTC), in collaboration with Lockheed Martin Aeronautics and the Pennsylvania State University Applied Research Laboratory, developed advanced inspection, adhesive mixing, and bonding techniques to improve manufacturing efficiency and reduce labor and defects.

ManTech Response

- Navy ManTech evaluated inspection technologies, including digital laser shearography (thermal and vacuum excitation) and thermography, to address the lack of a reliable nondestructive inspection method, which previously relied on subjective, non-repeatable visual assessments.
- Selected MoviTherm thermography technology to standardize and classify disbonds.
- Analyzed liquid epoxy mix-on-demand systems and selected the GRACO mix-on-demand system for improved efficiency.
- Developed a mix-on-demand technology to prepare the exact amount of material needed for each application, ensuring consistent bond line thickness. Previously, entire material kits were prepared regardless of the required amount, leading to inconsistent epoxy application.
- Designed and demonstrated a production-ready solution for bonding complex, custom-molded boots using a custom-molded boot bonding tool, inflatable bladder, and consistent bond pressure, reducing variation and time compared to traditional methods.

Movitherm inspection system.



Complex-molded boot example.

ManTech Impact & Benefits

- Projected $6.4M in savings over the life of the F-35 program.
- Achieved material savings by purchasing liquid epoxy in bulk instead of smaller, pre-packaged kits.
- Reduced mix-on-demand process time by 80%.
- Ensured boot bond line thickness met required tolerances.
- Implementation of the improved process began in 2024.RS)

Navy ManTech-developed technology improvements to complex boot inspection, adhesive mixing, and bonding techniques will save F-35 Program $6.4M.

Pipecrawler Tool Reduces Submarine Construction Span Time by Enabling Internal Pipe Closure Joint Access and Repair

Manufacturing Challenge

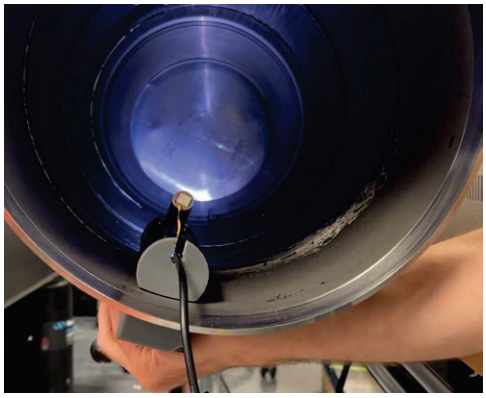
In submarine construction, final pipe installations form "closure joints"— the last welds that seal off internal access to the piping systems. Unlike earlier welds, closure joints cannot be reworked from the inside once completed. Any defects discovered typically require disassembly or removal of critical components, leading to significant delays and increased labor costs. Navy ManTech developed a tool that enters large-diameter piping through existing access points and performs internal inspection and weld repair – dramatically reducing repair-related downtime and improving overall construction efficiency.

ManTech Response

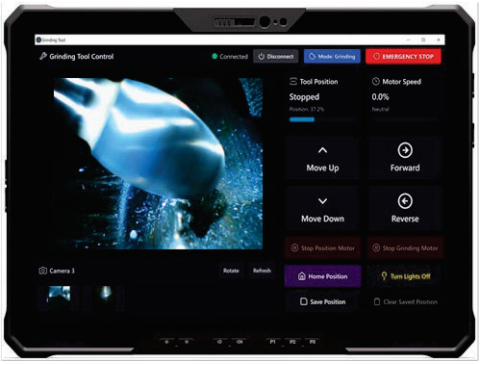
- Navy ManTech's Center for Naval Metalworking (CNM) developed a prototype tool capable of entering through a small 2-inch access point, navigating to the desired location using a magnetically coupled external handle, and performing precision grinding and blending operations while meeting stringent cleanliness requirements.
- The tool features three integrated cameras for navigation and grinding, a simplified Human-Machine Interface (HMI) with precision speed and depth controls, an independent vacuum tool for debris removal, and a 45-foot tether for control and vacuum hose.
- Successfully removed 100% of weld surface defects, verified through visual confirmation.
- Reduced defect repair time to an average of 8 hours per closure joint, compared to the previous ~2 weeks.

ManTech Impact & Benefits

- The tool's simple yet effective design allowed for near-instant implementation in Q4 FY25 at General Dynamics Electric Boat, delivering immediate and measurable benefits across the shipyard.
- Its compact form factor and high-quality imaging capabilities have attracted interest from additional shipyards, expanding its potential applications beyond the initial use case.
- The project is projected to save $10.6M across VIRGINIA and COLUMBIA Class submarines over five years, achieving a return on investment (ROI) of 4.5:1.



Magnetic coupling of the pipecrawler tool inside a large-diameter pipe.



HMI interface developed for operation of the pipecrawler tool.

Participants: *Office of Naval Research Navy ManTech, Advanced Technology International / Center for Naval Metalworking (CNM), PMS 397, PMS 450, General Dynamics Electric Boat, GE Vernova*

The Navy ManTech-developed tool is estimated to save $10.6M over five years for submarine construction and eliminate the need to remove critical equipment or previously installed piping, transforming a process that once took weeks into a task completed in a single shift.

DEFENSE LOGISTICS AGENCY (DLA) MANUFACTURING TECHNOLOGY PROGRAM OVERVIEW

OVERVIEW

The Defense Logistics Agency (DLA) ManTech program mission is to develop and deliver new capabilities through applied technologies and innovative solutions to enhance warfighter sustainment. Working with its diverse supply chain, the nine DLA ManTech Programs fund the advanced technology development needed to improve manufacturing capability throughout a product's life cycle. As illustrated, DLA Research & Development (R&D) programs deliver responsive, innovative solutions that improve Department of War readiness, support current strategies and operations, and anticipate future logistics and manufacturing needs at lower cost and risk. DLA ManTech developments provide the crucial link between invention and application by maturing, scaling up, and validating advanced manufacturing technology in "real-world" environments. The program goal is to provide a path to low-risk technology implementation by small businesses, defense unique suppliers, and to the military depots and shipyards. By anticipating and addressing production and sustainment problems before they occur, readiness levels increase, and sustainment costs are decreased.

ORGANIZATION

The DLA ManTech Program is aligned under the Office of the Under Secretary of War Acquisition and Sustainment, Assistant Secretary for Sustainment, as the nation's logistics combat support agency. Within DLA's Information Operations directorate, DLA R&D improves warfighter support by addressing military needs, internal business processes, and industrial base manufacturing challenges. DLA ManTech works with the Military Engineering Support Activities to conduct annual strategic assessments to identify and fund efforts to meet warfighter needs.

DLA R&D's ManTech program portfolio areas are:

1. Battery Network (BATTNET)
2. Casting PRO-ACT (CASTING)/ Forging PRO-FAST (FORGING)
3. Defense Logistics Information Research (DLIR)
4. Military Unique Sustainment Technology (MUST)
5. Applied Research & Testing Emerging Technologies (ARTET)
6. Subsistence Network (SUBNET)
7. Additive Manufacturing (AM)
8. Advanced Microcircuit Emulation (AME)
9. Strategic Materials

DLA MANUFACTURING TECHNOLOGY

INVESTMENT STRATEGY

DLA R&D's ManTech program develops innovative, agile, and secure logistics solutions that ensure warfighters receive critical support when and where they need it most. DLA R&D focus areas directly align to four of the SecDef's priorities: Core Readiness, Nuclear Modernization, Munitions and Energetics Organic Industrial Base, and Combatant Commands (COCOM) Support Agency Funding. This critical alignment drives how DLA ManTech sustains warfighter readiness and joint support across the Services.

DLA ManTech's priority of effort

DLA R&D executes its ManTech program in adherence with the DLA Strategic Plan, DLA Transforms: A Call to Action ongoing transformation.

With over a year of progress toward this plan, DLA is sharpening its efforts, guided by three agency-wide priorities for fiscal year 2026. The FY26 priorities represent strategic refinement that reflects where DLA must concentrate its efforts to sustain momentum and achieve maximum mission impact.

Land & Maritime Product Test Center Tooling for Testing Lab

Manufacturing Challenge

The DLA Land & Maritime Product Test Center (PTC) faced significant challenges in securing a reliable vendor to consistently provide and maintain test fixtures. To address aging fixtures and reduce vendor dependence, the test center leadership and engineering team made the strategic decision to develop new fixtures in-house. This innovative approach was critical to ensuring the continuation of enhanced testing capabilities at the PTC in Columbus, Ohio, while mitigating risks associated with vendor reliance.

ManTech Response

The Test Center embarked on its first-ever initiative to create an in-house process for developing test fixtures. This effort positioned the team to future-proof DLA's testing capabilities by reducing vendor requirements and ensuring resiliency against potential disruptions. Recognizing the need for advanced testing capabilities, DLA R&D Additive Manufacturing (AM) partnered with DLA MSC Land & Maritime to establish the state-of-the-art Tooling for Testing Lab. This lab equips DLA with the agility and resources to meet current and future testing demands while maintaining industry standards. Key components of the effort include:

- Industrial FFF printer capability using ultra-polymer materials.
- High-resolution handheld 3D scanner.
- Portable high-end workstations for modeling and scanning.
- On-demand, on-site 3D printing capability for fixture production.
- Workforce training in geometry capture, dimensional inspection using the 3D scanner, and 3D CAD software.

ManTech Impact & Benefits

Integrating 3D printing and scanning technologies into DLA Product Testing Centers marked a significant shift from traditional manufacturing methods, enabling substantial improvements across the board:

- Accelerated rapid prototyping and fabrication of custom test fixtures using 3D printing.
- Reduced procurement costs by an estimated 10% compared to previous vendor-dependent processes.
- Substantially decreased downtime caused by vendor response delays.
- Achieved design improvements that enhanced efficiency and effectiveness in testing outcomes.
- Increased production speed for faster testing cycles, improving overall readiness.
- Enabled fixture part creation using additive manufacturing processes, allowing the Mechanical Product Testing Center to develop specialized expertise in identifying failure modes unique to these components—a critical capability for sustaining the warfighter in the future.

Participants: *DLA R&D Additive Manufacturing Program, DLA Land & Maritime, Industry*

Establishes Tooling for Testing Lab, equipping DLA with 3D printing and scanning features for in-house test fixture production that will set the supply chain and sustain the warfighter.

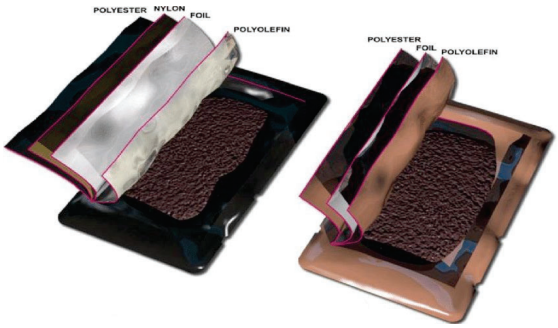
Enables Compostable Meal Bag Development for Military Operational Rations

Manufacturing Challenge

The Department of Defense (DoD) faces significant logistical and environmental challenges in managing the disposal of Meal, Ready-to-Eat (MRE) packaging. Each year, over 900 tons of MRE meal bag waste are generated, creating a substantial burden during contingency operations. Disposal methods, such as incineration and burn pits, are costly, high-risk, and contribute to an annual waste management expense of nearly $20 million. The use of open burn pits also produces toxic emissions, posing long-term health risks to military personnel—an issue addressed by the Honoring our PACT Act of 2022. A major barrier to adopting sustainable packaging solutions is the reliance on outdated military specifications based on material thickness rather than functional performance. This approach limits innovation and makes it difficult, costly, and time-consuming to qualify new materials, such as compostable polymers, that could address the waste problem.

ManTech Response

- The DLA ManTech program invested approximately $700K in a project with the University of Massachusetts Lowell (UML) to develop a performance-based framework for qualifying compostable MRE meal bags. The research focuses on identifying key mechanical metrics (e.g., puncture resistance, seal strength) and performance requirements for thermoformed meal bags, using current MRE bags as a baseline.
- The project team is testing commercially available compostable films through a series of rigorous assessments, including rough handling, insect infestation resistance, and biodegradability, to ensure they meet the demands of military logistics.
- This collaborative effort involves key partners across the supply chain, including the U.S. Army DEVCOM Soldier Center, the U.S. Department of Agriculture (USDA), MRE assembler AmeriQual, and UMass Dartmouth (UMD), to ensure the solutions are practical and scalable for manufacturing.



ManTech Impact & Benefits

- Reduces Logistical Burden and Costs: Enables the transition to compostable meal bags, significantly reducing the nearly $20 million spent annually on waste disposal logistics.
- Protects Warfighter Health: Minimizes the need for burn pits, reducing Soldiers' exposure to harmful toxic emissions and associated long-term health risks.
- Modernizes Military Specifications: Establishes performance-based packaging standards, replacing outdated thickness requirements. This streamlines the process for evaluating and adopting innovative, sustainable materials more efficiently and affordably.
- Strengthens Industrial Base Collaboration: Builds critical partnerships between academia (UML, UMD), government research labs (DEVCOM, USDA), and industry (AmeriQual, film suppliers) to accelerate the transition of sustainable technologies from research to operational readiness.

Participants: *DLA ManTech, DLA Troop Support Subsistence, University of Massachusetts Lowell (UML), U.S. Army Combat Capabilities Development Command Soldier Center (DEVCOM SC), U.S. Department of Agriculture (USDA-ARS), AmeriQual, UMass Dartmouth (UMD), DLA J3, & DLA J6.*

Provides a field-ready, biodegradable alternative to plastic MRE packaging, paving the way for a transition to PFAS-free materials and more sustainable military operations.

Small Business Innovation Research (SBIR) Directly Applied Separators (DAS) for Next Generation Lithium Battery

Manufacturing Challenge

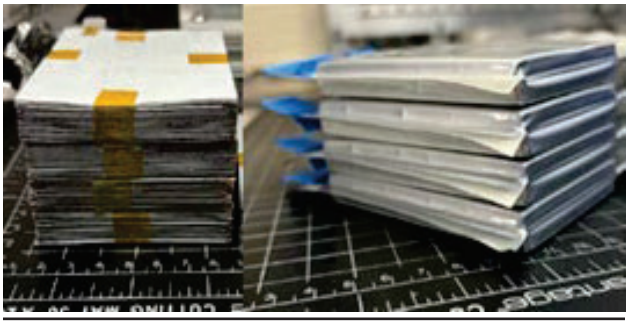
Reliance on foreign battery components results in high cost, poor reliability and limits the growth of a domestic supply chain. This puts at risk the availability and access to critical advanced batteries like Conformal Wearable Battery (CWB), BB2590, 6T and other battery systems. This project focused on a roll-to-roll manufacturing process to coat separator materials directly onto electrode surfaces. DAS supports domestic battery manufacturing and low cost, advanced cell production.

ManTech Response

- Developed roll-to-roll process to coat separator layer directly on a battery electrode.
- Exhibited technology in multiple cell formats with cell manufacturing collaborators.
- Demonstrated technology in a 4S, 160 Wh battery.
- Demonstrated compatibility with several common Li-ion battery anode and cathode chemistries.
- Pilot coating system supports continuous DAS electrode production.
- Coating demonstrates exceptional dimensional stability and thermal stability during high temperature testing.
- Simplified cell stacking.

ManTech Impact & Benefits

- Reduced separator material costs by 90%. Decreases Li-ion cell level cost by up to 20%.
- Eliminates the need to stock unique separators for each application.
- Simplifies traditional stacking process/machine setup and reduces downtime and equipment cost.
- Improves safety during internal short circuit (nail penetration) stable voltage decay over 12 hours rather than a failure event.
- Enhances thermal stability temperature of cells to maintain electrical isolation during and after > 180 °C heating.
- Improves charge/discharge performance.
- Complies with current Li-ion battery manufacturing.



DA 38+ layer Li-ion cell(s) build

UAV flown with 4S-16.2 V DA separator battery

Participants: *BATTNET, Small Business Innovation Program, Imperia Batteries® division of Physical Sciences Inc.*

Directly Applied Separators for battery production streamlines manufacturing and lowers costs.

SBIR Advanced Battery Manufacturing for Safe, High-Performance, Low-Cost Li-ion Batteries

Manufacturing Challenge

For many military operations, batteries continue to limit advancements in technological capabilities. There is a continued need for batteries that run longer, weigh less, cost less, and have improved performance under high loads. Replacing traditional slurry casting of active materials with high-speed electroplating reduces raw material costs, eliminates non-value-added process streams, and reduces the time required to synthesize the active material.

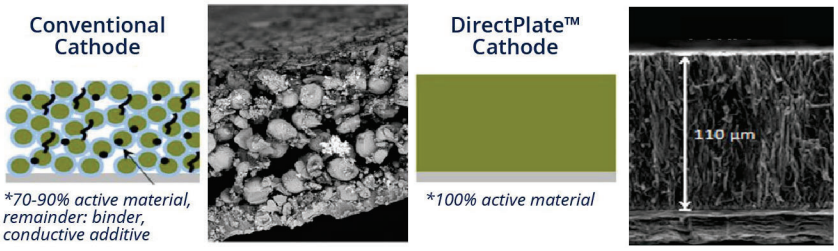
ManTech Response

- Designed and developed a roll-to-roll, single-step manufacturing process for electrodes with higher volumetric and gravimetric energy capacity.
- Significantly reduces cost of manufacturing cells using rapid electroplating technology.
- Provides a reliable domestic source of Li-ion cells for military batteries.

ManTech Impact & Benefits

- Achieved a 50% cost reduction compared to existing producers.
- Increased energy density by 40% over conventional electrodes.
- Reduced thermal runaway risk by 75% and successfully passed ballistic testing.
- The DirectPlate™ manufacturing process reduced the carbon footprint of electrode production by 40% compared to traditional methods.

Domestic manufacturer of world-class battery electrodes from low-purity raw materials



Deposition of active battery material in a single step

Participants: *BATTNET & Small Business Innovation, Xerion Advanced Battery Corp.*

Domestic Supply Chain Capability to Manufacture Li-ion Batteries

MANUFACTURING SCIENCE AND TECHNOLOGY PROGRAM
OVERVIEW

OVERVIEW

The OSD'S Manufacturing Science and Technology Program (MSTP) focuses on cross-cutting defense manufacturing needs – those that are beyond the ability of a single service to address. The program stimulates the early development of manufacturing processes and enterprise business practices concurrent with science and technology (S&T) development to achieve the largest cost-effective impact and to facilitate the development of leading-edge capabilities to our warfighters.

The program focuses heavily on satisfying the manufacturing technology needs for the DoD's critical technology areas including: trusted artificial intelligence and autonomy, biotechnology, integrated network systems-of-systems, directed energy, microelectronics, quantum science, hypersonics, space technology, renewable energy generation and storage, advanced computing and software, human-machine interfaces, future generation wireless technology (FutureG), advanced materials, and integrated sensing and cyber.

ORGANIZATION

The OSD ManTech office is located under the Assistance Secretary of Defense for Science and Technology within the Office of the Undersecretary of Defense for Research and Engineering. MSTP is one of three components of the OSD ManTech Office, the other two being the DoD Manufacturing Innovation Institutes (MIIs) and Manufacturing Education and Workforce Development (M-EWD).

MANUFACTURING SCIENCE AND TECHNOLOGY PROGRAM

INVESTMENT STRATEGY

The MSTP focuses its research and development investment portfolio on shared defense manufacturing needs using a set of identified joint, defense-critical, and sometimes high-risk manufacturing technology areas. The Joint Defense Manufacturing Technology Panel (JDMTP) helps identify the defense manufacturing technology gaps and assists MSTP in determining potential joint investment opportunities. MSTP then assesses these opportunities against R&E critical technology areas and issues a call for project proposals that must feature a government office lead. Project tenets must include:

- DoD Enterprise-wide issues
- Joint service applicability
- Enhanced manufacturability and producibility of a process or component
- Risk beyond reasonable and normal industry and program office
- Defense-essential or defense-unique requirement

Technology transition and joint-service or multi-system application are key factors in selecting MSTP projects. All potential MSTP projects are required to have a clear technology transition plan and target along with endorsement from the potential project team's program office. Funding is typically a combination of MSTP investment, component ManTech program investments, program office or transition office investments, and industry cost share. Technical experts are recruited from the DoD Services or agencies to serve as government program managers and are responsible to support technical execution, conduct financial management, and ultimately transition the technology to fielded systems.

The MSTP investment portfolio is broken down into four categories: Advanced Electronics and Optics, Advanced Materials and Manufacturing, Enterprise and Emerging Processes, and Advanced Energetics Manufacturing.

Joint Clothing Textile Modernization Initiative (JCTMI)

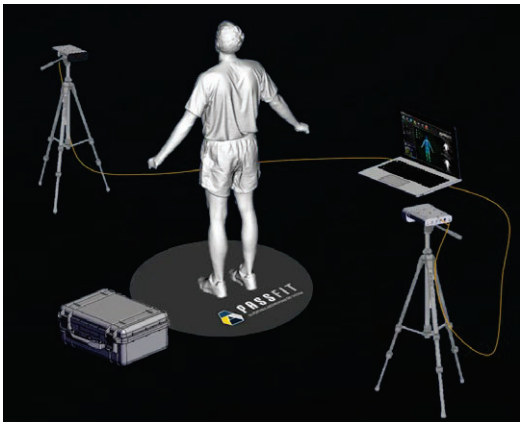
Manufacturing Challenge

The Department of Defense (DoD) Clothing and Textiles (C&T) manufacturing sector faces significant challenges impacting efficiency, production timelines, and supply chain reliability. A shrinking pool of domestic suppliers has left many items sole-sourced or unavailable, while aging equipment and unpredictable demand further extend lead times and discourage vendor participation. Restrictive and non-standardized government requirements hinder the adoption of automation and artificial intelligence, while long response times and development cycles delay the introduction of new technologies. Overcoming these challenges requires innovative solutions, streamlined processes, and stronger partnerships to ensure the sector remains resilient and adaptable to future needs.

ManTech Response

The JCTMI program is driving innovation and delivering solutions to address critical Manufacturing Challenges:

- Product Lifecycle Management (PLM) Platform: A robust PLM system with integrated digital tools to streamline processes.
- Apparel Tech Pack Development: Comprehensive technical documentation to support manufacturing workflows.
- 3D Predictive Body Scanning Module: Advanced technology to enhance precision and efficiency in garment production.
- Relational Sizing Algorithms: Data-driven algorithms to improve fit and sizing accuracy.



Development of a portable 3D scanner that can capture body dimensions of fully clothed warfighters to be used for the design, development and size prediction of uniforms and equipment.

ManTech Impact & Benefits

The ManTech program is revolutionizing manufacturing processes to enhance operational readiness and efficiency:

- Streamlining Processes: Eliminated manual workflows, outdated IT platforms, and paper-based processes, achieving 15-35% efficiency gains.
- Addressing Capability Gaps: Digitalized and automated technical requirements, reducing barriers for new vendors and improving response times by 50%.
- Adopting Cutting-Edge Technologies: Integrated automation, 3D design, and AI, improving production lead times and communication efficiency by 30-50%.
- Enhancing Warfighter Protection: Accelerated the deployment of mission-critical technologies, improving warfighter protection and readiness by 50%.

Participants: *Government: U.S. Army, U.S. Air Force, U.S. Marine Corps, U.S. Navy; Department Homeland Security (DHS); Defense Logistics Agency (DLA); Army Compat Capabilities Development Command Solider Center (DEVCOM-SC). Associations: American Apparel Footwear Association (AAFA), Advanced Functional Fabrics of America (AFFOA). Industry: Computer Generated Solutions Inc (CGS Inc), Alvanon, Clothing & Textile Companies. Academia: University of Michigan Transportation Research Institution (UMTRI), Montana State University (MilTech)*

OSD ManTech Investment: A $3.2M investment to accelerate innovation and modernize manufacturing processes, ensuring impactful results.

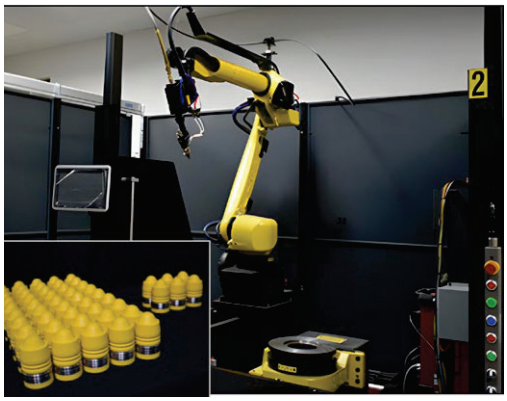
Advanced Manufacturing of High-Density Reactive Materials (HDRM)

Manufacturing Challenge

Conventional manufacturing technologies for warhead materials were incompatible with High-Density Reactive Materials (HDRM), a new class of materials offering significant performance enhancements, including increased blast overpressure, lethality, and weapon effectiveness. There was an urgent need for advanced manufacturing technologies to fabricate HDRM warheads efficiently and safely.

ManTech Response

- Evaluated three advanced manufacturing technologies, down-selected one, and matured the selected technology from MRL 4 to MRL 7.
- Streamlined the manufacturing process through automation, reducing touch labor, lowering costs, improving production rates, and enhancing safety.
- Invested $4.45M through Army ManTech to optimize the manufacturability of HDRM warheads.
- Introduced advanced manufacturing technologies and automation to ensure the safe handling of combustible metal powders while preserving their chemical and mechanical properties, leading to enhanced performance.
- Supported joint service efforts to integrate reactive materials into various munition portfolios, with this ManTech initiative playing a critical role in maturing manufacturing technologies and enabling the integration of HDRM into advanced weapon systems.



An example of BAM ALaMO warhead prototypes and a robotic welding arm designed to ensure the safe handling of reactive materials and reduce touch labor.

ManTech Impact & Benefits

- Enhanced Capabilities and Cost Savings: Increased DoD capabilities while reducing the cost of new technology.
- Scalability: Enabled production of munitions ranging from 20mm projectiles to full-size missile warheads exceeding 10 inches in diameter, providing warfighters with enhanced lethality and enabling weapon designers to pursue miniaturization or lethality improvements.
- Increased Production Capacity: Boosted production capacity from 10 units per month to 500 units per month, while reducing touch labor by over 50%.
- Cost Reductions: Lowered HDRM unit costs by 30% and total munition costs by approximately 25%.
- Future Applications: The Navy is actively evaluating this technology for HDRM in 6.5” OD munitions as part of the Multi-mission Affordable Capacity Effector (MACE) program.

Participants: *OSD ManTech, Office of Naval Research, U.S. Army DEVCOM – ARL, U.S. Naval Postgraduate School, academia, non-traditional defense contractor (small business)*

This effort demonstrates the transformative impact of advanced manufacturing technologies in improving performance, scalability, and affordability for next-generation munitions.

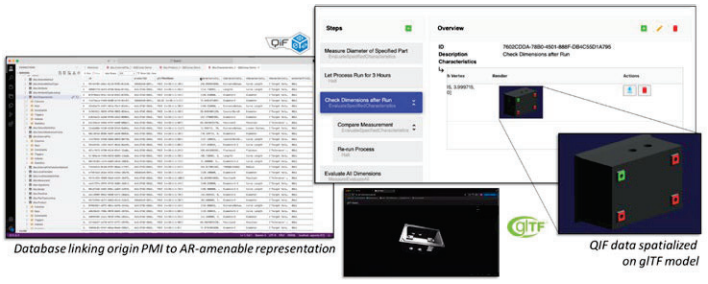
Quality Control, Quality Assurance Companion (QQComp)

Manufacturing Challenge

Inspecting complex systems is often costly and time-consuming, and while augmented reality (AR) systems have the potential to enhance productivity, they frequently face challenges in integrating with existing product lifecycle management (PLM) tools and devices. The core issue lies in a lack of interoperability, as traditional technical data packages (TDPs) are not designed for seamless data exchange between critical information, such as a part's original design specifications and its inspection results. This disconnect leads to inefficiencies and delays in sharing quality data with program offices, slowing the approval process for components and systems.

ManTech Response

- The Quality Control, Quality Assurance Companion (QQComp) project developed a comprehensive system leveraging digital manufacturing data standards to streamline inspection processes. Key features include:
  - A database that links design requirements, step-by-step inspection plans, and final results.
  - A website for creating detailed inspection plans and mapping them to specific part features, such as dimensions.
  - A data translation pipeline that automatically populates the database using a standardized data exchange format.
  - An augmented reality (AR) application that provides inspectors with step-by-step instructions based on the plans stored in the database.



QQComp spatially links product manufacturing information to design definitions and lightweight three-dimensional models.

- QQComp was developed using an agile approach, continuously addressing challenges and needs identified by transition partners NAWCAD Lakehurst and Warner Robins Air Logistics Complex (WR-ALC).
- Supported by OSD ManTech, DAF ManTech, and DLA ManTech, the project received $1.6M and $0.3M in funding, demonstrating a collaborative effort to close technical gaps in model-based quality assurance.

ManTech Impact & Benefits

- Delivered an enterprise-level solution for curating inspection jobs, resources, and results across the Organic Industrial Base (OIB).
- At WR-ALC, incorporated model-based definition best practices, reducing inspection time from 45 hours to 8 hours, saving approximately $8K per inspection or $1.5M annually.
- At NAWCAD Lakehurst, developed an optimization prototype tool to plan weekly inspection jobs, balancing physical resources, job complexity, and operator skill levels.

Participants: *QQComp is the result of a collaborative effort by the Air Force Research Laboratory (AFRL), Pacific Naval Information Warfare Center (NIWC), Army Engineer Research and Development Center (ERDC), and Navy Naval Surface Warfare Center (NSWC) Crane. The technology was successfully demonstrated and delivered to Warner Robins Air Logistics Complex (WR-ALC) and Naval Air Warfare Center Aircraft Division (NAWCAD) Lakehurst.*

QQComp streamlines quality assurance by cutting inspection time from 45 hours to 8 hours, saving ~$1.5M annually while enhancing interoperability and efficiency across manufacturing systems.

Zinc Anode Process Enhancement

Manufacturing Challenge

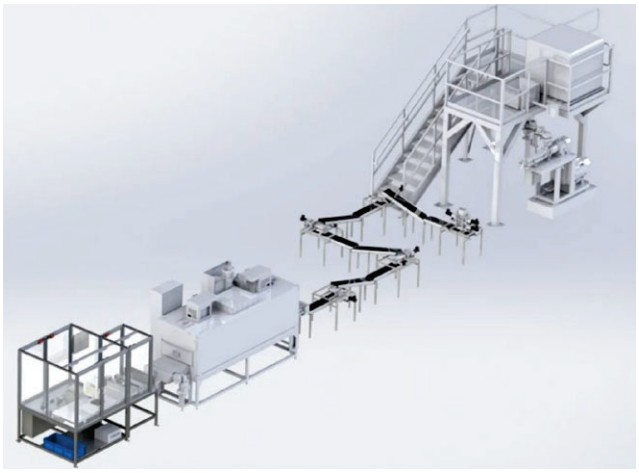
The U.S. Navy is investigating Next Generation Main Storage Batteries to support future ships requiring Large Energy Storage Systems. However, certain technologies, such as Nickel-Zinc batteries, rely on labor-intensive, operator-dependent manufacturing processes that are prone to variation and result in high scrap rates. These inefficiencies limit manufacturers' ability to meet near-term demand for testing and evaluation.

ManTech Response

- Leveraged Æsir's expertise in next-generation battery manufacturing to fund a Zinc Anode Enhancement effort aimed at semi-automating the anode manufacturing process for Nickel-Zinc batteries.
- Validated the process through successful testing of extrusion, calendering, drying, laminating, and cutting steps.
- Developed plans to build large Navy test prototype cells to validate battery performance.
- Supported by an OSD ManTech investment of $909K.

ManTech Impact & Benefits

- Improved cell and battery reliability through enhanced production capacity and automation.
- Reduced labor requirements from 9.3 hours per battery to 1 hour and decreased scrap rates from 32% to 5%.
- Increased production rates, enabling Æsir to meet the Navy's testing roadmap for Large Energy Storage Systems and scale up for next-generation power needs.
- Enhanced reliability and production speed with broad applicability across a wide range of DoD systems and platforms.



An example of the automated production floor layout which will decrease scrap rates, improve reliability, and increase production rates.

Current manufacturing processes are manual touch labor intensive, operator dependent, and susceptible to variation resulting in high scrap rates.

Participants: *PMS 450X, NAVSEA 05Z, General Dynamics Electric Boat, PMS 392, NSWC Crane, Æsir Technologies, SUB 073, ONR, PMS 390, PMS 4351, Multiple Commercial Vendors*

Zinc Anode Process Enhancement reduces labor from 9.3 hours to 1 hour per battery and scrap rates from 32% to 5%, boosting production capacity to meet Navy energy storage demands.

DoD MANUFACTURING INNOVATION INSTITUTES (DoD MIIs)

OVERVIEW

Using 10 U.S. Code 4841 authorities, the Office of the Secretary of Defense Manufacturing Technology Office (OSD ManTech) sponsors a network of Department of Defense (DoD) Manufacturing Innovation Institutes (MIIs). The first institute launched in 2012, with subsequent institutes established through 2020. The DoD MIIs seek to revitalize the U.S.'s domestic manufacturing capability through domestic public-private partnerships that enhance America's strategic competitiveness while enabling the military of tomorrow.

IMPACT AND INFLUENCE

Meeting Direct Military Needs

Initial OSD investment demonstrated value in meeting DoD priorities, prompting over $580 million in direct Military Service investments for DoD-directed projects as of FY 2025. OSD continues to fund strategic and joint technical, workforce development, and industrial base enhancement initiatives.

Reversing the Last Supper Consolidation

Industry membership predominantly comprises non-traditional, commercially focused companies. Over 50% of DoD MII members generate less than 10% revenue from DoD. The DoD MIIs are enabling these emerging commercial manufacturers to contribute to the DoD supply chain.

Prototypes, Demonstrations, and Transitions

As of 2025, 57% of research and development projects have yielded prototype demonstrations, with nearly a third transitioning to DoD or commercial products.

Education and Workforce Development

Between FY 2020 and FY 2025, the DoD MIIs trained almost 700,000 students, teachers, and workforce members in advanced manufacturing skills.

National Presence

The DoD MIIs comprise over 2,200 member organizations, representing industry (51% small business, 11% large business), academia (21%), Government (7%), non-profits (7%), and other (2%) spanning 49 states, Washington D.C., and Puerto Rico.

Adversarial Imitation

The DoD MIIs are on the frontlines of global manufacturing competition. After observing key U.S. investments, China launched its Manufacturing Innovation Centers initiative in 2016. The now 33 centers mirror and expand upon DoD MII technology areas, receiving significantly higher funding (10-100x). The Department of Commerce recently confirmed China has over 100 staff tracking the DoD MIIs.

MII National Response Initiatives

Organic Industrial Base Modernization

OSD ManTech tapped the DoD MIIs to accelerate technology innovation across depots, arsenals, and shipyards. The MIIs vetted proposals and awarded $2.5 million to five companies advancing breakthroughs in robotics, artificial intelligence, and cybersecurity. The impact was immediate—four solutions were adopted as best practices across the organic industrial base, driving faster modernization, greater efficiency, and stronger resilience in support of the warfighter.

Hypersonics Challenge

DoD called upon America Makes and LIFT to push the boundaries of materials science and manufacturing to rapidly meet the extreme demands of hypersonic flight. America Makes focused on advancing additive manufacturing techniques for high-temperature metals. LIFT tackled materials and manufacturing processes for hypersonic vehicles. These efforts yielded innovations such as advanced thermal protective coatings, novel high-temperature materials, and cutting-edge integrated computational materials engineering tools.

Manufacturing at the Point-of-Need Challenge

The U.S. Army called up the DoD MIIs to equip forward-deployed forces in austere environments. Quickly rallying the institutes, a panel of DoD judges selected six quick- turn projects from five DoD MIIs. Just nine months later, these teams showcased innovative technologies at the Cold Regions Research and Engineering Laboratory, including an expeditionary 3D printer, a bioreactor for producing blood in the field, and a portable repair factory.

The DoD MIIs are game-changing catalysts that serve as a connective tissue uniting innovative industrial networks with emerging technology and market sectors in the U.S.

Convening this network of visionaries enables DoD to connect with the network needed to bring new technologies to U.S. warfighters.

DoD MIIs connect organizations and investments to enable the affordable, rapid transition of defense-essential technologies

America Makes: National Additive Manufacturing Innovation Institute

Youngstown, OH | www.americamakes.us | Established 2012

America Makes strengthens U.S. capabilities in 3D printing and additive manufacturing

Manufacturing x Digital: Digital Manufacturing and Cybersecurity Institute

Chicago, IL | www.mxdusa.org | Established 2014

MxD drives digital adoption in manufacturing

National Advanced Materials Manufacturing Innovation Institute

Detroit, MI | https://lift.technology | Established 2014

LIFT connects materials, processes, systems, and talent

AIM Photonics: American Institute for Manufacturing Integrated Photonics

Albany & Rochester, NY | www.aimphotonics.com | Established 2015

AIM Photonics shapes development of the photonic integrated circuit industry

NextFlex: America's Hybrid Electronics Institute

San Jose, CA | www.nextflex.us | Established 2015

NexFlex innovates electronic packaging and printing

BioFabUSA: Advanced Regenerative Manufacturing Institute

Manchester, NH | armiusa.org | Established 2016

BioFabUSA enables the scalable manufacturing of cell-based therapies

The ARM Institute: Advanced Robotics for Manufacturing

Pittsburgh, PA | www.arminstitute.org | Established 2017

The ARM Institute advances smart, collaborative robotics

BioMADE: Bioindustrial Manufacturing and Design

Twin Cities, MN & Emeryville, CA | www.biomade.org | Established 2020

BioMADE builds a sustainable, domestic bioindustrial manufacturing network

MANUFACTURING EDUCATION AND WORKFORCE DEVELOPMENT (M-EWD)
OVERVIEW

OVERVIEW

The Office of the Secretary of Defense's Manufacturing Technology (OSD ManTech) Program promotes advanced manufacturing technologies and processes by working together with government agencies and private industry. OSD ManTech oversees the Manufacturing Education and Workforce Development Program (M-EWD) and manages the federal government's engagement with the eight Department of Defense Manufacturing Innovation Institutes (DoD MIIs), each specializing in a specific area of advanced manufacturing technology.

M-EWD collaborates with internal and external industrial base stakeholders and educational institutions to provide strategic guidance and targeted investments for workforce initiatives. These efforts focus on sustaining military advantage, enhancing supply chain resilience, and ensuring industrial readiness in the face of technology-driven global competition.

BUILDING REGIONAL STATE ECOSYSTEMS

Iowa Ammunition Plant — LIFT led a collaborative, multi MII team focusing on the modernization of the Iowa Army Ammunition Plant (IAAAP) and American Ordinance (AO). The collaborative project between LIFT, ARM, and MxD utilized data analytics that ensures the best solutions are brought to each workforce challenge and that these studies are adaptable to specific industries, regions, and technologies.

Indiana Workforce Study — This is an Agency Directed Project by ManTech to conduct research on Indiana's workforce in the manufacturing sector in Indiana to better understand both supply-chain and workforce and ecosystem. This project advances issues of concern to small and mid-sized manufacturers (SMMs) in the state and helps determine gaps in the state of Indiana.

MANUFACTURING EDUCATION AND WORKFORCE DEVELOPMENT (M-EWD) PROGRAM

UPSCALING MII RESOLUTIONS

ARM Competency Framework — In 2019, the ARM Institute created a robotics competency framework to clarify advanced manufacturing roles and create a common language across stakeholders. In 2024, OSD ManTech provided ARM with the funding to work with MxD, NextFlex and America Makes to build out their competency frameworks. The program will culminate in a cross-walk of the various competency frameworks to best identify skill and career adjacencies across a sub-set of advanced manufacturing focus areas.

NextFlex Military Spouse Program (MilSTTEM) — In collaboration with Central New Mexico Community College (CNM), this program offers skill-based training and employment support tailored to military spouses near Kirtland Air Force Base. The initiative leverages CMN's Internet of Things and Rapid Prototyping bootcamp to provide opportunities in emerging technologies and advanced manufacturing fields.

LEVERAGING INTERAGENCY RELATIONSHIPS

OSD ManTech M-EWD routinely collaborates with the National Standards of Standards and Technology (NIST) and the Manufacturing USA Program Office to tackle broad-ranging Workforce training needs and data models to inform future activities. NIST has been instrumental in helping draw attention to the successes of M-EWD programs and highlighting the value of a career in Manufacturing.

OSD ManTech M-EWD partners with many agencies across the Federal government through its membership in the Subcommittee for Advanced Manufacturing. As a co-chair for the Workforce Development working group, M-EWD ensures the interagency community is addressing Administration goals in equipping the workforce of tomorrow in Advanced Manufacturing principles.

EWD Focused on Mission Enabling Capabilities

The M-EWD program provides strategic leadership in advanced manufacturing talent development across the organic and defense industrial bases in support of the DoD Mission to provide our Warfighters with what they need to deter and win wars.

AIM Photonics' workforce program aims to cultivate expertise in integrated photonics by offering specialized education, training, and hands-on experience to prepare individuals for careers in the photonics industry.

BioMADE's workforce program focuses on developing a skilled workforce in biomanufacturing through education, training, and collaboration with industry and academic partners to advance biotechnology and biomanufacturing capabilities.

America Makes' EWD efforts aim to build a strong talent pipeline in additive manufacturing (AM) to support the U.S. organic and defense industries.

LIFT offers skilled trades certification courses in some of the most in-demand advanced manufacturing careers – right from its Learning Lab in Detroit and Puerto Rico.

ARM Institute - Roboticscareer.org is a comprehensive platform designed to support individuals pursuing careers in robotics by providing access to various educational resources, including training programs and industry certifications.

MxD's Virtual Training Center offers interactive, self-paced learning modules and simulation-based training in digital manufacturing and cybersecurity, designed with industry experts to meet current standards and real-world challenges.

BioFabUSA is working to close educational skills gaps in tissue engineering and organ manufacturing through accessible educational and training opportunities.

NextFlex's training programs provide cutting-edge education and hands-on training in flexible hybrid electronics (FHE), aimed at developing a skilled workforce to meet the demands of this emerging technology sector.

A robust, accessible workforce skilled in advanced manufacturing critical for producing and maintaining Warfighter systems, components, and supplies.

JOINT ADDITIVE MANUFACTURING WORKING GROUP (JAMWG)
OVERVIEW

OVERVIEW

The JAMWG is a Department of Defense (DoD) community focused on communication and coordination among the Military Services and Defense agencies to maximize the application of additive manufacturing (AM) for the U.S. warfighter and sustainers.

The JAMWG develops strategies to accelerate additive manufacturing adoption, coordinates technology development efforts, and engages with industry through the DoD Manufacturing Innovation Institutes (MIIs). By fostering collaboration and innovation, JAMWG ensures the integration of cutting-edge manufacturing technologies to enhance military capabilities and operational readiness.

JAMWG was established to leverage advanced manufacturing technologies for military operations in contested logistics environments. Its objectives include accelerating the qualification and certification of AM materials, machines, and parts; securing a common digital thread for data and model sharing across DoD and industry; expanding education and workforce development in AM; and developing DoD policy and guidance for AM integration. Through improved communication and collaboration, JAMWG supports future planning, exercises, and the strategic needs of Joint Forces.

JOINT ADDITIVE MANUFACTURING WORKING GROUP (JAMWG)

WHO IS PART OF THE JAMWG?

- 20 Department of Defense Principal Members
- 200+ Members from the Joint Services (Army, Navy, Air Force, and Marine Corps)
- Defense Logistics Agency
- Defense Innovation Unit
- Office of the Secretary of Defense Manufacturing Technology Program
- Joint Staff

PARTNERSHIPS

JAMWG engages with Department of Defense public-private partnerships to collect insights, share information, and advance state-of-the-art developments for additive manufacturing with the private sector.

Key partners include:

- America Makes - The National Additive Manufacturing Innovation Institute
- Additive Manufacturing for Maintenance Operations
- Additive Manufacturing Standards Collaborative

MAJOR EVENTS

- Office of the Secretary of Defense Additive Manufacturing Workshop and Wargame
- Challenges leveraging multiple Department of Defense Manufacturing Innovation Institutes
- Defense Manufacturing Conference Technical Sessions
- Pre-Military Additive Manufacturing (MILAM) Summit Face-to-Face

JAMWG Success Stories

Allied Additive Manufacturing Interoperability

The JAMWG's Allied Additive Manufacturing Interoperability (AAMI) program aims to make it easier for American and British defense industries to use additive manufacturing to make parts.

It demonstrates laser powder bed fusion production qualification methods for critical parts using a multi-phased approach that delivers a structured framework for additive manufacturing suppliers. By leveraging performance-based methods, the project ensures equivalent part production across allied nations, supporting a globally connected and resilient U.S. defense industrial base.

AAMI strengthens supply chain integration by addressing common barriers to additive manufacturing adoption like qualification, certification, and data security.

Joint Additive Qualification for Sustainment (JAQS)

The Joint Additive Qualification for Sustainment (JAQS) program addresses the lack of mature additive manufacturing (AM) suppliers for DoD applications. JAQS develops, trains, and qualifies contract manufacturers to execute process control standards necessary for qualified AM serial production.

The program aims to create, document, and share AM process know-how for the DoD. This expertise, focused on Laser Powder Bed Fusion (LPBF) and Directed Energy Deposition (DED), will be captured in process control documents (PCDs) and Process Qualification (PQ) guidance. Selected U.S. suppliers will receive hands-on training to learn how to implement these PCDs and qualification procedures.

After training, suppliers will undergo an audit to verify their capability to perform qualified AM manufacturing for the DoD, ensuring consistent part production. The suppliers that successfully complete a JAQS audit will be added to the DoD's list of approved suppliers.

The JAMWG is dedicated to advancing additive manufacturing (AM) across the DoD.

Discover more about DoD ManTech and its innovative programs by visiting **www.dodmantech.mil** or scanning the QR code below.

Stay connected and follow DoD ManTech on LinkedIn for the latest updates, success stories, and advancements in defense manufacturing technology.

Department of Defense Manufacturing Technology Program