ACCELERATING AMERICA'S MANUFACTURING ADVANTAGE

TO WIN THE GREAT POWER COMPETITION

2024 DoD Manufacturing Technology Program

December 2024

OFFICE OF THE ASSISTANT SECRETARY OF DEFENSE
3030 DEFENSE PENTAGON
WASHINGTON, DC 20301-3030

SCIENCE AND
TECHNOLOGY

December 2, 2024

SUBJECT: Accelerating America's Manufacturing Advantage to Win the Great Power Competition

As the 2024 Defense Manufacturing Conference theme underscores, the United States faces intensifying global competition for technological leadership, which underpins our national security. Accelerating innovation and advancing manufacturing capabilities are critical to wining the Great Power Competition. The U.S. Department of Defense (DoD) must ensure that advanced manufacturing technologies are available to equip the Warfighter with the next generation of cutting-edge capabilities, allowing the Joint Force to respond to new and evolving strategic demands rapidly.

For over 68 years, the U.S. Department of Defense Manufacturing Technology (DoD ManTech) Program has reinforced America's world-class manufacturing base to meet Joint Force needs rapidly and affordably across the defense system life cycle. The DoD ManTech Program comprises the Department of the Army ManTech Program, Navy ManTech Program, Air Force ManTech Program, Defense Logistics Agency ManTech Program, and the Office of the Secretary of Defense Manufacturing Technology Program. Although the DoD ManTech Program has a singular mission and unified strategic vision, the military Services and DoD agencies select and execute their own mission-driven projects and initiatives. This year's brochure showcases several of the many accomplishments from across our Services and Agencies.

In 2024, the DoD ManTech Program supported Warfighters by enabling the joint mission, driving innovation to deliver capabilities at speed and scale, and strengthening the foundations of research, development, and workforce readiness. Through the Joint Defense Manufacturing Technology Panel (JDMTP), the program is actively executing the 2022-2026 DoD ManTech Strategic Plan, driving alignment across DoD and advancing mission-critical projects.

This brochure provides examples of cutting-edge manufacturing technologies and capabilities designed to transition solutions to the Warfighter rapidly. None of this would be possible without the DoD's leadership in fostering and developing an advanced manufacturing workforce. In the special insert, you will read how the DoD ManTech Program is leveraging the DoD Manufacturing Innovation Institutes to strengthen the defense manufacturing ecosystem and cultivate a highly skilled U.S. workforce.

Today's DoD ManTech Program is critical to sustaining our nation's competitive edge in defense and manufacturing by accelerating innovation and advancing manufacturing technologies. We are proud to present the 2024 DoD ManTech Program brochure, showcasing the collaborative initiatives of the JDMTP and its continued contributions to enhancing our military's technological superiority.

Keith DeVries
Director, DoD ManTech Program
Office of the Undersecretary of Defense for
Research and Engineering

David Koch
Chair, JDMTP
Director, Defense Logistics Agency's Research
and Development

The Department of Defense Manufacturing Technology Program

WHAT? The Department of Defense Manufacturing Technology (DoD ManTech) Program was originally created in 1956, and falls under Section 4842 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.

HOW? Although DoD ManTech has a singular mission and shared strategic vision across the military services, defense agencies, and OSD, each component uses its own organization-specific processes, mandates, and procedures to select programs and execute its investments and initiatives.

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.

The directors and senior managers of these programs coordinate through the auspices of the Joint Defense Manufacturing Technology Panel (JDMTP). The JDMTP is chartered to identify and integrate requirements, conduct joint program planning, and develop joint strategies. The OSD ManTech Office administers the DoD ManTech Program by providing central guidance, direction, and support to the components ManTech Programs.

The OSD ManTech Program also manages Manufacturing Education and Workforce Development (M-EWD), the Manufacturing Science & Technology Program (MSTP), and the DoD Manufacturing Innovation Institutes (DoD MIIs). The brochure includes a special insert to provide updates and recognizes over 10 years of the DoD's public-private partnership with its nine DoD MIIs: America Makes (the national additive manufacturing institute), Manufacturing Times Digital (or MxD, digital manufacturing and cybersecurity institute), LIFT (lightweight materials institute), the American Institute for Manufacturing Integrated Photonics (AIM Photonics), NextFlex (the flexible hybrid electronics institute), Advanced Functional Fabrics of America (AFFOA), BioFabUSA (advanced regenerative manufacturing institute), Advanced Robotics Manufacturing (ARM institute), and BioMADE (bioindustrial manufacturing institute).

This brochure highlights nineteen manufacturing successes of the DoD Services and Agency ManTech Programs, provides a center article on DoD's efforts to build a Joint Force through cross-service collaboration, lists the 2024 nominations for the Defense Manufacturing Technology Achievement Awards, and announces the JDMTP Service Recognition Awards for 2024.

Army Manufacturing Technology Program 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 Executive Office (PEO) and its supporting Program Manager (PM), the Army Science and Technology (S&T) community, key industry and academic partners, and the organic industrial base.

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); U.S. Army Futures Command (AFC); 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:

- Network Command, Control, Communications & Intelligence (NC3I)
- Ground
- Aviation
- Soldier
- Weapons

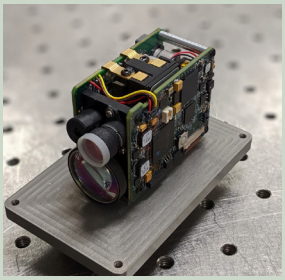
The Army ManTech Program coordinates with key partners across the defense industrial base to develop manufacturing processes and apply manufacturing technologies that will reduce acquisition and sustainability costs, as well as repair cycle times, of defense weapons systems in direct support of Army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

ARMY SUCCESS STORY

Army ManTech Reduces SWaP-C of Advanced Transceiver Optical Module, Enables Multi-Function Laser Range Finding Capability

MANUFACTURING CHALLENGE

Military-grade laser range finders (LRF) are very expensive due to currently available manufacturing processes. The military LRF is a critical component for Army tactical sensor suites, which allow the U.S. to maintain overmatch and enable the Warfighter to locate and precisely target threats.



Compact and lightweight multi-function Advanced Transceiver Optical Module (ATOM)

Eye-safe laser ranging and marking

Near-infrared pointing for use with night vision devices

MANTECH RESPONSE

- Army ManTech matured the manufacturing processes of the Advanced Transceiver Optical Module (ATOM) LRF to meet size, weight, and power and cost (SWaP-C) requirements while enabling multi-function capability
- Added automation stations to production processes and developed a first-of-its-kind "touchless" laser alignment station
- Trained junior operators how to operate laser alignment measurement instruments and custom software tools to streamline build process
- Army ManTech investment of $5.2M

MANTECH IMPACT AND BENEFITS

- Implemented multiple automated stations in the ATOM production line
- Demonstrated 200% reduction in laser cycle build time
- Increased product yield by 50%

Reduced component system manufacturing lead time and costs while maintaining quality and capability.

PARTICIPANTS

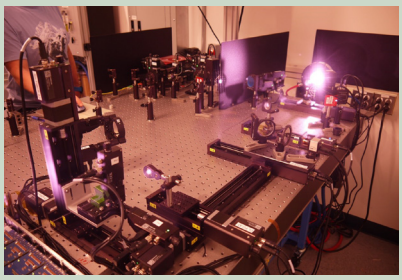
Army ManTech, U.S. Army Combat Capabilities Development Command C5ISR (Command, Control, Computers, Communications, Cyber, Intelligence, Surveillance and Reconnaissance) Research and Technology Integration (RTI) Directorate, multiple commercial vendors

ARMY SUCCESS STORY

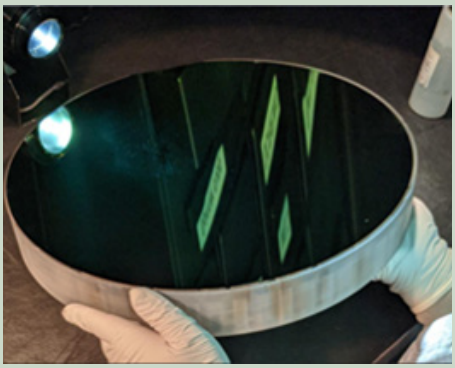
Army ManTech Invests in Advancing Critical Directed Energy Technology

MANUFACTURING CHALLENGE

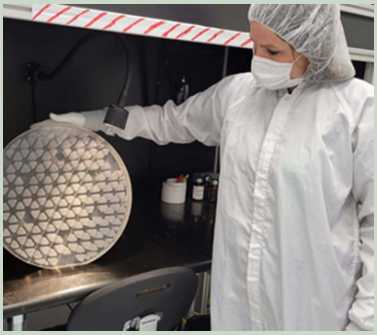
The component parts of a laser system are difficult to manufacture, expensive, and have a long lead time. The Army required new methods that were more cost and time effective.



Coherent's test bench for amplifiers



Optimax's uncoated optic



Optimax's optic after coating

MANTECH RESPONSE

- Army concentrated investment in the maturation and transition of components supporting emerging and critical directed energy technology advancement
- Army ManTech efforts will provide a mature industrial base at Manufacturing Readiness Level (MRL) 7 to produce the component parts required for the laser system
- Army ManTech investment of $5.1M

MANTECH IMPACT AND BENEFITS

- Reduced the cost of components by up to 54%, resulting in a savings of ~$7.5M per system
- Reduced the production time of components by up to 50%
- Components are being integrated into prototypes for ongoing testing

These components will be used to fill an important gap identified by an Army Office to protect light infantry forces and high-value assets in tactical and operational support areas.

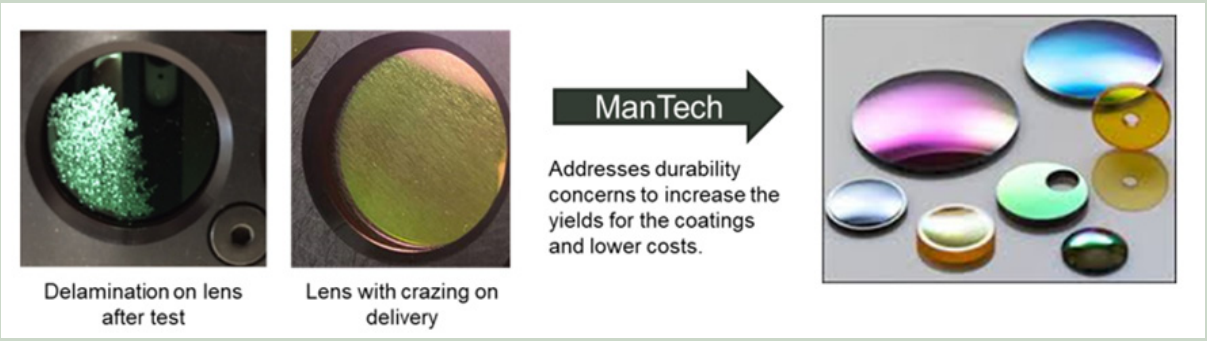
PARTICIPANTS

Army ManTech, Coherent, Optimax, Radiance Technologies

Army ManTech Improves Durable Dual-Band Optical Coatings to Enable Next-Generation Sensors

MANUFACTURING CHALLENGE

Optics are a critical component of next-generation multi-band optical systems. The large number of lenses and desired system performance require coatings that attain high optical transmission rates. This greatly increases the complexity of the coating designs and sensitivity to deposition tolerances, resulting in low manufacturing yields.



MANTECH RESPONSE

- Army ManTech matured the coating deposition processes for dual-band coatings to decrease system costs at the time of procurement and across the lifetime by reducing maintenance and repair/replacement costs
- Integrated ManTech Industry-Government team worked closely with suppliers across the industrial base
- Army ManTech investment of $5M

MANTECH IMPACT AND BENEFITS

- Produced > 90% yields for all substrates present in the current next-generation optical systems
- Demonstrated significant improvements over the current baseline, to include Mean Time Between Failure (MTBF) of > 50k vs < 20k hours
- Reduced coating cost per component by 33%, resulting in a return on investment of greater than 17:1

Improved optical coatings will be used in next-generation sensors for ground combat vehicles.

PARTICIPANTS

Army ManTech, U.S. Army Combat Capabilities Development Command (DEVCOM) C5ISR Center, Program Executive Office Intelligence, Electronics Warfare and Intelligence (PEO IEW&S)

ARMY SUCCESS STORY

Army ManTech Develops Machining for Armament Manufacturing, Reduces Tooling Costs and Production Time

MANUFACTURING CHALLENGE

Large-caliber artillery cannon barrels have traditionally been rifled using standard broach-cutting techniques. The use of high-strength materials and need for complex rifling profiles creates challenges with traditional methods. High-tooling loads require periodic resharpening and coatings to maintain effectiveness, adding to the cost of the process.

A 155mm howitzer tube moves to a rotary forge from an arsenal furnace where it was heated to nearly 2,000 degrees. After an approximate 15 minutes of forging, the tube will have the near-finished shape of a howitzer tube.

A 155mm howitzer tube is moved from the arsenal's rotary forge where it was heated to nearly 2,000 degrees and pounded into the near-shape of a cannon tube.

A 155mm howitzer tube and a 120mm Abrams Tank tube await their next machining operation at the Watervliet Arsenal.

MANTECH RESPONSE

- Army ManTech developed a novel process to manufacture large-caliber cannons
- The program delivered a prototype facility capable of the novel methods, which was demonstrated with multiple 39-caliber 155mm cannon models
- Army ManTech investment of $6.1M

MANTECH IMPACT AND BENEFITS

- Potential to reduce tooling costs by 30%
- Can reduce production time by approximately 50% for extended-range cannons
- This technology is pervasive and can add additional capability such as boring, enable the use of advanced cannon design features, and provide a flexible manufacturing platform that can adapt to new cannon designs
- Demonstrated the capability to manufacture cannons at a higher rate with improved quality and reduced scrap rate

Army ManTech investment propelled the development of the improved manufacture process from a Manufacturing Readiness Level (MRL) 4 to MRL 7 and enabled the technology to transition to Watervliet Arsenal.

PARTICIPANTS

Army ManTech, General Electric Research and Development, Faraday Technology Inc., and Corrdesa Inc.

Navy Manufacturing Technology Program Overview

The **U.S. Navy Manufacturing Technology (ManTech)** program is an industrial preparedness program focused on affordability improvements for key naval platforms as well as capability acceleration to get capabilities to the Fleet faster. Navy ManTech works closely with the Program Executive Offices (PEOs), Program Offices, key industry partners, and the Navy ManTech Centers of Excellence to identify manufacturing affordability challenges; develop affordable manufacturing technology; and transition that technology to the industry partners for implementation. Once implemented, the developed technology results in substantial affordability improvements — measured as either cost savings or cost avoidance — and strengthens the industrial base.

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

INVESTMENT STRATEGY

Navy ManTech will execute an investment strategy in FY24 – FY28 based on the direction of Office of Naval Research (ONR) leadership and determined by total acquisition funding; stage in acquisition cycle; platform cost-reduction goals; cost-reduction potential for manufacturing; and other factors primarily associated with the ability of ManTech to deliver the technology when needed. Over the next five years, Navy ManTech will continue to improve the affordability of Navy platforms critical to the future force, focusing resources on the VIRGINIA Class submarine (VCS), COLUMBIA Class submarine (CLB), DDG 51 Class destroyer, CVN 78 Class aircraft carrier, FFG 62 Class frigate, and F-35 Lightning II aircraft, as well as select manufacturing technology projects that accelerate the delivery of capabilities to the Navy. The eight capability acceleration thrust areas include Sustainment Technology, Energetics Production Support, Advanced Submarine Technology Fabrication, Future (Major) Acquisition Platform Support, Unmanned / Autonomous Vehicle Production, Directed Energy, Hypersonics Fabrication, and Other ONR Manufacturing Maturation. Navy ManTech will also focus efforts on PEO IWS weapon systems that support the ship platforms in its investment strategy.

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 FY24 – FY28, Navy ManTech will develop enabling manufacturing technology – new processes and equipment – for implementation on Navy weapon system production lines.

NAVY SUCCESS STORY

Navy ManTech-Developed Mixing Process Utilizing RAM Technology Manufactures Energetic Materials Safer, Cheaper

MANUFACTURING CHALLENGE

Conventional energetics production utilizes mechanical mixing to process high solids energetics formulations that has a potential to cause energetic initiation. Additionally, conventional processing utilizes complex and long mixing practices with high yield losses. To ensure warfighter supremacy, energetics production requires higher throughput from more efficient, environmentally friendly, and safer processes.

Navy ManTech-developed mixing process utilizing the Resonant Acoustic Mixing (RAM) 5 reduced cost by 10% compared to conventional methods

Mk152 warhead loaded with fuze

Hydra 70 system utilizing Mk152 warhead

MANTECH RESPONSE

- Navy ManTech's Energetics Manufacturing Technology Center (EMTC) at Naval Surface Warfare Center (NSWC) Indian Head Division (IHD), with support from Naval Air Warfare Center (NAWC) Weapons Division (WD), developed a RAM5 manufacturing process for energetics to support Mk152 warhead loading for the Hydra 70 system
- Transitioned to small-munitions production of Mk152 warheads at NSWC IHD for PMA-242
- ManTech investment of $2.6M

MANTECH IMPACT AND BENEFITS

- Reduced cost by 10% when compared to conventional energetics processing
- Eliminated potential friction initiation of energetics during mixing that has resulted in past explosive incidents
- Reduced mixing operations complexity and mixing time by 94%

RAM technology improves throughput and provides safe and cost-effective energetic manufacturing solutions that can be applied to any small ordnance item.

PARTICIPANTS

Office of Naval Research Navy ManTech, Energetics Manufacturing Technology Center (EMTC), NSWC IHD, NAWC WD, PMA-242

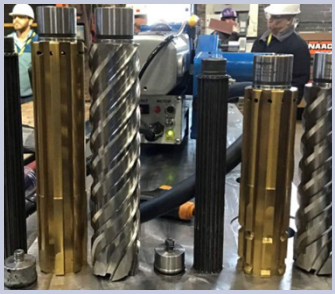
Navy ManTech Drilling Technology Will Save NNS and BIW $4.5M over Five Years

MANUFACTURING CHALLENGE

Alignment of precision, Grade-A shock machinery components requires drilling deep holes with very tight tolerances. Due to the size (diameter/depth) of these holes, the drilling process requires multiple set-ups with two or more individuals for each operation. The clearance limitations for the application prevent current commercial-off-the-shelf, portable drilling equipment from being utilized. Navy ManTech developed a prototype compact annular cutter with a magnetic base that can drill and ream tight tolerance holes with the increased bit life required for this unique and challenging shipyard application.

Navy ManTech developed a tight tolerance deep hole drilling machine

Prototype system undergoing evaluation on a test sample



Cutting and reaming tools developed for use with the drilling system

MANTECH RESPONSE

- Navy ManTech developed a prototype tight tolerance, deep-hole drilling solution with a smaller tool size that has a clearance height of approximately 8.5 inches, a drill depth capability of 6.5 inches, and drill diameter capabilities of 1.5625 and 2.00 inches
- ManTech investment of $858K
- Reduced Set-up Time: The ambidextrous drive capability increases applicability to more set-up locations, while the increased magnetic base strength simplifies the alignment and mounting process
- Reduced Steps per Hole: The required number of steps to drill a hole has been reduced from 34 to 6 for Huntington Ingalls Industries - Newport News Shipbuilding (NNS) and from 59 to 17 for General Dynamics Bath Iron Works (BIW)
- Additional system features include adaptive feed capability for both drilling and reaming processes, optional electrical or manual drive control, hands-free operation once the system is properly set up and aligned, and portability / operation by a single person

MANTECH IMPACT AND BENEFITS

- Reduced NNS and BIW labor requirements for drilling reduction gear holes by 60%
- Eliminated rework related to misaligned holes by 100%
- Reduced the maintenance repair costs for labor and material by 50%
- Implemented in FY24
- Can be implemented across all shipyards and any industry that has a need to drill holes with high tolerance and low head clearance

The technology will result in estimated combined five-year savings of $4.5M for both NNS and BIW resulting in a five-year return on investment of 3.5:1.

PARTICIPANTS

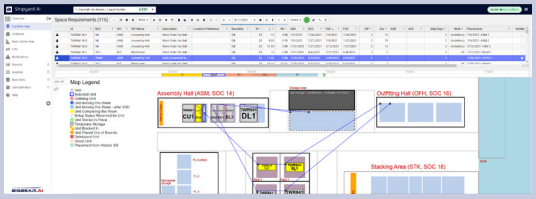
Office of Naval Research Navy ManTech, Center for Naval Metalworking (CNM), PMS 378, PMS 400, Huntington Ingalls Industries - Newport News Shipbuilding, General Dynamics Bath Iron Works, Hougen Manufacturing

NAVY SUCCESS STORY

Navy ManTech Integrates Automated Schedule Optimization and Machine Learning into Shipyard Capacity Planning, System Estimated to Save Shipyards $20.7M

MANUFACTURING CHALLENGE

At Huntington Ingalls Industries (HII) – Newport News Shipbuilding (NNS) and HII – Ingalls Shipbuilding (Ingalls), a single warship is erected from hundreds of units that may weigh hundreds of tons and require hundreds of square feet of floor space within specialized facilities for each stage of construction. This situation creates chains of dependencies that may be disrupted in the planning phase by weather, outsourced delays, schedule and resource variability along with availability of parts due to supply chain delays. Navy ManTech developed a system that integrates automated schedule optimization and machine learning (ML) and supports more robust construction schedules, enhances communication with supply chain management, and addresses efficiency and safety concerns.



Screenshot from Shipyard AI system of sample shipyard laydown map

Aerial views of NNS (center) and Ingalls (right); space constraints limit growth of the shipyard footprint

MANTECH RESPONSE

- Navy ManTech proved that ML can be integrated with the existing Shipyard AI software
- Defined use cases and requirements and worked closely with NNS, Ingalls, and software vendor BigBear.ai to develop and evaluate a preliminary proof of concept
- Completed agile software development sprints that updated system features and significantly increased functionality
- ManTech investment of $2.2M
- System was partially implemented at NNS and Ingalls in 3Q FY2024. The final ML client is expected to be installed and fully implemented at both shipyards in Q1 FY2025

MANTECH IMPACT AND BENEFITS

- Estimated combined five-year savings of $20.7M ($15.6M for NNS and $5.1M for Ingalls) with a combined five-year return on investment of 9.4:1
- Ability for Production Planning and Supply Chain to rapidly inform each other of construction need dates, availability dates, and subsequent changes to reduce risk to schedule compliance
- The tool leverages ML to analyze historical decisions made by capacity planners to create a more robust recommender system that rapidly produces a properly structured footprint by feeding the placement recommendations into Shipyard AI's engine.
- Upgraded Shipyard AI software will be available to the wider shipyard community and include the additional benefits improved upon during the project

Implemented at NNS and Ingalls in FY2024, the system is estimated to save the combined shipyards nearly $21M over the initial five years of use. Additional savings are anticipated when the software is offered to the broader shipbuilding community in FY2025.

PARTICIPANTS

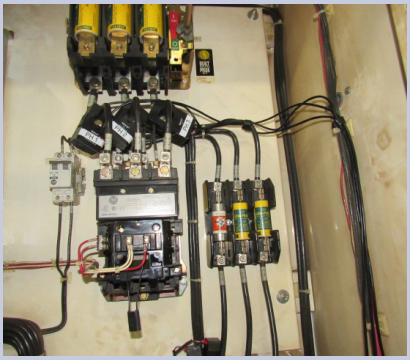
Office of Naval Research Navy ManTech, Naval Shipbuilding and Advanced Manufacturing (NSAM) Center, Huntington Ingalls Industries – Newport News Shipbuilding, Huntington Ingalls Industries – Ingalls Shipbuilding, BigBear.ai

NAVY SUCCESS STORY

Navy ManTech Extends Condition-Based Maintenance by Adopting Industrial Internet of Things, Saving Navy $7.0M over Five Years

MANUFACTURING CHALLENGE

General Dynamics Electric Boat (GDEB) critical path manufacturing assets experience catastrophic failure despite preventative maintenance (PM) and conventional predictive maintenance (PdM) programs. Under an earlier ManTech project (S2750 Diagnostic Monitoring), GDEB and the Institute for Manufacturing and Sustainment Technologies (iMAST) identified the value of precision and PdM through manual equipment health monitoring means. Catastrophic failure and unscheduled downtime were predicted using hand-held vibration analyzers and thermography and conducting analysis of machine oil. However, not all critical assets can be safely monitored with standard means due to physical access challenges on areas requiring monitoring.



Current sensors inside electrical cabinet

Vibration sensors on press components

Sensors on Crane

MANTECH RESPONSE

- Navy ManTech supplemented conventional PdM with advanced industrial internet of things (IIoT) technology to automatically communicate impending faults / failures of critical assets for near-continuous health monitoring
- Wireless sensors (vibration, current, air flow, and liquid level) were installed on two critical path assets (large crane and a press), and gateways were used to transfer machine data to a stand-alone laptop
- A pilot and subsequent demonstrations were conducted to showcase the ability to wirelessly transfer machine data from the critical assets to a stand-alone lap top; upon full implementation at GDEB in FY2025, the data will be transferred to GBED's operational technology network
- Navy ManTech Investment of $1.4M

MANTECH IMPACT AND BENEFITS

- Provided capability to enable monitoring of all critical path VIRGINIA and COLUMBIA Class submarine manufacturing equipment to reduce costs and schedule disruptions for the production of nation's most critical weapons systems
- Proved monitoring could be done in a security-compliant and cost-effective manner (return on investment =1.9:1)
- Added benefit – produced the first actual, hard usage data for Naval Surface Warfare Center Crane, which will also support shipyard capacity planning

Improved capability to monitor the health of even the most hard-to-reach and critical manufacturing equipment, saving the Navy $7.0M over five years, after implementation at GDEB in the fourth quarter of FY2025.

PARTICIPANTS

Office of Naval Research Navy ManTech, Pennsylvania State University Applied Research Laboratory, Institute for Manufacturing and Sustainment Technologies (iMAST), General Dynamics Electric Boat

Department of the 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 such as F-16, B-1, F-22, B-2, F-35, and B-21 to deliver billions of dollars in acquisition and sustainment cost savings and avoidance. Over the last twenty years, the cost of computing power, data storage, and internet bandwidth have all fallen exponentially, dramatically reshaping 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 and the AFRL Transformational Capabilities Office (TCO), 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.

INVESTMENT STRATEGY

Based on both the DoD demand signals and the technology trends driving rapid manufacturing innovations. DAF ManTech uses five technology pillars in its investment strategy. **Advanced Concepts** includes programs that address procurement and sustainment needs of Programs of Record to provide a new capability to the weapons platform or substantial return-on-investment (ROI) in the form of reduced cost and/or increased platform availability. **Hypersonic Strike, Autonomous Collaborative Systems, Space Systems, and Networked C3 Systems** generally include enabling technologies that are more pervasive in nature and therefore impact multiple weapons platforms and are often directed at emerging operational capabilities for which there isn't currently a baseline technology.

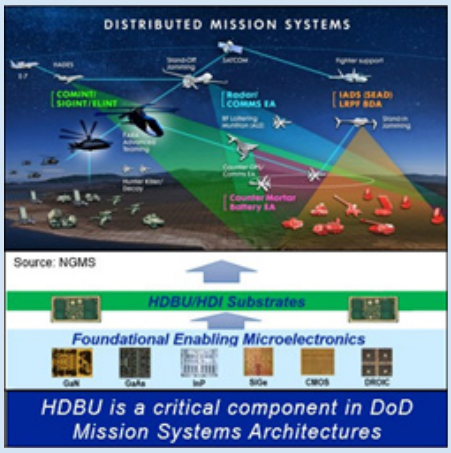
The DAF ManTech investment portfolio also includes two crosscutting emphasis areas, Advanced Manufacturing Technologies (AMT) (TRL/MRL 4-7) and Digital Manufacturing Research (TRL/MRL 2-4). These represent pervasive opportunity areas that deliver capabilities across all the technology pillars at reduced cost and timelines in the high mix, low volume aerospace manufacturing environment. DAF ManTech efforts in AMT and Digital Manufacturing Research heavily leverage the Manufacturing Innovation Institutes as well as partnerships with academia and industry to meet Warfighter needs.

AIR FORCE SUCCESS STORY

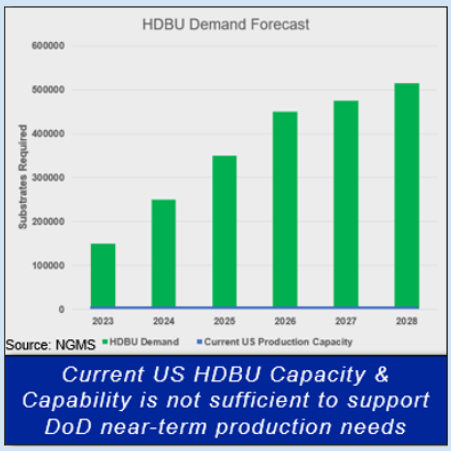
Air Force ManTech Matures Manufacturing Readiness Level of ACT Multi Chip Module (MCM) & High Density Build Up (HDBU) Project

MANUFACTURING CHALLENGE

There is a critical domestic supply chain shortfall for the advanced substrates needed for Arrays at Commercial Timescales (ACT) microelectronics multi-chip module (MCM) assemblies for next generation platforms for the entire DoD due to the increased need for SWAP (size, weight and power) constrained platforms. The manufacturing of the multi-chip module is one of the greatest costs of multiple programs within the DAF Department of the Air Force (DAF) wideband phased arrays product line.



Advanced Substrate High Density Build Up (HDBU) need statement photo



Advanced Substrate Demand photo

MANTECH RESPONSE

- This project focused on transferring manufacturing processes from Northrop Grumman Mission Systems to key sub tier vendors with a focus on utilizing reliability test vehicles and DAF ACT MCM functional demonstrators with methodical manufacturing readiness level maturation for use in DAF relevant environments to lay the groundwork towards a full domestic manufacturing capability Air Force ManTech Investment of $6.77M

MANTECH IMPACT AND BENEFITS

- Fulfilled a critical need for multiple DAF Programs of Record and all national advanced packaging programs for the DIB ecosystem
- First DoD investment in this technology that laid the groundwork to buy down the risk of full domestic implementation
- Catalyst for over $110M of additional DoD investment and that will result in a fully on shored manufacturing and material supply chain critical to our national defense

There is a critical domestic supply chain shortfall for the advanced substrates needed for Arrays at Commercial Timescales (ACT) microelectronics multi-chip module (MCM) assemblies for next generation platforms for the entire DoD due to the increased need for size, weight and power constrained platforms.

PARTICIPANTS

Steven Dooley – Air Force Research Lab (AFRL), Thomas Dalrymple – AFRL, Deanna Sessions – US Army DEVCOM, Fadi Alfouini – Northrop-Grumman Corp (NGC), David Shahin – NGC, Brad Handy – NGC, Brian Heldmann – NGC, Bradley Coon – NGC, Meredith LaBeau – Calumet, Audra Thurston – Calumet

AIR FORCE SUCCESS STORY

DAF ManTech Delivering a Ballistic Conformal Battery to AFSOC

MANUFACTURING CHALLENGE

AFSOC requires a drop-in multifunctional solution combining lightweight armor with the energy storage required for a 72-hour mission that fits within standard plate carriers and is compatible with all kit electrical interfaces. The battery must have inherently safe chemistry that doesn't spark or produce smoke or flame upon ballistic penetration. Due to short warfighter procurement timelines, there was an added challenge to rapidly scale from lab to LRIP for all stages of production, from components to final unit assembly, to provide sufficient production capacity to complete qualification testing and initial program of record procurements.

Fully Assembled Ballistic Conformal Battery.

Battery cells after ballistic penetration showing no indication of spark, smoke, or flame

Inherently safe battery cell exhibiting no reaction during nail penetration test.

MANTECH RESPONSE

- Scaled battery cell component manufacturing from lab to LRIP scale
- Improved cell and battery unit manufacturing to increase throughput and reduce scrap
- Provided sufficient Ballistic Conformal Battery units to satisfy safety and performance certification requirements

MANTECH IMPACT AND BENEFITS

- Reduced Ballistic Conformal Battery cost by 50% to reach parity with legacy COTS battery
- Reduction of 2 pounds per Ballistic Conformal Battery versus legacy battery and armor combo and reduction of individual kit-pieces required
- Inherently safe, non-flammable battery chemistry significantly increases warfighter safety and low-temperature battery performance relative to legacy COTS solutions

Maturing the manufacturing of the Ballistic Conformal Battery accelerates transition of a drop-in technology that increases warfighter effectiveness while simultaneously increasing safety. "The BCB is one of the few truly innovative pieces of new equipment that has come across my desk in the past few years…I never want to give them back."
–TSgt Caleb Mason, ACC/TACP Chief Weapons and Tactics

PARTICIPANTS

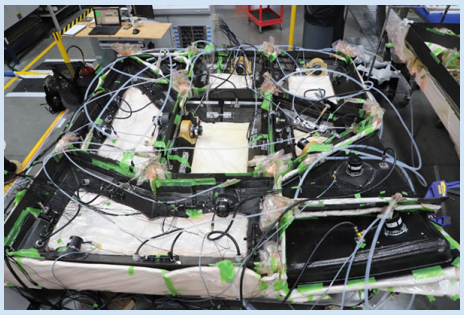
Air Force Research Laboratory's Materials and Manufacturing Directorate and Aerospace Systems Directorate, Cornerstone Research Group, Inc

AIR FORCE SUCCESS STORY

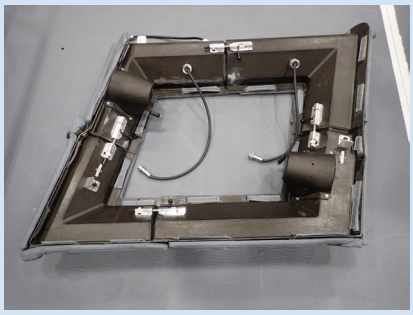
DAF ManTech Enhances Out-of-Autoclave Manufacturing of Large, Bonded, Composite Structures

MANUFACTURING CHALLENGE

Curing large, bonded, composite structures is challenging due to size, complex cell structures, and limited material freezer out-time. Quick and efficient vacuum bagging and Out-of-Autoclave (OoA) heating is essential so structures can be cured before reaching out-times. Traditional vacuum bagging methods are challenging in low accessibility cell structures, requiring advancements in current vacuum bagging technology. Curing large composite structures with conventional methods like forced air ducting is inefficient and time-consuming, making it difficult to meet production demands.



9-Cell MRL 6 Demonstration Assembly with EZ Bake Heaters and Welded Bags



Conformal EZ Bake Heater Assembly

MANTECH RESPONSE

- Developed engineered welded nylon bags and EZ Bake heating systems for curing large, bonded, composite structures with complex configurations using Pi preforms for hardware-free joining
- Simplified vacuum bag installation for complex cell geometries by designing near-net shape welded bags, surface marked, facilitating fast, accurate and repeatable placement prepared off the critical path
- Deployed EZ Bake heaters with locally enclosed heating elements, allowing for precise temperature regulation, energy efficiency, and easy mid-cure repair access
- Optimized EZ Bake heating technology with material selection, geometric design, and control logic optimization for specific and unique geometries to achieve a mature and optimized heating solution, significantly increasing composite structure cure fidelity

MANTECH IMPACT AND BENEFITS

- Demonstrated and validated engineered welded nylon bags and EZ Bake heating systems using test articles with complex and demanding geometries achieving MRL 7 for both technologies
- Reduces layup time and cost, eliminates the need for highly skilled technicians, and reliably produces high quality composite structures with less risk of rework
- EZ Bake heating systems are more accessible and easier to install, are energy efficient, have lower noise pollution, and provide for a faster and higher-level of temperature regulation during a cure
- $40M cost savings at just one of the manufacturing sites for an Air Force Program of Record

Accelerated large, bonded, composite structure production with affordable, scalable, and efficient Out-of-Autoclave vacuum bagging and heating technologies with 50% reduction in time and labor cost

PARTICIPANTS

Air Force Research Lab, Janicki Industries, ARCTOS Technology Solutions, Air Force Life Cycle Management Center

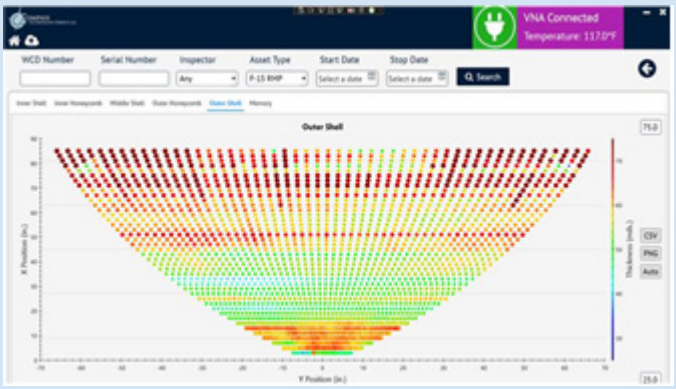
AIR FORCE SUCCESS STORY

DAF ManTech and Warner-Robins Air Logistics Complex (WR-ALC) Develop Full Radome Electromagnetic Digital Twin

MANUFACTURING CHALLENGE

Radome performance is critical to the effectiveness of any radar system. In the current state, radomes must be removed from service and sent to multimillion dollar radio frequency (RF) ranges or anechoic chambers for testing, and repair requires expensive, time-consuming iterations between production and test. As such, warfighters often must function with unknown radar performance degradation, and readiness is affected by long lead times for testing and repair.

Robotic AMMP collection microwave reflection data (courtesy of Warner Robins Air Logistics Complex)



Visualization of ROPE model predictions (courtesy of Compass Technology Group)

MANTECH RESPONSE

- Developed the Radome Operational Performance Evaluation (ROPE) system in response to this challenge
- ROPE uses microwave reflection data gathered from an Advanced Microwave Mapping Probe to create a full electromagnetic digital twin of a radome. This model can then be tested in simulation, eliminating the requirement for a physical RF range.
- Validated and approved for use on F-15 legacy radomes, agreeing with the RF anechoic range at Robins AFB to within 1%. The F-15 program office is currently validating ROPE for its new radome modernization program radomes.
- Operating in pilot production at WR-ALC
- Secured $10.75M from the Accelerate the Procurement and Fielding of Innovative Technologies program to place systems in two additional Air Force depots, one Navy depot, and one Air Force operational unit

MANTECH IMPACT AND BENEFITS

- Reduces the capital cost for radome testing by more than 10X
- Reduces the cost and cycle time for radome repair by more than 10X
- Provides a forward deployable system for radome testing by operational units

Project resulted in development of deployable full radome electromagnetic digital twin, resulting in reduced radome testing costs and lower cycle time for repair.

PARTICIPANTS

Air Force Research Laboratory, Warner-Robins Air Logistics Complex, F-15 System Program Office, & Compass Technology Group (Alpharetta, GA)

DEPARTMENT OF DEFENSE
MANUFACTURING
TECHNOLOGY PROGRAM
INNOVATING MANUFACTURING

Website

LinkedIn

Convening ManTech Programs to Build a Joint Force through Cross-Service Collaboration

The DoD ManTech Program bridges the ManTech programs under a unified framework. By bringing together representatives from each Service and agency, the program ensures that the U.S. defense manufacturing community operates as a collaborative and coordinated joint force. This collective approach helps streamline decision-making, foster innovation, and drive the adoption of advanced manufacturing technologies.

The Joint Defense Manufacturing Technology Panel (JDMTP) is the leading coordination body for this effort. Comprised of representatives from all ManTech components, the JDMTP facilitates regular engagement among the Service and Agency ManTech programs. It serves as a forum to share technical challenges, progress, and best practices without interfering with the Service's mission priorities. This ongoing dialogue ensures that each branch and agency can access the latest technological developments and collaborate effectively on joint projects, thereby enhancing the overall defense manufacturing capabilities.

The DoD ManTech Program has spearheaded several initiatives to enhance cross-service collaboration and drive joint investments in manufacturing technologies critical to future defense capabilities. Some of the vital collaborative initiatives include the following:

Additive Manufacturing for Sustainment: This cross-service initiative focuses on using 3D printing technologies to improve the sustainment and readiness of military systems. By collaborating across services, this initiative accelerates the development of advanced manufacturing processes to repair or replace parts more efficiently, reducing downtime and costs.

Navy ManTech is developing a qualified in-situ repair process that monitors a family of parts, including knife-edge seal teeth features on rotating engine components. It is utilizing power-blown L-DED additive manufacturing with Inconel 718®.

Defense Logistics Agency (DLA) ManTech is collaborating with the Office of the Deputy Assistant Secretary of Defense for Materiel Readiness (ODASD-MR) to integrate advanced manufacturing technologies at the edge with the Organic Industrial Base. This partnership aims to facilitate the rapid deployment of additive manufacturing produced parts and their technical data packages on the Secured Unclassified Network, allowing for collaboration with NATO partners. Furthermore, as this capability evolves, it addresses the challenges posed by contested logistics and potential threats to the global supply chain.

OSD MSTP-funded Joint Cold Spray project performs two distinct functions to repair equipment at forward locations: mobile 3D printing and direct-to-surface bonding. The system can use various metal powders to produce parts to specific tolerances and application demands. At maturity, it can achieve widespread use as a tool to repair a vast array of military platforms for both point-of-need applications and sustainment. Its implementation would drastically reduce equipment downtime, circumvent lengthy replacement part lead times, and provide substantial cost savings.

Directed Energy: These systems will allow the Services to counter various current and emerging threats with rapid responses and engagement at the speed of light. High-energy laser (HEL) and high-power microwave (HPM) technologies offer new ways to counter these diverse threats.

Cold spray technology

The Army, Navy, and OSD ManTech programs have matured the industrial base in manufacturing process improvements, supply chains/management, and alternative materials of critical DE components. These combined efforts have yielded substantial improvements for DE systems through automation and the reduction of touch labor to meet future demand and get these strategic combat capabilities into the Warfighter's hands. These efforts have also been instrumental in establishing domestic suppliers to eliminate reliance on non-domestic sources for these DE materials, components, subsystems, and systems of systems. Joint Air Force and Navy ManTech programs also address needs in novel fibers and phase arrays for HEL systems while developing novel sources and components for HPM systems.

Advanced Composites for Lightweight Structures: The Services work together on advanced composite materials for lightweight, high-strength structures. This collaboration aims to improve the performance and durability of defense platforms while reducing weight, which is particularly valuable for aircraft and unmanned systems.

Navy ManTech developed an alternative method to fabricate non-flight-critical parts using previous data to validate HexPEKK® material and demonstrated performance against F-35 Lightning II specifications. New designs for candidate non-flight-critical parts, such as ducts and equipment trays, were developed, printed, and shown through full-scale testing. The technology's benefits include estimated acquisition cost savings of $28.6M for the joint-Service F-35 Program, additional potential weight savings, and application to other programs. Navy ManTech anticipates that Lockheed Martin and Northrop Grumman will implement the technology in FY25.

Digital Manufacturing and Cybersecurity: As defense systems become increasingly digitized, the DoD ManTech Program is driving collaboration across services to integrate cybersecurity measures into manufacturing processes. This joint initiative ensures digital manufacturing technologies are secure and resilient against cyber threats.

Navy ManTech applied digital thread to ship and submarine processes to locate and install paint masking and hanger stud positions. General Dynamics Electric Boat and General Dynamics Bath Iron Works have implemented the new process. The technology reduces hull construction costs and provides five-year cost savings of nearly $13M for the VIRGINIA and COLUMBIA Class submarine and DDG 51 Class destroyer.

MSTP's Quality Control, Quality Assurance Companion (QQComp) project is a Joint effort to augment human workers' inspection activities with an advanced, DoD-specific computer vision toolkit for object detection to support maintenance activities and develop a standards-based infrastructure for industrial XR. The QQComp team has demonstrated a viable path towards a file format-agnostic approach to model-based quality assurance by maturing open-source standard data translation tools. A standards-based approach will result in government-developed open-source software that can be reused and shared by the larger community, resulting in efficiency gains within the industrial base, error reduction and detection, and cost savings by avoiding vendor lock-in.

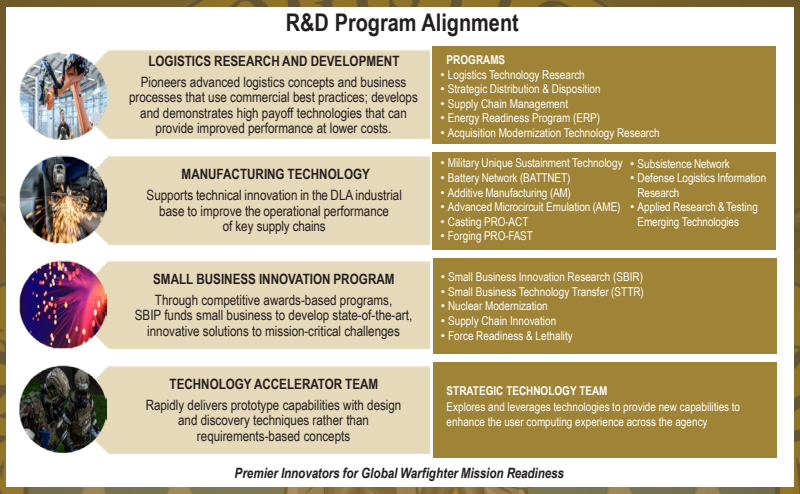
The DLA ManTech digital twin/digital thread initiative has made significant strides through successfully completing a pilot project. This project focused on utilizing process mining capabilities to enhance the enterprise-wide digitization strategy and support business process re-engineering. It also aims to improve the ability to audit the DLA's global supply chain transactions. The advancements brought by this initiative will profoundly impact various aspects of the nation's defense strategy.

Enhancing Joint Force Efficiency: By fostering cross-service and cross-agency collaboration, the DoD ManTech Program enhances the overall efficiency of defense manufacturing efforts. This unified approach reduces duplication of effort and maximizes the impact of investments in advanced manufacturing technologies. The shared expertise and resources enable the U.S. to address complex challenges more effectively, ensuring the U.S. develops, produces, and sustains cutting-edge capabilities.

The DoD ManTech Program is vital to creating a unified defense manufacturing force that leverages the strengths of each Service and agency. Through the JDMTP and its subpanels, the program fosters collaboration, drives innovation, and accelerates the transition of critical technologies into defense systems. By coordinating efforts across services and agencies, the DoD ManTech Program ensures the U.S. maintains its competitive edge in the Great Power Competition, strengthening national security and advancing America's manufacturing advantage.

DLA Manufacturing Technology Program 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 DLA ManTech Program funds the advanced technology development needed to improve manufacturing capability throughout a product's life cycle. As illustrated, DLA's R&D programs deliver responsive, innovative solutions that improve DoD 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 Defense (OUSD) Acquisition and Sustainment, Assistant Secretary for Sustainment, as the nation's combat logistics support agency. Within DLA's Information Operations (J6), DLA R&D (J68) 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 needed efforts to meet Warfighter needs.

INVESTMENT STRATEGY

The DLA ManTech program uses two lines of effort (LOE) to guide its investments. The first DLA R&D LOE 1, Industrial Base and Aging Weapon System Support, ensures a viable and responsive defense industrial base; addresses obsolescence using trusted manufacturing sources of qualified microcircuits to sustain legacy DoD weapon systems; and introduces advanced manufacturing concepts into the DoD supply chain, such as AM replacement parts.

The 2nd DLA R&D LOE 2, 3D Technical Data Modernization/ Model Based Enterprise Technologies, transforms data into 3D machine usable formats to support DoD's digital modernization efforts for significantly improved readiness. MBE systems enable DLA, the military services and industry to specify accurate requirements and deliver high-quality material/end-items throughout the supply chain.

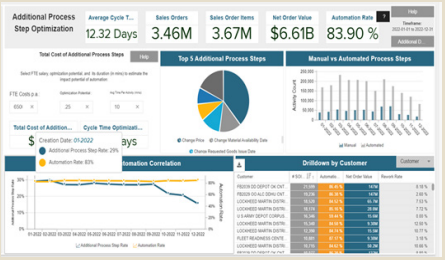
The DLA ManTech program portfolio areas are:

(1) Advanced Microcircuit Emulation
(2) Battery Network
(3) Castings/Forgings
(4) Military Unique Sustainment Technology (MUST)
(5) Subsistence Network
(6) Defense Logistics Information Research, and
(7) Additive Manufacturing

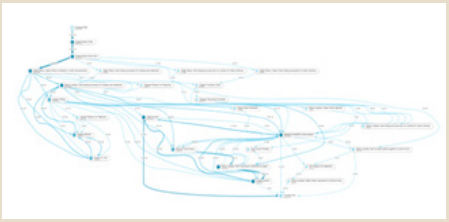
DLA ManTech Develops Digital Twin Process Mining to Improve Efficiency and Effectiveness of Order to Cash (O2C) Processes

MANUFACTURING CHALLENGE

DLA's business processes enable DLA personnel to carry out the enterprise's mission. These processes are complex in nature due to the environment they support; they span across multiple IT systems, require manual activities and hand-offs, and are difficult to track from beginning to end. These challenges lead to inefficiencies and points of failure which hinder overall productivity.



Phase 2: Stakeholders Dashboard



DLA Business Processes given the complexities of the operations

Key Performed Indicators

MANTECH RESPONSE

- In 2022, the DLA Research & Development (R&D) provided the technological infrastructure to propel early-stage adoption for emerging and disruptive technologies under new program called Applied Research & Testing Emerging Technologies (ARTET), which Phase 1 of the project focused on piloting Celonis, a leading process mining technology, to develop a process digital twin to model the Order Management sub-process of the Order-to-Cash (O2C) business process for DLA Aviation managed items. This was piloted within the DLA IT environment, more specifically in the DLA R&D ARTET using data from DLA EBS
- Phase 2 of the project focuses on expanding the process digital twin across the agencies end-to-end O2C process and associated sub-processes to demonstrate broader applicability across the enterprise by supporting Digital-Business Transformation (D-BX) and ERP modernization efforts
- The project team collaborated with 100+ stakeholders from across DLA via various workshops, meetings, and validation sessions. Collaboration focused on understanding KPI's, data validation, and reviewing DLA's Order Management processes to identify current state inefficiencies and improvement opportunities using insights from the process digital twin
- Process flows were analyzed, and inefficiencies identified. Areas include manual process steps, additional activities within the overall process, order rejections and reviews, and time-consuming communication methods to customers/vendors. Utilizing the Digital Twin to analyze the process, various improvement methods are expected to impact the Order Management process, including the use of an Order Management portal

MANTECH IMPACT AND BENEFITS

- Support IT Transformation, Re-Platform Functionality, Align to COTS Functionality, Streamline User Experience.
- Support Continuous Improvement.
- Maximize Automation / RPA Measure Benefits & Outcomes.

The implementation of the O2C Digital Twin Process Mining significantly improves the efficiency and effectiveness of processes in DLA's O2C process. The Process Digital Twin project supports DLA's Strategic Plan across multiple Critical Capabilities and Lines of Effort by introducing an emerging technology that can be used to support system & process transformations.

PARTICIPANTS

Defense Logistics Agency (DLA) and Accenture

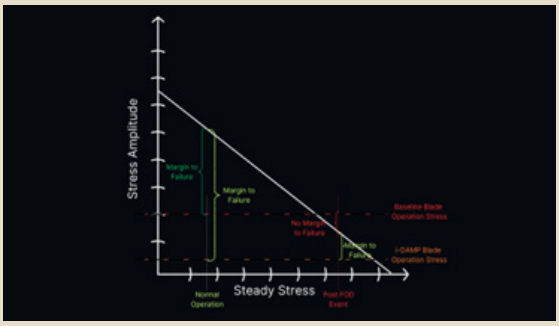
DLA Develops a Combined Vibration Suppression Design and Additive Repair Process to Enhance Turbine Engine Blade Sustainment

MANUFACTURING CHALLENGE

The Department of Defense (DoD) faces a $1 billion challenge due to potential failures of turbine engine blisks, critical components housed in aircraft engines. Additive Manufacturing (AM) offers transformative potential to address this issue by innovatively producing and repairing these complex parts. However, uncertainties in the fatigue performance of AM components pose significant challenges. To resolve this, a solution must enhance the damage tolerance and reliability of AM blisks, ensuring their effective use and improving the durability and efficiency of military aircraft engines.

i-DAMP vibration suppression method void/powder in a blade

Laser wire directed energy deposition system for AM repair



Graphical damage tolerance explanation with the Goodman line

MANTECH RESPONSE

- Developed hybrid manufacturing repair process with vibration suppression design that improves damage tolerance
- Demonstrated a residual stress reducing air-grinding process
- Incorporated an approval process for accepting/rejecting repair techniques
- Worked with Navy to demonstrate the repair/manufacturing paradigm in a relevant spin environment

MANTECH IMPACT AND BENEFITS

- A viable repair exists for >$200M worth of turbine engine blisk in Hold For Future Repair status
- Alleviates a Pending $1B sustainment issue for fighter jet turbine engine blisks
- Extends turbine engine time on wing by reducing likelihood of component failures
- Improves warfighter readiness to deploy and fight

By advancing Additive Manufacturing (AM) technologies, this effort reduces maintenance costs, boosts operational efficiency, and drives innovation in aerospace, ensuring technological leadership and economic growth in defense and related industries.

PARTICIPANTS

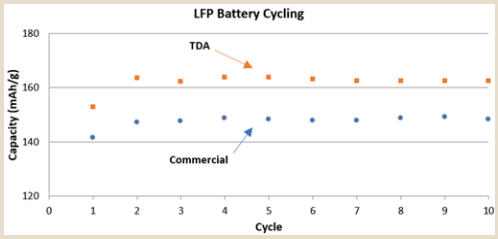
Lori Smith-Mitchell, DLA R&D, lori.smith-mitchell@dla.mil; Todd Pickering, NAWCAD, todd.m.pickering.civ@us.navy.mil; Onome Scott-Emuakpor, Hyphen Innovations, onomese@hyphenmade.com; Philip Johnson, Hyphen Innovations, philip@hyphenmade.com

DLA ManTech Develops Scalable, Continuous Hydrothermal Process to Manufacture Lithium Iron Phosphate and Lithium Manganese Iron Phosphate

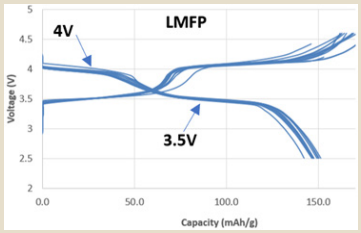
MANUFACTURING CHALLENGE

Rechargeable lithium-ion batteries (LIBs) are one of the major power storage technologies; used in portable electronics, electric vehicles, renewable energy storage, and in many weapons systems. Unfortunately, all of the lithium iron phosphate (LFP) used in LIBs is manufactured in China using a batch solid-state sintering process. To address the need for a scalable domestic supply, TDA Research has developed a continuous hydrothermal process using proven chemical unit operations and equipment that makes high quality LFP and lithium manganese iron phosphate (LMFP) and that can easily take advantage of economies of scale.

TDA's LFP Pilot Process



Cycling performance of TDA's LFP electrode material



Energy Density of TDA's LMFP

MANTECH RESPONSE

- Designed, built, and operated a 10 kg/day pilot unit at TDA's Golden, CO Facility
- Investigated feedstock solubility limits and reactor hydrodynamics to improve LFP conversion
- Using our continuous process, produced LFP that will be delivered to Saft for performance characterization
- DLA SBIR investment of ~$1.8MM

MANTECH IMPACT AND BENEFITS

- TDA's novel hydrothermal LFP outperforms commercially-available LFP (~162 vs. 150 mAh/g)
- TDA's process is continuous, which provides increased scalability and recyclability compared to the current solid-state batch process
- Can easily adapt the process for new feedstock chemistries
- TDA has included manganese (LMFP) to boost energy density of our electrode materials

Provides a domestic, scalable supply of high-capacity LFP & LMFP electrode materials

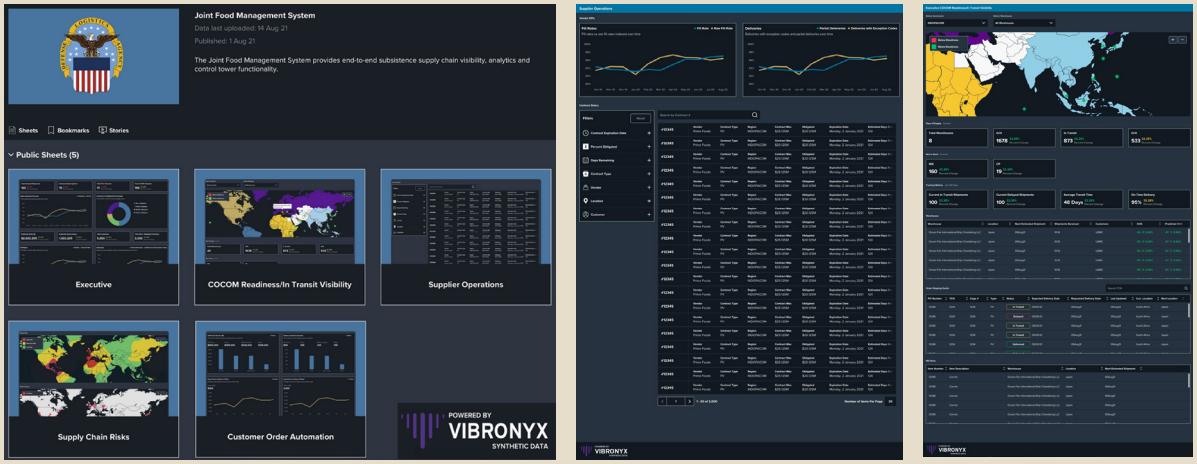
PARTICIPANTS

TDA Research Inc., Saft Groupe SAS (Current LFP based battery supplier to DoD), DLA ManTech (BATTNET)

DLA ManTech Aligns and Synchronizes the Subsistence Supply Chain using the Joint Food Management System (JFMS)

MANUFACTURING CHALLENGE

The Defense Logistics Agency (DLA), as the DoD Executive Agent for Subsistence under DoDD 5101.10, is tasked with managing and ensuring the quality of subsistence products while promoting greater supply chain integration. Additionally, DLA must collaborate with the Military Services to develop and maintain a joint food management system. To address these requirements, a comprehensive solution is needed, including a detailed rollout plan, cost-benefit analysis, and recommendations for implementing an effective Joint Food Management System.



JFMS Functionality and Capability Contribution to the DLA Digital Business Transformation and Modernization Initiatives

MANTECH RESPONSE

- This DLA Research and Development Subsistence Network project objective was to provide best-value analysis that considered cost and other quantifiable and non-quantifiable factors supporting a potential investment decision for the DLA and Military Partners
- The vendor developed a strategic plan for digital transformation of the subsistence supply chain, for how digital applications can improve service, cost, and inventory levels, as well as provided strategic guidance to develop, implement, and maintain a Joint Food Management System (JFMS)
- DLA ManTech investment of $2.66M

MANTECH IMPACT AND BENEFITS

- Improve DLA Troop Support day-to-day operations, strategic planning, and performance management
- Provide real-time and predictive capabilities to the Subsistence supply chain
- Implementing the JFMS solution would result in
  - » $134M annual cost avoidance by automating manual processing of Military Services orders
  - » $2.4M annual cost avoidance by automating data collection for reporting by DLA customer, vendor, and contracting teams
  - » Improved situational awareness with COCOM readiness metrics and real-time in-transit visibility
- Estimated total Return on Investment (ROI) of 469% with development of the proposed JFMS solution

The JFMS solution provides improved readiness, customer satisfaction, and operational efficiencies

PARTICIPANTS

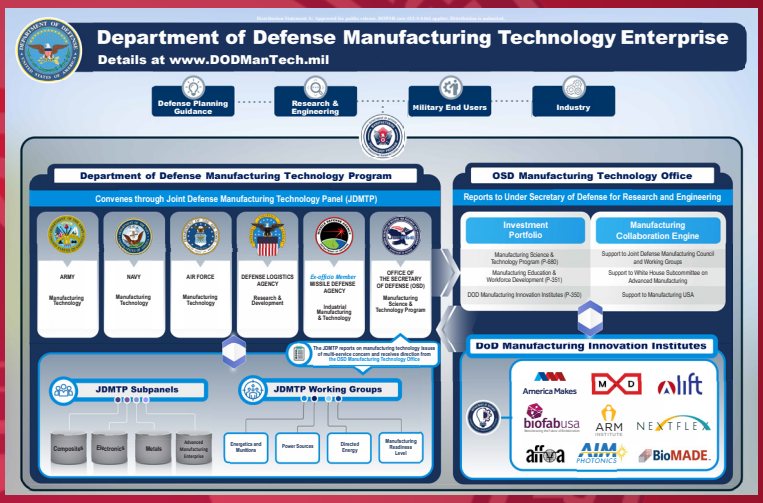
DLA ManTech, Vibronyx Inc., DLA Troop Support Subsistence, Military Services, DLA J3, & DLA J6

Manufacturing Science and Technology Program 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 developments enabling 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).



INVESTMENT STRATEGY

The MSTP focuses its research and development investment portfolio on cross-cutting defense manufacturing needs using a set of identified joint, defense-critical, and sometimes high-risk manufacturing technology areas. 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 then issues a call for project proposals that must feature a Governmental 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

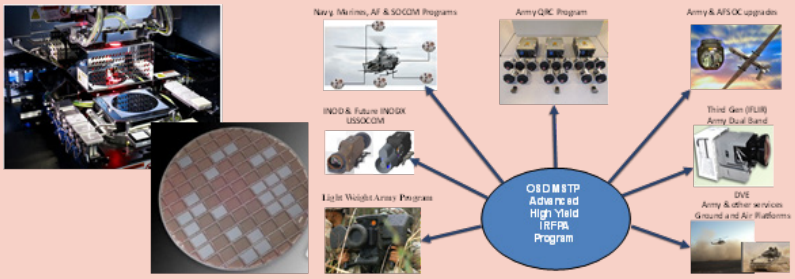
Technology transition and joint-service or multi-system application are key factors in selecting MSTP projects. All potential MSTP projects are required to have a clear technology transition plan and target along with endorsement from the potential project team's program office. Funding is typically 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 4 categories: Advanced Electronics and Optics, Advanced Materials and Manufacturing, Enterprise and Emerging Processes, and Advanced Energetics Manufacturing.

MSTP Produces Advanced High Yield Infrared Focal Plane Arrays

MANUFACTURING CHALLENGE

Currently tactical/strategic/space cooled infrared focal plane arrays (IRFPAs) have low overall yields. IRFPAs permit tactical, strategic, and space applications including multi-spectral-aided target detection, improvised explosive device (IED) detection, 3D imaging, missile warning/tracking/defense, space-based & high-altitude remote sensing. This effort has identified the major yield limitations at the two predominant tactical and strategic IRFPA producers (RVS and DRS) and is designed to dramatically improve overall yield and reduce cost.



Advanced High Yield Infrared Focal Plane Array Manufacturing at RVS and DRS

MANTECH RESPONSE

- Improved traditional fabrication techniques for tactical/strategic/space IRFPA fabrication. These improvements are critical to reducing the overall cost and improving the production yield of infrared detectors
- This program has been identified as a key investment area by all the services, and thus is endorsed by the Air Force, Navy, Missile Defense Agency, and OGAs
- This program aligns with a previous Army, MDA, and OSD/Army ManTech funded efforts to enhance the performance and reduce the cost of IRFPAs
- Cost avoidance per 3rd Gen IRFPA of > 20%

MANTECH IMPACT AND BENEFITS

- Enables affordable 3rd Gen and strategic infrared (IR) sensors. Significantly reduce acquisition and ownership costs. Permit warfighting in urban areas, multi-spectral-aided target detection, disturbed earth (IED) detection, missile warning/tracking/defense
- Significantly reduces risk for many relevant Army, Navy/Marine Corps, and Air Force programs.
- The Return-on-Investment (ROI) is projected at 9 to 1 for Army 3rd Gen IRFPAs

OSD MSTP Advanced High Yield Focal Plane Array enables affordable 3rd Gen and strategic infrared sensors

PARTICIPANTS

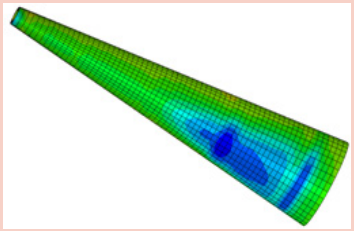
The U.S. Army Combat Capabilities Development Command C5ISR (Command, Control, Computers, Communications, Cyber, Intelligence, Surveillance and Reconnaissance) Center, United States Special Operations Command, Missile Defense Agency, Air Force, Navy, and Marine Corps, RVS and DRS

OSD MSTP Establishes Manufacturing Readiness Improvements for Alternative Composite Materials in Hypersonic

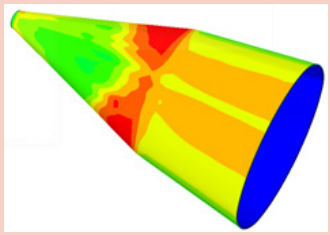
MANUFACTURING CHALLENGE

High-temp composite materials such as Carbon-Carbon (C/C) are critical to the success of hypersonic vehicles. However, significant manufacturing challenges such as long lead times, high cost, and low throughput must be overcome for high temperature materials to better meet the U.S. demand for hypersonic weapons systems. Materials such as Ceramic Matrix Composites (CMCs) or Carbon-Silicon Carbide (C/SiC) are excellent candidates for a future hypersonic aeroshell material. This ManTech effort aims to demonstrate both manufacturability and thermo-structural performance in relevant environments of these materials to provide a viable alternative to traditional reliance on Carbon-Carbon.

Area of Interest Aeroshell Acreage



Thermal Stress Analysis of a High L/D Geometry



Thermal Stress Analysis of an Axisymmetric Geometry

MANTECH RESPONSE

- Conducted analysis to assess performance of candidate CMC materials for hypersonic aeroshell environments for both axisymmetric and high lift-to-drag ratio (L/D) shaped vehicles
- Identified the required material architectures and produced hardware samples of the top materials in a relevant configuration for hypersonic aeroshells
- Conducted manufacturing readiness assessments of the top two candidate material systems
- Collaborating with Joint Acceleration of Hypersonic Vehicle Aerostructure Alternatives (JAHVAA) program to further advance the CMC technologies by utilizing cost share to re-evaluate manufacturing readiness level (MRL) on top candidates from JAHVAA funded aeroshell hardware

MANTECH IMPACT AND BENEFITS

- Provided ManTech with the realization that CMC vendors tend to vastly overestimate the manufacturing readiness level of hypersonic aeroshell
- Collected arc jet data on a candidate material through cost share opportunity (estimated savings of $800k or more in test costs plus schedule challenges)
- Determined that CMC aeroshell design solutions are likely not a drop-in replacement for existing C/C hypersonic aeroshell. They must be implemented earlier in the design phase
- Provides path to transition CMCs with the top vendors to hypersonic programs of record

Advanced Aeroshell Technology Development Program establishes manufacturing readiness improvements and path to transition for CMC materials vendors

PARTICIPANTS

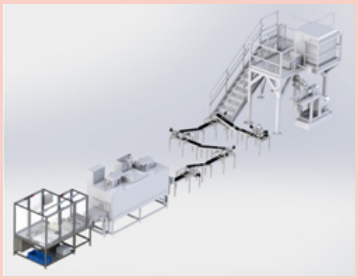
DEVCOM Aviation and Missile Center, ReLogic Research, Air Force Research Laboratory, OSD ManTech, NASA, Missile Defense Agency, Joint Hypersonics Transition Office, General Electric, Physical Sciences Inc, North Country Composites, MATECH, Naval Surface Warfare Center Crane, National Institute for Aviation Research, Joint Acceleration of Hypersonic Vehicle Aerostructure Alternatives program

MSTP and Navy ManTech Aim to Improve Zinc Anode Manufacturing Line to Boost Capability and Reduce Labor

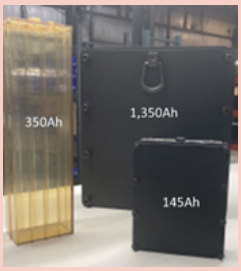
MANUFACTURING CHALLENGE

The current anode manufacturing process requires a lot of manual touch labor, is operator dependent, and susceptible to variation. Next Generation Submarine Main Storage Battery (NG SMSB) efforts are ramping up to scale commercial Nickel-Zinc (NiZn) batteries to a US Submarine system. NiZn manufacturing has to be sped up, improved, and of high quality, low variability. Navy ManTech is improving the manufacturing process through automation, reduced labor, reduced scrap, and reduced variability.

Manual Anode Manufacturing



Automated Anode Line



NiZn Prototype Cells

MANTECH RESPONSE

- MSTP, DLA ManTech and Navy ManTech supported design, operation, and implementation of custom manufacturing equipment and processing to enhance zinc anode manufacturing
- This support aims to reduce labor and scrap and increase domestic capability to manufacture NiZn batteries across branches of DOD
- Final product of automated anode line will increase reliability of product and increase production capacity
- MSTP investment of $909k with $1.1M cost share from Æsir Technologies

MANTECH IMPACT AND BENEFITS

- Aims to reduce overall labor per G31 battery from 9.3 hours to less than 1 hour
- Aims to reduce scrap rate from 32% to less than 5%
- Impacts NG SMSB and SSN(X) Developmental Roadmaps by meeting required cell level testing prototype manufacturing
- Programs addressed are VIRGINIA Class Submarines, Submarine Search and Rescue, and SSN(X)
- US Army Tank & Automotive Command is evaluating NiZn 6T battery prototypes for system application

Ongoing effort aims to Improve Nickel-Zinc Anode Line Capability and Reliability through Increased Automation Resulting in Reduced Labor, Scrap, and Cost

PARTICIPANTS

Naval Surface Warfare Center Crane, SAIC, Defense Logistics Agency, Æsir Technologies, PMS 450X, NAVSEA 05Z, PMS 392, SUB 073, PMS 390, PMS 351, General Dynamics Electric Boat, U.S. Air Force, U.S. Army Tank and Automotive Command

2024 DEFENSE MANUFACTURING TECHNOLOGY ACHIEVEMENT AWARD NOMINATIONS

The Defense Manufacturing Technology Achievement Awards (DMTAAs) are sponsored by SME and awarded to ManTech teams who demonstrate outstanding performance in executing and delivering ManTech solutions for DoD. The Joint Defense Manufacturing Technology Panel would like to recognize these teams for their hard work and congratulates the winners of the 2024 DMTAAs, to be announced at the 2024 Defense Manufacturing Conference.

TECHNOLOGY ENABLER

The primary advancement is in software, hardware, firmware, data management, and related activities

Project Title	Service/Agency	Subpanel
Advanced High Yield IR Focal Plane Array	OSD	Electronics
Deformable Mirrors for High Energy Lasers	OSD	Electronics
Electrochemical Machining for Armanent Manufacturing	Army	Metals
Machine Learning and Schedule Optimization	Navy	AME
Order to Cash (O2C)	DLA	AME
* Spatial Intelligence with Dynamic Extended Reality (SPIDER)	AF	AME

COST REDUCTION / RATE OR SAFETY IMPROVEMENT

Projects where the primary objective is to reduce cost, increase rate or provide significant safety methodology for manufacturing production, or sustainment

Project Title	Service/Agency	Subpanel
Deep Hole Drilling	Navy	Metals
High Power Magnetron Maturation Program (HPMMP)	OSD	Electronics
Production Optimization of HEL Optics (Grind and Polish)	Army	Electronics
Vacuum Bagging and Curing Advancements for Pi Bonded Structures	AF	Composites
* Radome Operational Performance Evaluation (ROPE)	AF	AME

ENHANCING MILITARY CAPABILITY

ManTech projects which enhance systems and sub-systems to improve military performance

Project Title	Service/Agency	Subpanel
* Advanced Transceiver Optical Module (ATOM)	Army	Electronics

* DMTAA Winner

READINESS IMPROVEMENT

Manufacturing technologies where the primary benefit is readiness

Project Title	Service/Agency	Subpanel
* Depot Factory AI Robotics (DFAIR)	AF	AME
Print Plastic to Make Metal	Navy	Metals

SUPPLY CHAIN IMPROVEMENT

Develop manufacturing technologies, processes, or workforce improvements that enhance efficiency (cost) and effectiveness (quality) of the supply chain

Project Title	Service/Agency	Subpanel
Arrays at Commercial Timescales (ACT)	AF	Electronics
Advanced Aeroshell Technology Development	OSD	Composites
* Modernization and Readiness Analysis of Joint Food Management System (JFMS)	DLA	N/A

2024 JDMTP SERVICE RECOGNITION AWARDS

DoD ManTech and the JDMTP Principals recognize and thank the following members of JDMTP for their past contributions to JDMTP. These individuals have personally dedicated their time and manufacturing technology expertise and have shared critical information on their respective DoD Component's manufacturing projects in order to exchange knowledge, identify mutual objectives, and jointly collaborate to improve the overall DoD ManTech program.

2024 SERVICE RECOGNITION AWARDS

Andrea Simmons
Prior Army ManTech Action Officer

Joe Barniak
Moved on from JDMTP Secretariat position.

Scott Bartlett
Moved on from Composites Subpanel Chair role

Keith DeVries
Prior OSD Principal

Scott Pearl
Air Force ManTech Action Officer, Retiring from AF ManTech

Tracy Frost
Prior DoD ManTech Director

Steve Luckowski
Prior MII Program Manager

* DMTAA Winner

PAST DEFENSE MANTECH ACHIEVEMENT AWARD WINNERS

The Joint Defense Manufacturing Technology Panel seeks to recognize and honor those most responsible for outstanding technical accomplishments in achieving the vision of the Department of Defense ManTech Program. That vision is to realize:

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

2023

Automation of Fiber Amplifier Test Beds

CH-53K Flexbeam Automation

Lightweight Hydrogen Fuel Cells for Unmanned Aerial Systems

Advanced Automation for Agile Aerospace Applications

Powerful Lightweight Lead Polymer Bipolar Batteries for Military Vehicles

2022

Digital Data-Next Gen Measurement/Locating Tools

AF CLASP

GaN MMIC Production Initiative

Virtual Part Repair Programming for Robotic Thermal Spray Apps

MgO Binder Replacement for Thermal Batteries

Precursor Foamable Celluloid Materials

2021

Production BOM QA Using Artificial Intelligence

VIRGINIA Class Submarine Alternative Coating and Surface Preparation Solutions for Air-System Ball Valves

Polymer Gradient Index Lenses for Military Optics

Advanced Radome Diagnostic System (ARDS)

Advanced Laser Diode Supply Chain Improvement During COVID

2020

Development of Large Diameter Silicon Carbide Substrates

Agile Manufacturing Cell with High Energy Buried Arc Welding for Vehicle Structures

Novel Ultra-Strong Low Cost Film Manufacturing Technology for Superior Warfighter Protection

Hatchable Cold Spray Technology for Naval Shipyards and Marine Corps Depots

Integrated Casting Ordering Network (ICON) Portal Enhancement and Supply Chain Development

2019

12 μm Pixel High Definition Uncooled LWIR2019

Maturation of Adv. Mfg. of Low Cost Sustainment

High Performance, Low Variability AM Parts

III-V Dual Band Infrared FPAs

DLA Nuclear Enterprise Support Office NSNs

2018

Automated Aircraft Inlet Coating

Organic Light Emitting Diode (OLED) Microdisplays

F-35 High Fidelity Fastener Measurement

Lithium-Ion Replacement for TOW MGS Nickel Cadmium Battery

2017

Tungsten Carbide Penetrator and Assembly Cost Reduction

Affordable Protection from Objective Threats

Virginia Class Submarine Retractable Bow Plane System

128 Kilobit RAM ROM Microcircuit Emulation

2016

High Operating Temperature Multi-Band FPA

Digital Thread for Material Review Board

Optical Windows – ALON

2015

F-35 Electro-Optical Targeting System (EOTS) Producibility

Welding of High Strength Steels

Manufacturing Technology for High Power Vertical Cavity Surface Emitting Lasers (VCSELS)

2014

Chip Scale Atomic Clock (CSAC)

F-35 Canopy Thermoforming Automation

Low Light Level Sensor

Large Affordable CdZnTe Substrates (LAS)

Establishing the Production Capability for Lighter, Higher Energy Soldier Batteries

2013

Advanced Body Armor

Plate Edge Preparation Improvements (PEPI)

Restoration of Aerospace Parts by Cold Spray

2012

Fastener Insertion Live Link System (FILLS)

Customer/Supplier Interoperability During Collaborative Design

3-D Technical Data Package and Certification

2011

Use of Digital Radiography for Final Part Acceptance of Aerospace Casting

Prosthetics & Orthotics Manufacturing Initiative (POMI)

Automated Fiber Placement of Carbon Fiber Bismaleimide Materials

2010

High Power, High Energy Density Lithium-Ion Batteries

Seal Extrusion Development and Demonstration (SEDD)

Weld Seam Facing and Back Gouging

2009

F-35 Inlet Duct Robotic Drilling

Low Cost Manufacturing of Materials for Improved Warfighter Protection

2008

Laser-Welded Corrugated-Core (LASCOR) Panel Evaluation

Low Observable Paints for Aircraft

2007

Lean Battery Initiative

Low Cost SiC-N Ceramic Tile

Translational Friction Stir Welding

2006

Uncooled Focal Plane Array Producibility

Engine Rotor Life Extension

2005

Large Aircraft Infrared Countermeasures

Large Marine Composite-to-Steel Adhesive Joints

2004

Lean Depot Repair

Uniform Cannon Tube Reshaping