Department of Defense Manufacturing Innovation Institutes

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U.S. Advanced Manufacturing is Central to Warfighter Success









Courtesy of NextFlex

Our warfighters cannot use it if our U.S. manufacturers cannot make it!



Courtesy of NextFlex



Courtesy of NextFlex



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SOURCE: Defense.gov



Department of Defense Manufacturing Technology Program *Overview*

For over 68 years, the DoD ManTech Program has reinforced America's worldclass manufacturing base to meet joint force needs rapidly and affordably across the defense system life cycle.

The DoD ManTech Program furthers national security by:

- developing and applying emerging manufacturing processes and technology,
- strengthening joint planning and coordination,
- implementing advanced manufacturing within the organic industrial base for sustainment
- fostering outreach and communication with the defense industrial base, and
- recruiting and **training the manufacturing workforce**.













Department of Defense Manufacturing Technology Program *Enterprise*



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Office of the Secretary of Defense Manufacturing Technology Program *Portfolio*

Investment Programs Under PE 0603680D8Z

- P680 Manufacturing Science and Technology (MSTP)
- P350 Department of Defense Manufacturing Innovation Institutes (DoD MIIs)
- P351 Manufacturing Education and Workforce Development (M-EWD)
- ✓ Supporting the OUSD(R&E) critical technology areas
- ✓ Managing the <u>Manufacturing Science and Technology Program</u>
- ✓ Overseeing the <u>DoD Manufacturing Technology Program</u>
- ✓ Serving as a Principal on the <u>Joint Defense Manufacturing Technology Panel</u>
- Leading and fostering the Federal Government's partnerships with the <u>DoD Manufacturing Innovation Institutes</u>
- ✓ Furthering the DoD's <u>Manufacturing Education and Workforce Development</u> activities
- <u>Collaborating</u> with other Federal agencies on advancing manufacturing in the United States



Department of Defense Manufacturing Innovation Institutes *Overview*

Industry-driven, public-private partnerships serving the Warfighter and Nation

WHAT?

Public-private partnerships that increase economic and national security by maturing manufacturing processes, building sustainable supporting ecosystems, and providing manufacturing education and workforce development.

WHY?

To grant the Department of Defense (DoD) access to advanced manufacturing technologies, address DoD modernization priority needs, and further the national imperative to ensure future products are made in the United States.

HOW?

Catalyze the establishment, effective operation, and integration of industry-led public-private partnerships that connect and develop people, ideas, and technology in ways that accelerate the transition of new capabilities into defense and commercial products and systems.



The Department's Formal Relationship with the DoD MIIs

- **Program Office:** The Office of the Secretary of Defense Manufacturing Technology Program (OSD ManTech) oversees DoD's relationship with the institutes. The DoD Manufacturing Innovation Institutes (MIIs) are considered an integral part of the wider DoD Manufacturing Technology Program.
- Legislative Authorities: 10 U.S.C. § 4841
- **Partnership Mechanism:** Cooperative Agreements or Technology Investment Agreements
- Program Management:
 - The U.S. Army, Navy, and Air Force provide program managers and subject matter experts committed to helping the DoD MIIs meet Department-wide needs while equipping the Warfighter
 - The Joint Defense Manufacturing Council conducts formal evaluations of each DoD MII every five years.
 - The Joint Defense Manufacturing Technology Panel regularly engages with the DoD MIIs by funding governmentdirected projects, participating in institute events, and collaborating with institutes to support subpanel priorities.



DoD MII Mission and Vision *Chartering Principles*

Advancing Research & Technology

Partner with industry to invest in applied research and industrially-relevant manufacturing technologies Establishing & Growing Manufacturing Ecosystems

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Establish regional manufacturing hubs and ecosystems for long-term, national impact Securing Human Capital

Develop manufacturingspecific education and workforce development resources to ensure innovative technology is manufacturable

- Industry driven, public-private partnerships are a resource for the entire DoD and other Federal Agencies
- Principles support the OSD ManTech congressionally-mandated mission to support the Warfighter while enhancing the U.S. manufacturing base capabilities, expertise, and intellectual property



DoD Manufacturing Innovation Institute Locations







DoD MII Mission and Vision *Business Model Overview and Tenets*

MISSION

Catalyze the establishment, effective operation, and integration of industry-led public-private partnerships that connect and develop people, ideas, and technology in ways that accelerate the transition of new capabilities into defense products and systems.

Regional hubs with national impact to U.S. ecosystem	Competitively award to non-profit to act as "honest broker," accountable for long-term viability	Industry-led, DoD-informed technical road-mapping
Industrially relevant, DoD-oriented research and development (R&D) to "bridge the gap" (Technology Readiness Level / Manufacturing Readiness Level 4-7)	Access to shared assets for U.S. companies including intellectual property and infrastructure	Education and training for sufficient, <mark>skilled manufacturing</mark> workforce
Initial federal investment (\$70-\$120M per institute) over 5-7 years	Leverage minimum of 1:1 cost share from non-federal sources	Formal DoD evaluations prior to continued DoD engagement and funding



DoD MII Public-Private Partnership Model Comparison with Traditional Systems Acquisition

Strategy	<u>Traditional Model for Engaging with Industry</u> DoD & industry invest independently	DoD Manufacturing Innovation Institutes DoD partnership with industry
Access to Technology	Limited DoD engagement with non-traditional contractors	Expanded partnerships with entrepreneurs, students, startups, & manufacturers to innovate
	Disparate time spent on understanding the domestic ecosystem & commercial supply chain capabilities	Organized ecosystems & technology roadmaps enable DoD to leverage commercial technologies
Cycle Time	Long Technology often out-of-date by the time its fielded	Agile Commercially validated capabilities reduce or eliminate the need for a longer R&D phase
Cost	Not Affordable High likelihood that DoD replicates & invests in technology already commercially available	Saves R&D Dollars Validates & gains commercial buy-in for DoD dual-use technology
Education & Workforce Development	Minimal ability for DoD to significantly affect change in the career trajectory of students	Integrated partnerships with academia to train & inspire students to engage in defense manufacturing



DoD MII Membership Breakdown

DoD MII Membership as of FY24 Q4





Where the DoD MIIs Fit within the National Landscape



Focusing on the intersection of the Defense Industrial Base and Commercial Industrial Base to ensure commercial competitiveness, not only DoD benefit



DoD MIIs Build Bridges Between Innovation and Production



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The DoD MIIs Fill an Acquisition Gap



• Act a "Prototype to production" capability for Programs of Record

	Enabling S&T and Materials Science Analysis			Technology Maturation & Risk Reduction		Engineering & Manufacturing Development		Production & Deployment		
Manufacturing Readiness Level (MRL)	MRL 1 Basic Mfg Implications Identified	MRL 2 Mfg Concepts Identified	MRL 3 Mfg Proof of Concept Developed	MRL 4 Mfg Process in Lab Environment	MRL 5 Components in Production Relevant Environment	MRL 6 System or Subsystem in Production Relevant Environment	MRL 7 System or Subsystem in Production Representative Environment	MRL 8 Pilot Line Demonstrated Ready for low- rate initial production	MRL 9 Low-rate initial production ready for full rate production	MRL 10 Full rate production, lean production practices in place
Technology Readiness Level (TRL)	TRL 1 Basic Principles Observed	TRL 2 Concept Formulation	TRL 3 Proof of Concept	TRL 4 Breadboard in Lab	TRL 5 Breadboard in Representative Environment	TRL 6 Prototype in Representative Environment	TRI Prototype in Enviror	. 7 Operations Iment	TRL 8 System Qualification	TRL 9 Mission Proven

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DoD MII Success Story Examples Individual DoD MII Accomplishments

- America Makes collaborated with the Defense Logistics Agency to transition a Joint Additive Manufacturing Model Exchange, providing an accessible but secure way to share 3D printing files across the DoD enterprise.
- LIFT worked with Ricardo Defense Systems to <u>develop a Humvee Antilock Brake and Electronic Stability Control</u> <u>Systems system to prevent 74% of rollovers</u>. The Army awarded Ricardo a three-year, \$89 million contract to provide 9,480 critical safety improvement retrofit kits.
- **MxD**'s Jobs Taxonomy Digital and Cyber Hiring Guide are transforming how universities and community colleges educate and how companies identify needed skills for hiring and retraining workers for Industry 4.0.
- **AIM Photonics** established the <u>first integrated silicon photonic circuit offering in the U.S.</u> and <u>the first 300-mm</u> <u>offering anywhere in the WORLD</u>.
- **NextFlex**'s FlexFactor has grown to national impact across <u>12 states</u>, <u>35 community college and education</u> partners, <u>50 industry partners</u>, and <u>22,000+ participants</u>.
- **BioFabUSA** developed a groundbreaking tissue foundry platform composed of a series of automated modules enabling the manufacture of tissue engineered medical products.
- **The ARM Institute** launched Roboticscareer.org <u>the ONLY national resource that provides industry-vetted</u> <u>robotics for manufacturing training.</u>
- BioMADE is developing <u>a domestic source of natural rubber from dandelions</u>. Currently, more than 90 percent of the world's natural rubber is made from latex derived from rubber trees and is primarily sourced from tropical locations outside of the U.S.









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Examples of DoD MII Manufacturing Facilities

\$50M Lightweight Metals Manufacturing Center



First Complete Flexible Hybrid Electronics Pilot Line \$30M+





AIM Foundry & Test, Assembly and Packaging Facility - \$240M



MxD's Future Factory Pilot - \$5M+

Institutes are member-based consortia with core capabilities



Point-of-Need Manufacturing Challenge

Quick-turn solutions for forward-deployed forces in austere environments

POINT-OF-NEED CHALLENGE

- DoD invested ~\$2.5M with \$700K industry partner cost share
- 13 joint DoD judges selected 6 projects from 5 MIIs
- 9 months later, project teams demonstrated technologies at the Cold Regions Research and Engineering Laboratory





TECHNOLOGIES ADVANCED

- Circuit Card Repair and Medical Brace Additive Manufacturing
- Cold Spray Metal Additive Manufacturing
- Metal Additive Manufacturing
- Blood On-Demand
- Therapeutic Agent Delivery System
- Cybersecurity for Manufacturing Systems



DoD MII Success Story Examples

DoD MIIs are a Unique Resource to Address DoD Manufacturing Challenges

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COVID-19 Response	Hypersonics Challenge	Point of Need Challenge			
 DoD MIIs activated 1.4K members across 45 states to address COVIID-19 issues (FY20) DoD awarded over \$60.7M in funding for 20+ projects Projects were funded and initiated within 5 weeks 	 Leveraging member network and government partners: America Makes is advancing additive manufacturing for high temperature metals (\$2.1M) LIFT is addressing materials and manufacturing for hypersonic vehicles (\$3M) 	 Quick-turn solutions for forward-deployed forces in austere environments (FY23) DoD invested ~\$2.5M with \$700K industry partner cost share Panel of 13 joint DoD judges selected 6 projects from 5 MIIs 9 months later, project teams demonstrated technologies at the Cold Regions Research and Engineering Laboratory 			
 Project Examples: Novel Drug Delivery Personal Protective Equipment Design Database CleanSURFACES Mat 	 Project Examples: Thermal Protective Coatings High Temperature Materials Integrated Computational Materials Engineering 	 Project Examples: Zero-Trust Cyber Security Platform for Machines On-Demand Blood Program 			



Supporting the Warfighter





Supporting the Joint Force

- Facilitate rapid transition of technical advances to industry by sponsoring government directed projects to advance concepts through prototype development and by providing rapid, flexible contracting
- Lower the risks of technology transition by using innovative tools to support legacy systems and applying new manufacturing processes to reduce cycle times
- Help scale advanced manufacturing by identifying domestic sources for components and materials, and by advancing technologies from the prototype stage to limited-scale production
- Facilitate access to the advanced manufacturing ecosystem by engaging with leaders in industry and academia to create and participate in training programs





DoD's Long-Term Strategy for the DoD MIIs

Through the DoD ManTech Program, the Department continues to:

- Maintain active partnerships with the DoD MIIs ensuring DoD equities are met contingent through periodic evaluation of performance and progress toward the MIIs' chartering principles
- Establish follow-on agreements, as appropriate, and in the Department's best interest, at the Department's discretion
- Integrate DoD MII project portfolios with the Department's critical technology areas



DoD MIIs

Demonstrating Growing, Tangible Impact

- Helping to bridge the gap between basic research and product development/fielding
- Providing DoD with access to key, domestic enabling technologies
- Advancing manufacturing innovation for specific, focused technology areas
- Ensuring a strong ecosystem of companies and organizations

- Maintaining close manufacturing partnering relationships
- Providing shared assets among MII member organizations; key benefit for small and medium enterprises
- Creating an environment to develop the skills and educate/ train the workforce

DoD's MIIs are creating new, collaborative environments spurring innovation, performance, and competitiveness across the U.S. industrial base



DoD MII Mission and Vision Ideal Steady State

• DoD strategic partnership ensures defense equities in manufacturing R&D

- ✓ Industry-driven technology roadmaps include DoD applications
- ✓ Shorter innovation cycles for DoD priorities; alignment to Service priorities
- ✓ Commercially validated capabilities reduce or eliminate the need for a longer R&D phase

Continued investment and engagement by MII membership

- ✓ Retain and grow members to span US ecosystem and suppliers
- ✓ Organized ecosystems enable DoD to leverage commercial manufacturers and facilities
- MIIs enable unusual reach and partnerships with non-traditionals

• MII's tailor Business Plan for diverse revenue streams

- ✓ Growth in Agency-Driven projects, fee-for-Service, IP licensing
- ✓ Share risk reduction efforts with industry
- ✓ Validate and gain commercial buy-in for DoD dual-use technology

Increase skilled workforce in support of defense manufacturing

- ✓ MIIs implementing DoD Manufacturing EWD Strategy
- ✓ Integrated partnerships with academia to train current and future defense workforce
- ✓ Upskilling for departing military and veterans, retraining of DoD organic workforce



2025 DoD ManTech Pentagon Day

Calling all Pentagon staff!

DoD ManTech Program Exhibition

Talk to DoD ManTech government and DoD Manufacturing Innovation Institute leaders



The Service ManTech Programs and DoD Manufacturing Innovation Institutes (MIIs) – **TOGETHER** – are innovating to equip our forces with the best tools possible



For more information...



DoD ManTech Program & DoD MIIs

www.DoDManTech.mil



The Manufacturing USA Program

www.manufacturingusa.com/

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