



# DoD Manufacturing USA Institutes

## Small Business Briefings



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# DoD ManTech Program

## MISSION:

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

ManTech carries out its mission through programs in the Military Departments, participating Defense Agencies, and OSD



DoD Manufacturing USA Institutes are executed out of OSD with support from the Services.



National Institutes of Health



The Laboratory for Physical Sciences



DEFENSE INNOVATION UNIT EXPERIMENTAL



FDA





# DoD Institutes Design Tenets

Industry driven, public-private partnerships



Investments in applied research and industrially-relevant manufacturing technologies (cost-matched)

Regional hubs of manufacturing excellence with National Impact

Required focus on education and workforce development needs

Tenets meet key DoD ManTech requirements





# DoD Manufacturing USA Institutes



## America Makes: The National Additive Manufacturing Innovation Institute

Est. AUG 2012 (Youngstown, OH)



## Digital Manufacturing and Design Innovation Institute (DMDII)

Est. FEB 2014 (Chicago, IL)



## LIFT - Lightweight Innovations For Tomorrow

Est. FEB 2014 (Detroit, MI)



## AIM Photonics (photonic integrated circuits)

Est. JUL 2015 (Albany, NY)



## NextFlex (flexible hybrid electronics)

Est. AUG 2015 (San Jose, CA)



## Advanced Functional Fabrics of America (AFFOA) – (revolutionary fibers and textiles)

Est. APR 2016 (Cambridge, MA)



## Advanced Regenerative Manufacturing Institute (ARMI) (advanced tissue biofabrication)

Est. DEC 2016 (Manchester, NH)



## Advanced Robotics for Manufacturing (ARM)

Est. JAN 2017 (Pittsburgh, PA)



- DoD MIIs part of Manufacturing USA: whole-of-government effort, in partnership with industry & academia
- Strategically aligning resources to address targeted technology spaces
- Creating 'industrial commons' for manufacturing R&D, workforce education and development
- Catalyzing defense and broader industrial 'innovation ecosystems' across the nation
- Accelerating trust in supply chain development with diversified risks



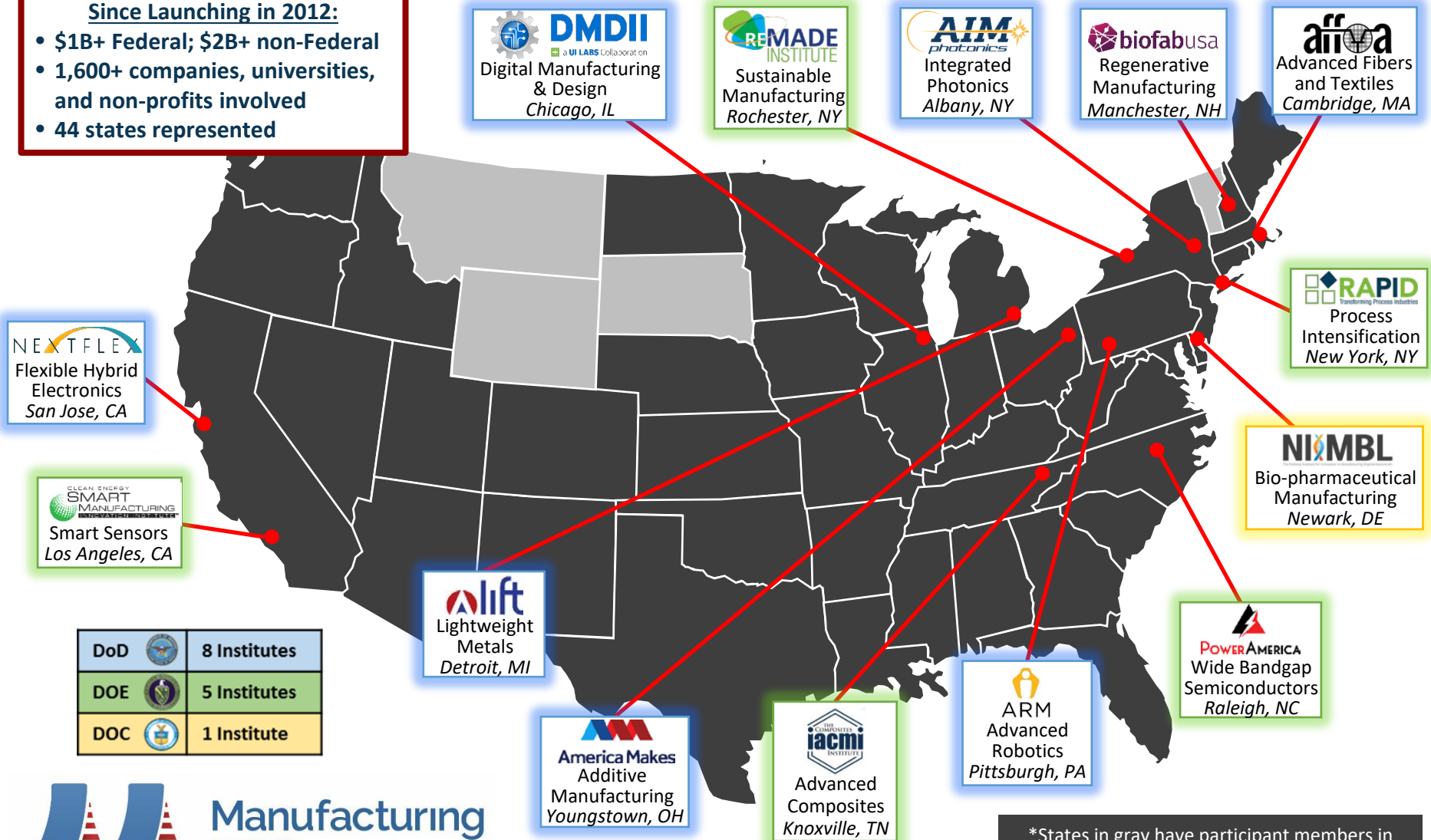
AIM Photonics Institute in Rochester, NY



# Manufacturing USA Network

**Since Launching in 2012:**

- \$1B+ Federal; \$2B+ non-Federal
- 1,600+ companies, universities, and non-profits involved
- 44 states represented



DoD		8 Institutes
DOE		5 Institutes
DOC		1 Institute



\*States in gray have participant members in Manufacturing USA Institutes





# DoD Institutes Introduction

## DoD Institutes Design Tenets



- Industry driven, public-private partnerships
- Regional hubs of manufacturing excellence
- Investments in applied research and industrially-relevant manufacturing technologies
- Required focus on education and workforce development needs

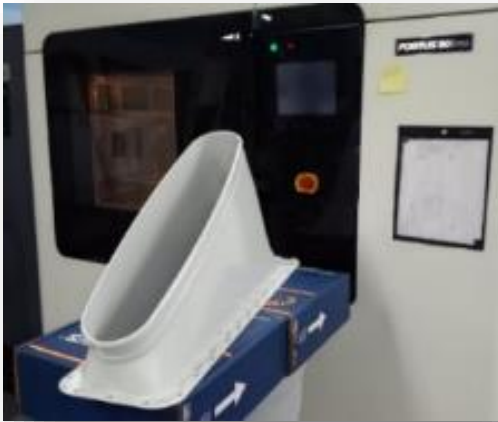
**Tenets meet key DoD ManTech requirements and are aligned with Manufacturing USA**



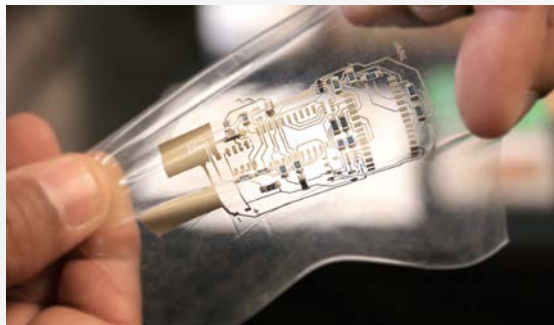
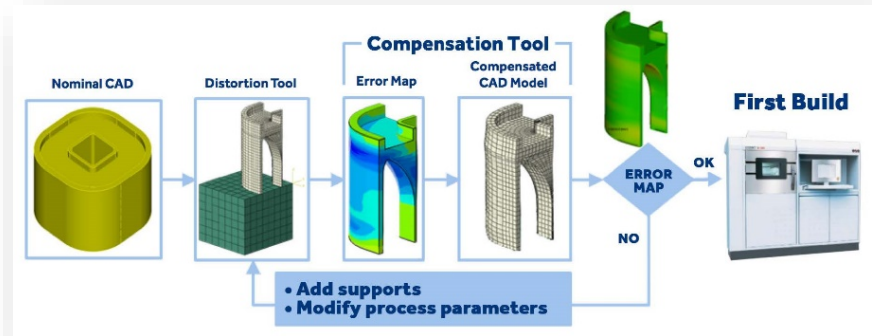
# Technology Project Success Stores



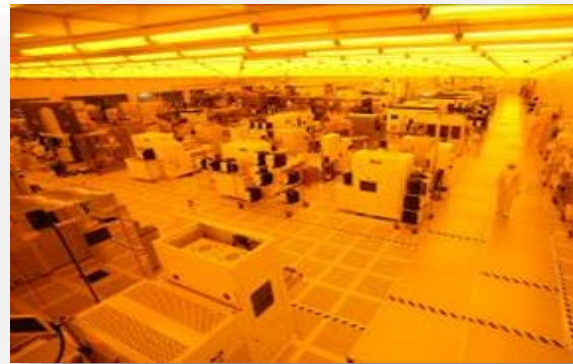
## Replacement Parts Completed Airworthiness



## Developing a Robust Distortion Prediction and Compensation Software Tool for Additive



## World First Fully Flexible Arduino Microsystem



## First U.S. Multi-Project Wafer Capability in Integrated Photonics



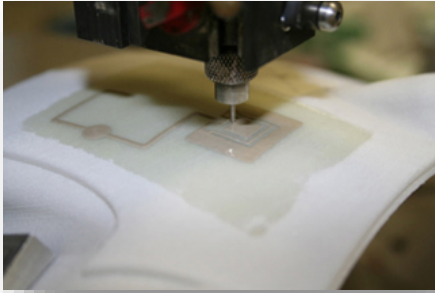
## Thin Wall Ductile Iron Castings



# DOD Application Success Stories



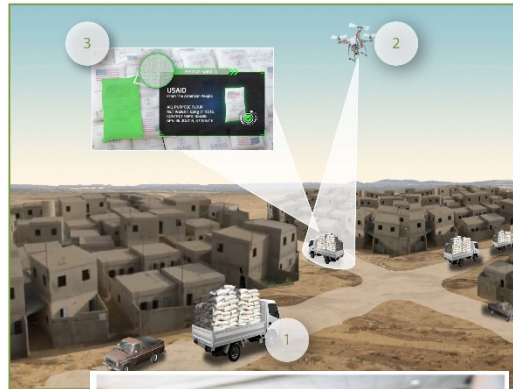
## Flexible Write of Array Antenna and FSS on UAV Surface



## Printed Casting Molds Improve Aircraft Readiness



## LiFi



## Light-Weighting to Reduce Fatal Rollovers



## LOOKs



## Reducing Orthotic Out-Patient Visits from 3 to 1





# Education & Workforce Development Activities Flourish



- **Highly Effective Manufacturing USA Education & Workforce Development Working Group**
- **2018 Science + Innovation Awards**
  - Manufacturing Innovation Awards
  - Go STEAM USA Talent Search
- **DoD Institute Initiatives**
  - LIFT's Operation Next
  - NextFlex's Flex Factor
  - America Make's ACADEMI Program





# Manufacturing Facilities and Capabilities

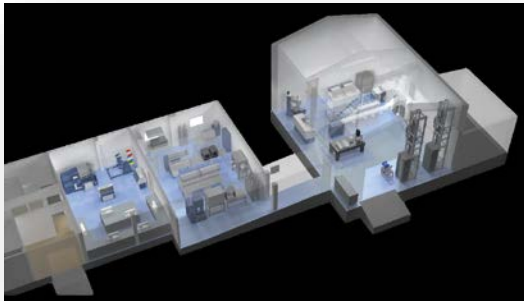


## \$50M Lightweight Metals Manufacturing Center



## AIM Foundry & Test, Assembly and Packaging Facility

## First Complete Flexible Hybrid Electronics Pilot Line



## Defense Fabric Discovery Center at Lincoln Labs



## Future Factory Pilot



# Manufacturing USA Success

## Summary



- ✓ 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

**Collaborate ~ Innovate**



# Manufacturing USA Engagement Opportunities



- ✓ Project Funding
- ✓ Vast Networks
- ✓ Workforce Readiness
- ✓ Technology Transition



**DoD's Manufacturing USA Institutes spur innovation, performance, and competitiveness for businesses across the U.S. industrial base.**





# Manufacturing USA Engagement

Membership Value for Small Businesses



## Each institute offers exclusive membership benefits including:

- Participation in project reviews
- Access to institute technical information and reports
- Access to education and workforce development programs
- Access to a Technical Help Desk
- Invitations to institute networking events
- Access to “Member’s Only” website and shared space
- Access to manufacturing equipment



# DoD Manufacturing USA Institutes

## “Quick Start” Engagement Guides



Four tailored “quick-start” guides, each focused on a major user or stakeholder group:

1. Federal Agencies
2. U.S. Manufacturers
3. Academic Institutions
4. State & Local Governments

The image displays four overlapping "Quick Start Engagement Guide" documents from the Department of Defense Manufacturing USA Institutes. Each guide is tailored to a specific stakeholder group:

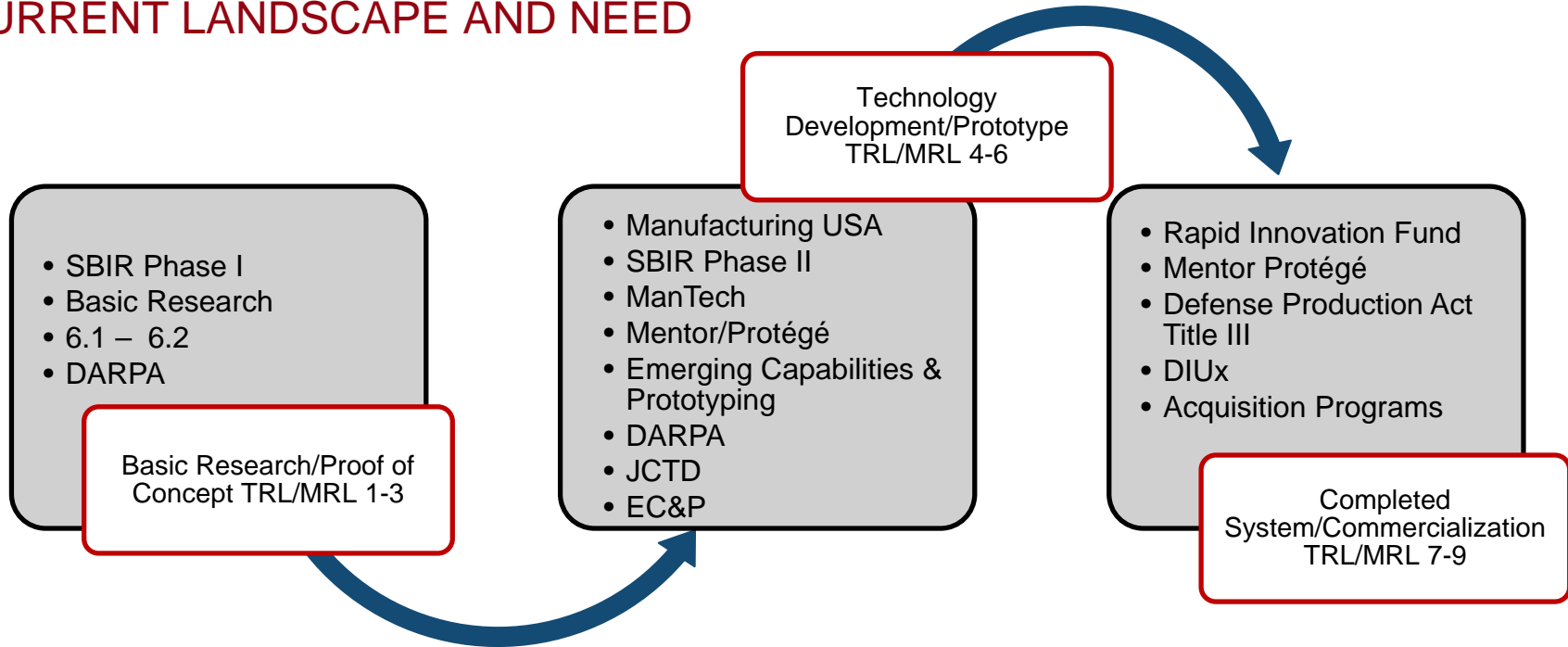
- State & Local Governments:** Focuses on building innovation infrastructure and making manufacturing a priority.
- Academic Institutions:** Focuses on sharpening the focus of funded research and making manufacturing a priority.
- U.S. Manufacturers:** Focuses on strengthening the bottom line and making manufacturing a priority.
- Federal Agencies:** Focuses on making the U.S. more competitive and partner up to achieve your mission.

Each guide includes key messages, bullet points, and quotes from industry and government leaders. For example, the Federal Agencies guide includes a quote from Dr. Nicholas Ueackak, Government CIO A&M Photonics: "The DoD has needed a concerted effort focused on investigating manufacturing capabilities for some time. These Manufacturing Institutes address this need and are now providing solutions that DoD should be able to leverage for years to come."



# Driving the Innovation Cycle Faster

## CURRENT LANDSCAPE AND NEED



TRL 1-3	TRL 4	TRL 5	TRL 6	TRL 7	TRL 8-9		
MRL 1-3	MRL 4	MRL 5	MRL 6	MRL 7	MRL 8	MRL 9	MRL 10
Enabling S&T Capability	Matériel Solution Analysis	Technology Maturation & Risk Reduction		Engineering & Manufacturing Development		Production and Deployment	

### Technology Maturation



# Technology Transition and Commercialization Community of Practice (TTAC CoP)



Institutionalizes increased collaboration and rigor in technology transition and commercialization activity across the Department of Defense to best utilize taxpayer dollars, achieve the greatest return on investment, and provide the best capability for the warfighter.

## GOALS AND OBJECTIVES

### Guide Transition of Technology

- Understand best practices
- Capture lessons learned

### Shared Technology Transition Tools

- Create access to shared tech transition tools
- Jointly develop transition tools

### Develop Standards and Metrics for Transition Outputs

- Jointly develop a common architecture for measuring tech transition outputs

### Technology Transition Strategic Planning

- Shared templates for transition planning
- Coordinated closing of gaps
- Data repositories





# Questions?



**For more information on the DoD Manufacturing USA Institutes:**

<http://www.businessdefense.gov/Programs/Manufacturing-USA-Institutes/>

**For more information on the Manufacturing USA Program:**

<https://www.manufacturingusa.com/>



# Back Up Slides



# America Makes

## The National Additive Manufacturing Innovation Institute



### America Makes

**Established:** August 2012

**Hub Location:** Youngstown, OH

**Lead:** National Center for Defense Manufacturing and Machining (NCDMM)



**Mission:** Accelerate the adoption of Additive Manufacturing (AM) in the United States industrial base to reduce cost, reduce lead time, and increase capability of DoD warfighter products.

### TECHNOLOGY DEVELOPMENT

Since launching in 2012, America Makes has executed **over 75 projects** against a consortium developed AM technology roadmap. Projects range from those addressing design tools, materials, and processes to those supporting an integrated value chain.

### DoD APPLICATIONS

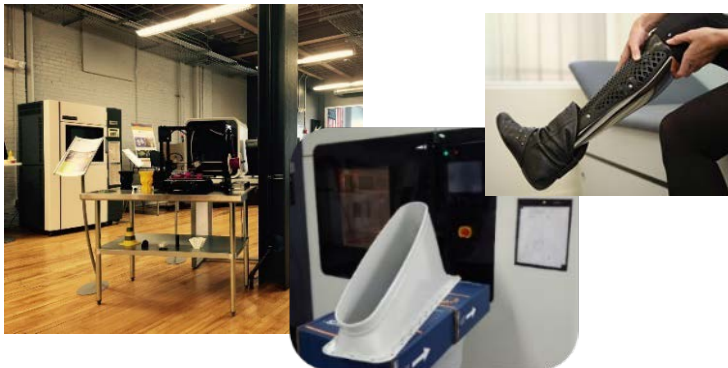
America Makes delivered AM repair and replacement solutions along with training for DoD sustainment organizations to improve warfighter readiness. America Makes coordinated the AM community to prioritize and accelerate formation of standards and specifications critical to industry and organic DoD adoption of AM.

### WORKFORCE READINESS

Application-based training programs were developed to fill a critical training gap for design and materials engineers to improve Design for AM (DfAM) skills. America Makes is developing the next generation of workforce training program to generate industry accepted labor certifications and credentials for DoD personnel.

### FACILITIES & CAPABILITIES

America Makes is an impartial **convener** of AM stakeholders, a **coordinator** of technical and workforce information, and an activation **catalyst** through the execution high-impact projects.





# DMDII

## Digital Manufacturing and Design Innovation Institute



**Established:** February 2014  
**Hub Location:** Chicago, IL  
**Lead:** UI LABS

★ ★ ★

**Mission:** Accelerate the development and transition of digital manufacturing technologies into the DoD. Provide the U.S. government and American manufacturers with the digital tools needed secure the manufacturing enterprise, reduce development & production cost, and accelerate product development.

### TECHNOLOGY DEVELOPMENT

Since launching in 2014, DMDII has completed **33** projects with **30** projects ongoing. Projects seek to solve technology challenges in digital manufacturing that are too big for any one organization.

### DoD APPLICATIONS

In 2018, DMDII executed a Model Based Enterprise assessment of Rock Island Arsenal that provides Army leadership with a roadmap for leveraging digital manufacturing technologies that would increase technical workforce productivity 40-45% and lower maintenance downtime by 30-50%.

### WORKFORCE READINESS

2018 marks one year since DMDII's creation of **the first massive open online course on digital manufacturing and design** being available to anyone online. More than **30,000 people** have accessed the curriculum so far.

### FACILITIES & CAPABILITIES

DMDII also launched the **National Center for Manufacturing Cybersecurity**. The hub will be a testbed for the creation and adoption of new cybersecurity technologies to help secure the supply chain and the warfighters who rely on these capabilities.







# LIFT

## Lightweight Innovations for Tomorrow



**Established:** February 2014

**Hub Location:** Detroit, MI

**Lead:** ALMMII



**Mission:** Develop advanced lightweight materials manufacturing technologies and implement educational programs to train a workforce confident in deploying new technologies in defense and commercial applications.



### TECHNOLOGY DEVELOPMENT

Since launching in 2014, LIFT has completed **15** projects with **35** projects ongoing. Projects work to develop and deploy new lightweight manufacturing technologies and processes for products that can be applied to vehicles in the air, land, or sea.

### DoD APPLICATIONS

LIFT is leading a project that will **reduce Humvee rollovers by 74%**, reducing fatalities of service men and women. The project will provide validation of quality retrofit installation on the Humvee fleet, including **training soldiers** on the installation process.

### WORKFORCE READINESS

“**Operation Next**”, created by LIFT and piloted at Ft. Campbell, launched to provide military service members with industry-driven education and skills during their transition period prior to separation. To date the program has 25 graduates and 27 currently enrollees.

### FACILITIES & CAPABILITIES

The **LIFT High Bay** in Detroit is the **nation’s premier lightweighting applied research and development facility**. The facility is uniquely positioned to help revolutionize manufacturing through lightweight innovation and education.



# AIM Photonics

## American Institute for Manufacturing Integrated Photonics



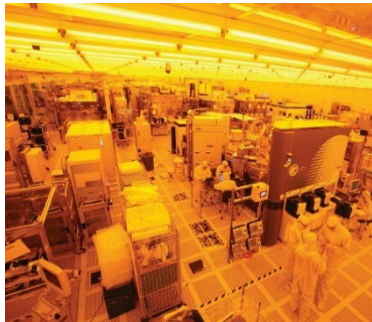
**Established:** July 2015

**Hub Location:** Albany & Rochester, NY

**Lead:** Research Foundation of SUNY



**Mission:** Accelerate transition of IP into DoD weapon systems & commercial products by maintaining a U.S.-based IP ecosystem to provide DoD and industry access to world's best IP fabrication, packaging, and testing capabilities, previously only available in Asia or Europe. (Also counters China's major investment in this area)



### TECHNOLOGY DEVELOPMENT

Development/release of Process Design Kits and rollout of Multi-Project Wafers has enabled industry, academia & DoD to design, fab and test IP subsystems in **over 60 projects**, enabling innovation in capability tied to DoD's future needs.

### DoD APPLICATIONS

AIM's capabilities directly result in the reduction of SWAP-C by replacement of all-electronic systems across all services. DoD-relevant application areas include next-generation SIGINT, PNT, communications, sensors, and compact random access LIDAR.

### WORKFORCE READINESS

AIM Academy has created industrial internships, bi-annual design training, seminars, professional learning, international roadmaps, meeting industry's needs and increasing global competitiveness.

### FACILITIES & CAPABILITIES

World's only 300 mm integrated photonics prototyping foundry, with domestic industry now on-shoring previous overseas efforts. The associated Test, Assembly, & Packaging Facility (Rochester) is also state-of-the-art, and will be the only domestic facility of its kind, allowing export-controlled test, assembly and packaging.



# NextFlex

## America's Flexible Hybrid Electronics Manufacturing Institute



# NEXT FLEX

**Established:** August 2015

**Hub Location:** San Jose, California

**Lead:** FlexTech Alliance



**Mission:** Pioneer Flexible Hybrid Electronics (FHE) manufacturing to serve our nation's warfighters and the U.S. Electronics Assembly industrial base.

### DOD TECHNOLOGY

#### PLATFORMS (Prototypes)

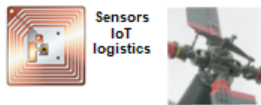
Soldier Monitoring Systems



Integrated Array Antenna Systems



Asset Monitoring Systems



Soft Robotics



### TECHNOLOGY DEVELOPMENT

Since launching in 2015, NextFlex has completed **8** core-funded projects with **24** projects ongoing and two additional Project calls. NextFlex has an additional 30 agency funded projects totaling (\$31.5M to date). Projects integrate digital printing processes with thin semiconductors to achieve low-cost-low-volume stretchable, bendable, conformable, & flexible electronic devices and sensors.

### DoD APPLICATIONS

The institute is leading **DoD electronics technology transitions** through FHE prototypes to include; warfighter health monitoring, platform monitors, 3D antenna systems, and soft robotics.

### WORKFORCE READINESS

NextFlex launched **FlexFactor** to expose students to opportunities in advanced manufacturing careers. The multi-week high school program provides a user guide to engage national school systems.

### FACILITIES & CAPABILITIES

The **NextFlex Technology Hub** includes capabilities where FHE devices and manufacturing processes can be prototyped, materials can be tested, and pilot-scale manufacturing can be proven at the NextFlex Technology Hub.



# AFFOA

## Advanced Functional Fabrics of America



**Established:** April 2016

**Hub Location:** Cambridge, MA

**Lead:** MIT



**Mission:** Enable a domestic manufacturing-based revolution by transforming traditional fibers, yarns, and fabrics into highly sophisticated, integrated and networked devices and systems. IP-protected technology that is Made in USA



### TECHNOLOGY DEVELOPMENT

Since launching in 2016, AFFOA has over 30 active projects in its portfolio. Projects design and produce fabrics that can see, hear, sense, communicate, store, convert energy, regulate temperature, monitor health, and change color.

### DoD APPLICATIONS

AFFOA launched a dedicated defense facility and first generation “**Fabric LiFi**” product platform. This free-space optical system can provide authentication (Identify Friend or Foe), navigation and communication in GPS denied environments—in air, land and undersea.

### WORKFORCE READINESS

In collaboration with MD5 and MIT, AFFOA hosted an **Advanced Fabrics Hackathon** to design functional fabric prototypes for military applications. In 2018 AFFOA initiated a Advanced Fabrics Entrepreneur Program with 25 start-up companies. AFFOA has developed a STEM curriculum with Greater Lawrence Tech School

### FACILITIES & CAPABILITIES

In 2017, AFFOA opened its **Fabric Discovery Center (FDC)**. The FDC hosts end-to-end prototyping, start-up incubation space, and education activities to enhance the DoD’s effort to secure U.S. leadership in revolutionary fibers and textiles manufacturing.





# BioFabUSA

## Advanced Regenerative Manufacturing Institute



**Established:** December 2016

**Hub Location:** Manchester, NH

**Lead:** ARMI



**Mission:** Make the large scale manufacturing of engineered tissues and tissue-related technologies practical, and prepare the required workforce to meet the needs of the wounded warfighter and others in need of this technology across the U.S.

### TECHNOLOGY DEVELOPMENT

Since launching in 2016, BioFabUSA has initiated **25 projects**. Projects include developing real-time label-free viability and sterility assurance sensors, centralized fluid management, tissue transport, online curriculum development, and enhanced veteran training.

### DoD APPLICATIONS

The development of tissue products on an industrial scale enables the DoD to accelerate numerous medical products through development for treating our wounded Warfighters. This contributes to **force readiness and saves lives on the battlefield** of today and the future.

### WORKFORCE READINESS

The focus of BioFabUSA's workforce program is to ensure that the U.S. has the **trained workforce** necessary for large-scale manufacture of engineered tissues. BioFabUSA has started its **EWD roadmap** launched **6** projects as well as conducted a wide variety of outreach initiatives.

### FACILITIES & CAPABILITIES

In 2018, the institute launched **BioFabConsulting** to offer regulatory, and preclinical consulting to institute members. Both a tissue foundry for the first ever manufacturing line for engineered tissues as well as the BioFabUSA Incubator space have been approved for development.







# ARM

## Advanced Robotics for Manufacturing Institute



**Established:** January 2017

**Hub Location:** Pittsburgh, PA

**Lead:** Advanced Robotics



**Mission:** Accelerate innovation to drive U.S.-based growth in manufacturing while developing domestic robotics expertise to create high-value careers.



### TECHNOLOGY DEVELOPMENT

Since launching in 2017, ARM has kicked off **18 projects**. With a focus on key industrial sectors such as aerospace, automotive, electronics, and textiles, projects target growth sectors that are ripe for rapid adoption of robotic technologies in manufacturing.

### DoD APPLICATIONS

ARM advances new robotic technologies to ensure that the U.S. retains its **global leadership** in manufacturing to help secure the supply chain and the warfighters who rely on these capabilities.

### WORKFORCE READINESS

ARM is developing an **educational partner network** to develop messaging around robotics and automation careers, develop and promote broad participation in ARM certification and education programs, and encourage a robotics/automation industry-recognized stackable credential.

### FACILITIES & CAPABILITIES


In 2017, ARM began construction on a one-of-a-kind advanced **manufacturing hub in Pittsburgh**, bringing together large-scale academic research and corporate development under one roof.




# DOC and DOE Institutes



**POWER**AMERICA

**Established:** January 2014   
**Hub Location:** Raleigh, NC  
**Lead:** North Carolina State University  
**Federal Funding:** \$70 Million  
**Industry cost share:** \$70 Million




**Established:** January 2015   
**Hub Location:** Knoxville, TN  
**Lead:** University of Tennessee, Knoxville  
**Federal Funding:** \$70 Million  
**Industry cost share:** \$180 Million




**Established:** June 2016   
**Hub Location:** Los Angeles, CA  
**Lead:** Smart Manufacturing Leadership Coalition  
**Federal Funding:** \$70 Million  
**Industry cost share:** \$70 Million


# NIIMBL

**Established:** December 2016   
**Hub Location:** Newark, DE  
**Lead:** University of Delaware  
**Federal Funding:** \$70 Million  
**Industry cost share:** \$129 Million



**Established:** December 2016   
**Hub Location:** New York, NY  
**Lead:** American Institute of Chemical Engineers  
**Federal Funding:** \$70 Million  
**Industry cost share:** \$140 Million



**Established:** January 2017   
**Hub Location:** Rochester, NY  
**Lead:** Rochester Institute of Technology  
**Federal Funding:** \$70 Million  
**Industry cost share:** \$70 Million

\*The first Manufacturing USA institute to operate under the RAMI Legislation

