DoD Manufacturing USA Institutes

Beyond Phase II Conference
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DISTRIBUTION F: Further dissemination only as directed by ODASD(MIBP) Manufacturing Technology Office (15 June 2017) or higher DoD authority.
WHY
The U.S. is not doing well in the Global Economy, and needs a reinvigorated Manufacturing Sector that includes a strong Defense Industrial Base.

HOW
Transform manufacturing in the U.S. through innovative, coordinated:

- *Technology Development*
- *Technology Transition and Dissemination*
- *Workforce & Educational Outreach*

WHAT
Increase the yield of innovative products and increased domestic manufacturing competitiveness.

Collaborate ~ Innovate
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
DoD Institutes Introduction

Current DoD 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 MII 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

*DoD Institutes Introduction*

*Current DoD Institutes*
DoD Institutes Introduction
Manufacturing USA Institutes Headquarter Locations

Since Launching in 2012:
- $1B+ Federal; $2B+ non-Federal
- 1,300+ companies, universities, and non-profits involved
- 44 states represented*

Digital Manufacturing & Design
Chicago, IL

Regenerative Manufacturing
Manchester, NH

Advanced Fibers and Textiles
Cambridge, MA

Sustainable Manufacturing
Rochester, NY

Integrated Photonics
Albany, NY

Process Intensification
New York, NY

Biofabusa

Advanced Composites
Knoxville, TN

Flexible Hybrid Electronics
San Jose, CA

Smart Sensors
Los Angeles, CA

Lightweight Metals
Detroit, MI

Wide Bandgap Semiconductors
Raleigh, NC

Advanced Robotics
Pittsburgh, PA

Additive Manufacturing
Youngstown, OH

Aim Manufacturing USA

https://www.manufacturingusa.com/institutes

*States in gray have participant members in Manufacturing USA Institutes
Manufacturing USA Success
Organizational Relationships

**Deloitte Report Extract:**

- **9,424** Relationships between organizations
- **1,174** Organizations involved with the program
- **753** Organizations with formal membership
- **203** Organizations have relationships with multiple institutes
- **120** Organizations are members of more than one institute

Together, the Institutes’ convene **nearly 1,200 organizations** in an inter-industry network comprised of **9,000+ organization relationships**.

Mapping of Mfg USA network relationships. Extract from Jan 2017 third party (Deloitte) evaluation of the Mfg. USA Program.
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
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
Established: August 2012
Hub Location: Youngstown, Ohio
Lead: National Center for Defense Manufacturing and Machining (NCDMM)
Regional Location: “TechBelt” Cleveland to Pittsburgh Corridor & El Paso, Texas Region

Mission: Accelerate additive manufacturing innovation and widespread adoption by bridging the gap between basic research and technology development/deployment.

- $55M federal investment and 1:1 cost share pledged to support development and management of the institute plus applied research projects over 5 years
- Strong tech transition, workforce education & STEM focus

https://www.americamakes.us/
Established: February 2014  
Hub Location: Chicago, Illinois  
Lead: UI LABS  
Federal Funding: $70M  
Cost Share (UI Labs): $106M

**Mission:** Digitize American Manufacturing

**Competitiveness Performance Improvements**

- **Lower design costs** through better collaboration with suppliers
- **Lower manufacturing cost and capital requirements** from better optimization of end-to-end product lifecycle
- **Reduced time to market** due to more rapid iteration
- **Next-gen innovations first:** digital design, digital factories, digital supply chains
- **New and legacy products**

http://dmdii.uilabs.org/

Distribution A: Cleared for Public Release
LIFT
Lightweight Innovations for Tomorrow – Detroit, MI

Positioned to expand the US Industrial base for new products and technologies for commercial and USG demands that utilize new, lightweight high-performing metals.

Mission: Provide the National focus on expanding US competitiveness and innovation in lightweight metals manufacturing, and facilitating the transition of these capabilities and new technologies to the industrial base for full-scale application.

Established: February 2014
Hub Location: Detroit Metro, Michigan
Lead: ALMMII (American Lightweight Materials Manufacturing Innovation Institute)
Regional location: I-75 Corridor
Federal Funding: $70M
Cost-Share: $78M

http://lift.technology/
Objective: Develop & demonstrate innovative manufacturing technologies for:
- Ultra high-speed transmission of signals for the internet and telecommunications
- New high-performance information-processing systems and computing
- Sensors and imaging enabling dramatic medical advances in diagnostics, treatment, and gene sequencing

This Institute focuses on developing an end-to-end photonics ‘ecosystem’ in the U.S., including domestic foundry access, integrated design tools, automated packaging, assembly and test, and workforce development.

All these developments will require cross-cutting disciplines of design, manufacturing, packaging, reliability and testing.

http://www.aimphotonics.com/
**NextFlex**
Flexible Hybrid Electronics Manufacturing Innovation Institute – San Jose, CA

**Established:** August 2015  
**Hub Location:** San Jose, California  
**Lead:** FlexTech Alliance  
**Federal Funding:** $75 M  
**Industry Cost Share:** $96 M

**Flexible Hybrid Electronics:** Highly tailorable devices on flexible, stretchable substrates that combine thinned CMOS components with components that are added via “printing” processes. This technology is identified as flexible-hybrid due to integration of flexible components such as circuits, communications, sensors, and power with more sophisticated Silicon based processors.

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<thead>
<tr>
<th>Commercial</th>
<th>DOD Applications</th>
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<tbody>
<tr>
<td>Wearable Technologies</td>
<td>Warfighter information devices and sensors</td>
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<tr>
<td>Internet of Things</td>
<td>Unattended sensors, vehicle borne sensors</td>
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<tr>
<td>Medical (prosthetics, medical sensing)</td>
<td>Warfighter Training and performance monitoring. Soldier medical care</td>
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Objectives:

- Serve as a public-private partnership between government, academia, and industry to address manufacturing challenges from design to end products.
- Support an end-to-end innovation ‘ecosystem’ in the U.S. for revolutionary fibers and textiles manufacturing and leverage domestic manufacturing facilities to develop and scale-up manufacturing processes.
- Provide rapid product realization opportunities, based on robust design and simulation tools, pilot production facilities, a collaborative infrastructure with suppliers, and workforce development opportunities through targeted training and curriculum programs.

Established: April 1, 2016
Hub Location: Cambridge, Massachusetts
Lead: Advanced Functional Fabrics of America.
Federal Funding: $75 Million
Industry cost share: $240 million

http://join.affoa.org/
**Established:** December 2016  
**Hub Location:** Manchester, New Hampshire  
**Lead:** ARMI  
**Federal Funding:** $80 Million  
**Industry cost share:** $214 Million

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**Focus Areas:**

- **Cell & Material Selection & Sourcing:** The ATB-MII will use industrial manufacturing practices to reliably and reproducibly generate cells and biomaterials.
- **Biofabrication Platforms:** Integrated biofabrication platforms will be developed to transform these standardized starting materials into novel and evolving tissue and tissue-related end-products.
- **Process Design and Automation:** Additionally, process design and automation will need to be used to improve the rate and reproducibility of multi-step manufacturing processes.
- **Tissue Finishing and Testing Technologies:** The ATB-MII will assist in developing the successful commercialization of tissue-based products and non-destructive validation tools.

**Biofabrication:** An innovative manufacturing industry segment is creating state-of-the-art manufacturing innovations in biomaterial and cell processing, bioprinting, automation and non-destructive testing technologies for critical Department of Defense and novel commercial use.
Problem: The use of robotics is becoming widespread in manufacturing environments but the robots are typically expensive, singularly purposed, challenging to reprogram, and require isolation from humans for safety.

Need: Robotics are increasingly necessary to achieve the level of precision necessary for defense and other industrial manufacturing requirements which limits the participation of mid-size to small manufacturers due to capital cost and complexity of use.

Solution: ARM will integrate industry practices and institutional knowledge across many disciplines to realize the promises of a robust manufacturing innovation ecosystem.

Technologies ripe for significant evolution within the RIME institute include, but are not limited to:
- Robot control (learning, adaptation, & repurposing)
- Collaborative robotics
- Dexterous manipulation
- Autonomous navigation and mobility
- Perception and sensing
- Testing, verification, and validation (TV&V)

Established: January 2017
Hub Location: Pittsburg, PA
Lead: American Robotics
Federal Funding: $80 Million
Industry cost share: $173 Million

http://www.arminstitute.org/
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<th>DOC and DOE Institutes</th>
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| **Established:** January 2014  
**Hub Location:** Raleigh, NC  
**Lead:** North Carolina State University  
**Current Number of Members:** 70  
**Federal Funding:** $70 Million  
**Industry cost share:** $70 Million |
| **Established:** January 2015  
**Hub Location:** Knoxville, TN  
**Lead:** University of Tennessee, Knoxville  
**Current Number of Members:** 122  
**Federal Funding:** $70 Million  
**Industry cost share:** $180 Million |
| **Established:** June 2016  
**Hub Location:** Los Angeles, CA  
**Lead:** Smart Manufacturing Leadership Coalition  
**Current Number of Members:** 56  
**Federal Funding:** $70 Million  
**Industry cost share:** $70 Million |
| **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*