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Driving Small Business Performance

JUNE 20-23, 2023 | BALTIMORE MD

DoD Manufacturing Innovation Institutes (MIIs) and Manufacturing USA



Panel Moderator:

Stephen Luckowski, Program Manager, OSD Manufacturing Innovation Institutes (MIIs)

Panelists:

Kimberly Gibson, America Makes, Ecosystem Director

Ed Hendricks, NextFlex, Director of Business Development

Beth Cryderman Moss, LIFT, Director of Contracts



June 22, 2023



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Stephen Luckowski

Program Manager, OSD Manufacturing Innovation Institutes (MIIs)



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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.

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



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



Manufacturing Institutes Origins Public Private Partnership History

2011-2012
Research

- **PCAST Reports call for...**
 - Advanced Manufacturing Initiative as national innovation policy
 - Manufacturing Innovation Institutes to address key market failure



2012
Design

- **The White House directs OSD to pilot an institutes program...**
 - OSD places the MIIs under the existing authorities for the DoD ManTech Program (*10 U.S.C. Section 2521*).
 - With existing R&D authorities since the mid-1950s, ManTech incorporates the MIIs to advance manufacturing technology development, transition, and manufacturing education and workforce investments.

2012-2017
Establishment

- **OSD ManTech establishes nine manufacturing innovation institutes through...**
 - *Leading processes to identify and vet candidate technical focus areas to advance via an MII*
 - *Competing and award operation of the MII (typically to non-profit organizations) through a multi-year Cooperative Agreement (CA) or Technology Investment Agreement (TIA).*

2017-Present
Sustainment

- **OSD ManTech helps sustain the nine MIIs with an eye towards future department needs...**
 - Continued DoD participation helps to maintain and enhance manufacturing innovation ecosystems
 - This enables shared access to state-of-the-art equipment and facilities for small, medium, and large manufacturers, as well as academia.



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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

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

Securing Human Capital

Develop manufacturing-specific 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 (IP)



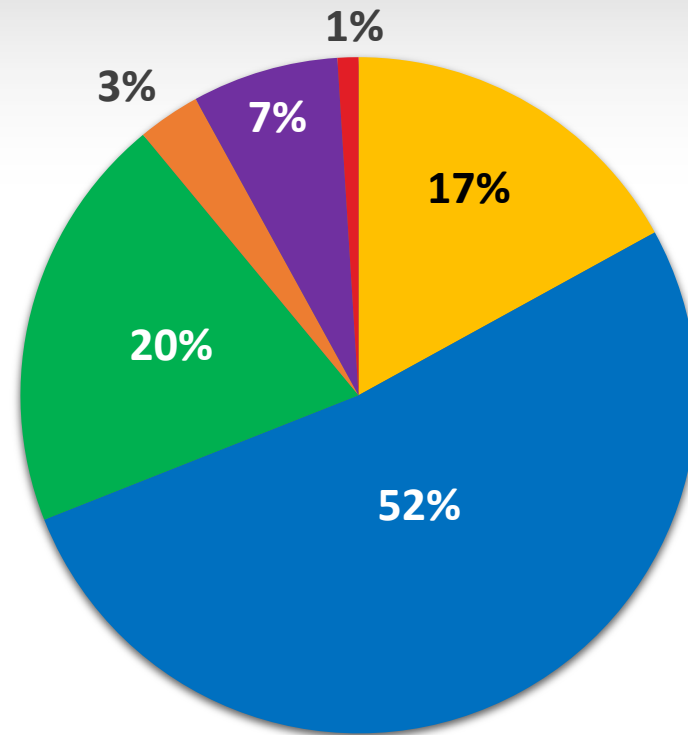
DoD Manufacturing Innovation Institutes Overview

Current Institutes



DoD MII Membership

DoD MII Membership as of FY22 Q4



- Large Business (more than 500 employees)
- Academic - University, Community College, K-12
- Not-for-profit organization

- Small Business (500 or fewer employees)
- Other - Federal Agency, Lab, or FFRDC
- Other



Institute Value Proposition

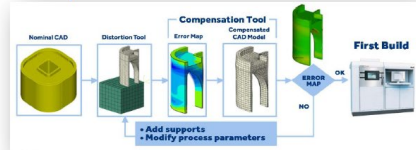
Unlike government labs, institutes provide access to commercially-developed technology, industry cost-share, and intellectual property

Commercial Technologies → Unique Facilities → Ecosystem Access

Replacement Parts Completed Airworthiness



Developing a Robust Distortion Prediction and Compensation Software Tool for Additive



\$50M Lightweight Metals Manufacturing Center



First Complete Flexible Hybrid Electronics Pilot Line



World First Fully Flexible Arduino Microsystem



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

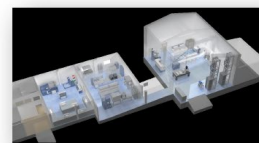
DISTRIBUTION A: Cleared for Public Release



Thin Wall Ductile Iron Castings



AIM Foundry & Test, Assembly and Packaging Facility



Defense Fabric Discovery Center at Lincoln Labs



Future Factory Pilot

Institutes are “Consortia with Capabilities”



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DoD MIIs by the Numbers

- 10 years since the launch of first DoD MII, America Makes
- **1,700+** members from 49 states, DC, and Puerto Rico
- **350+** members on DoD MII Boards, Committees, Councils
- **860+** completed research and development projects, **370+** on-going
- **77,460+** students, teachers, workforce trained by DoD MIIs in FY22
- **\$703+M** initial DoD investment
 - Additional **\$266+M** follow-on agreement investment from OSD ManTech
 - Additional **\$600+M** for DoD-sponsored projects
- **\$1.6+B** initial committed industry, academia, non-profit cost share
 - Additional **\$138+M** for academia/industry-sponsored projects
 - Additional **\$19+M** for State/local government-sponsored projects



For more information...



DoD ManTech Program & Sponsored Institutes

www.DoDManTech.mil



The Manufacturing USA Program

www.manufacturingusa.com/



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Kimberly Gibson

America Makes, Ecosystem Director



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VISION

To be the driver for additive manufacturing (AM) innovation, technology, and education

MISSION

Accelerate the adoption of AM to advance US manufacturing competitiveness and security

**ACHIEVING
THE
MISSION**

CONVENING the most brilliant minds from government, industry, and academia to accelerate AM innovation

COORDINATING AM technical and workforce data to transform industry

CATALYZING industry through collaborative projects, delivering high value and high impact



The three core activities of the Institute are:

- **Develop Additive Manufacturing Technology:**
Projects, Innovation, Technology Transfer, Implementation
- **Accelerate Human Capital Development:**
Workforce, Education, Training, Outreach
- **Maintain Collaborative Ecosystem:**
Government, Membership, Community

These focus areas are enabled by:

- **Membership:** Driving engagement and collaboration with our nation's brilliant minds from government, industry and academia to advance Additive Manufacturing
- **Communications:** Driving awareness and spreading the word to government, members, stakeholders, community
- **Operations:** Run by a not-for-profit organization with a lean and collaborative structure



Technology Advancement and Collaboration through Partnership

- Coordinating known stakeholder needs
 - Unique by member type
 - Academia, Industry, Gov't, Non-profit, National Labs
- Establishing priorities
 - Defining gaps and opportunities
 - Milestone, objective, and requirement-based approaches
 - Leveraging diverse expertise to target benefits and impact
- Leveraging collective intelligence/capabilities for applied learning
 - Execution mechanism
 - Many similarities to supply chain development



pharmalogisticsiq.com





AMNOW
Supply Chain & Sourcing



Design Methods



Material Qualification



Product Qualification



Inspection/
Certification



Business Case

← Key Investment Areas Impacting Supply Chain Readiness at a National Scale →



Strengthen Warfighter Capability Needs and Domestic Manufacturing Competitiveness

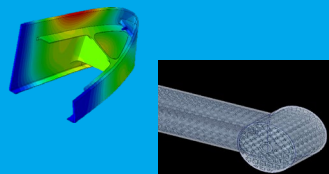


Considerations for Production/Acquisition of AM Products



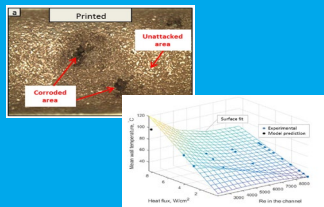
Supply Chain & Sourcing

- Capacity
- Capability
- Technical Resources
- Standards and Specifications
- Quality Control



Design

- Design data
- Manufacturability
- DfAM
- Data Management
- Standards and Specifications
- Materials Selection
- Tools/Methods



Performance & Durability

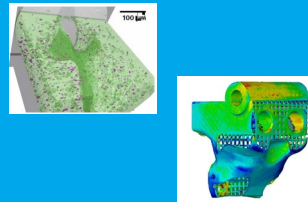
- Mechanical properties
- Component/ Subsystem behaviors
- Environmental Factors
- Standards and Specifications
- Maintenance/ Repair



Image Courtesy Quintus Technologies

Post-Processing & Finishing

- Heat treatment
- Coating
- Machining
- Polishing
- Joining/Brazing
- Standards and Specifications



Inspection/ NDE

- Reasonable criteria
- Inspectability - PoD
- Tools/methods
- Standards and Specifications



Cost & Rate

- Complexity
- Cost drivers
- Yield
- Productivity drivers



Executing the Mission

Thought
Leadership

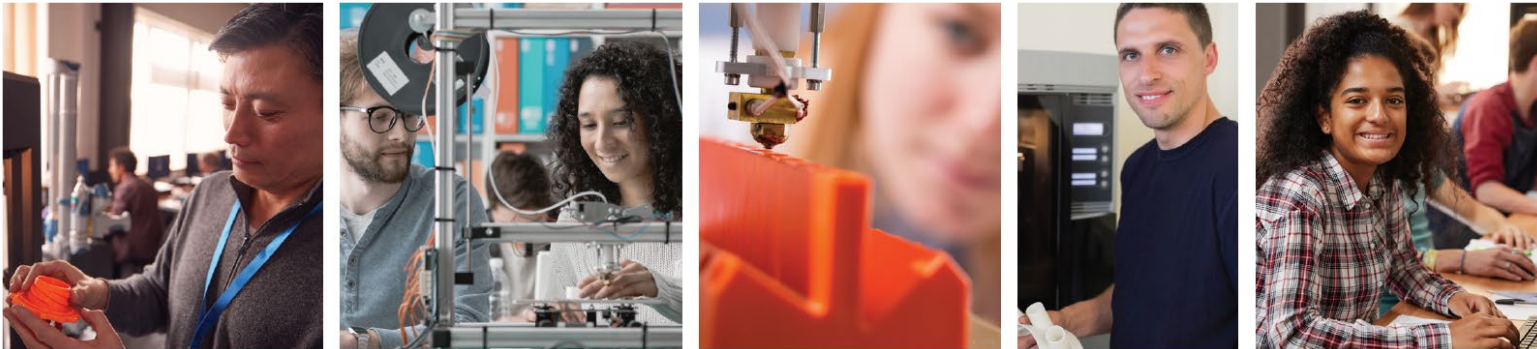
EWD
Roadmap &
Inventory

Industry
Recognized
Credentials

Educational
Outreach
“K-Grey”

Tailored AM
Training

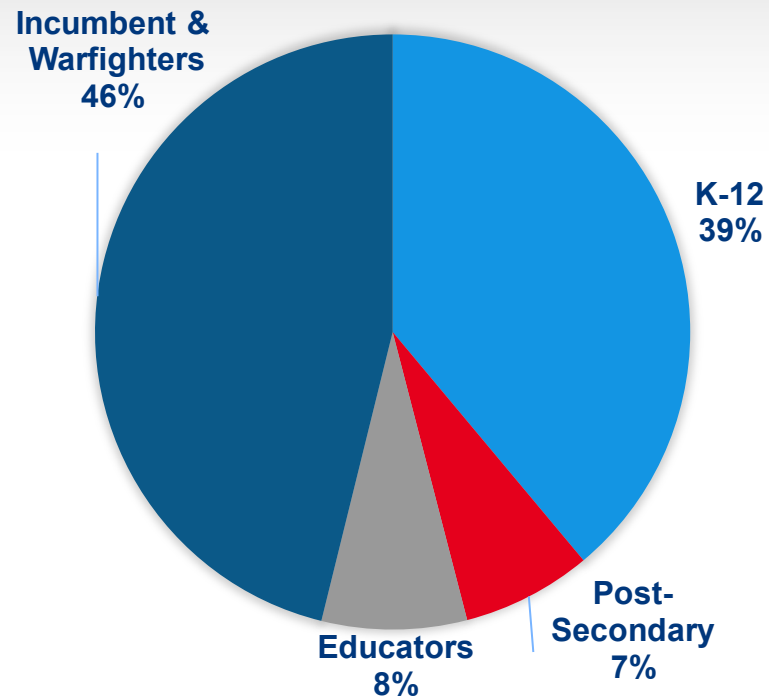
Inspiring, preparing and growing today and tomorrow’s talent pipeline in additive manufacturing



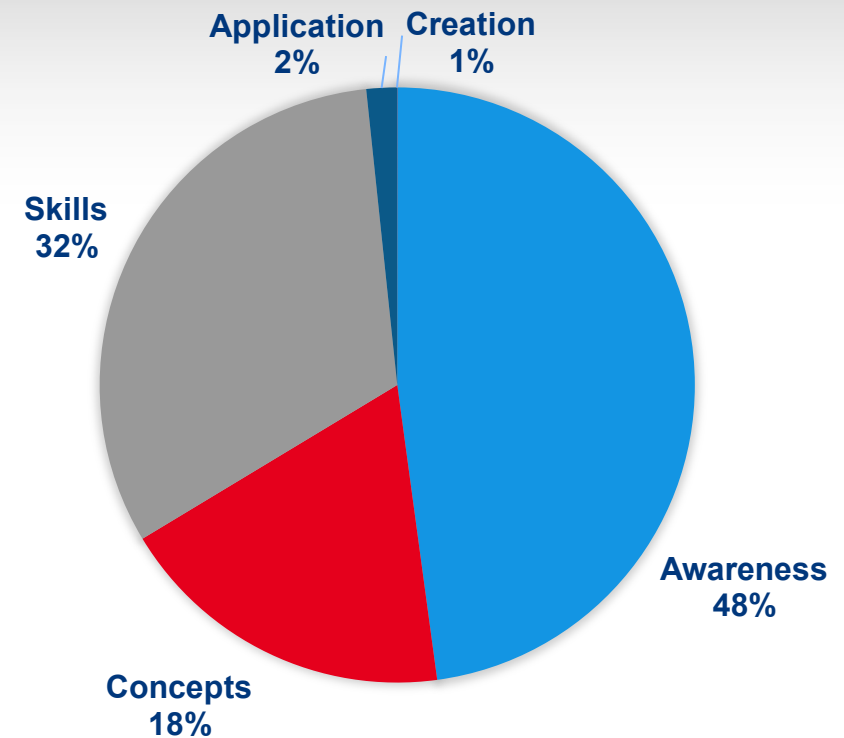
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Metrics Breakdown

EWD AUDIENCE



LEVEL OF LEARNING



Over 1300 learners received a credential or certification
Nearly 200 educators and train the trainers have received training to deploy EWD Assets
Launching/Launched EWD Programming at over three dozen schools this fall



Answering the Call – Supporting DoD

	JAMWG - AMMO	AMPED	OPNAV	Drive AM	SWARM
Program	CA3	Additive Manufacturing Portal for Education	Naval Civilian Workforce Development	Driving Research, Innovation, and Value through Education in AM	Scaled Workforce Assets in Regionalism for Manufacturing
Funder	Core Funding and Activity	Office of Secretary of Defense	Navy OPNAV (Navy Operations)	Congressional Interest Item	State of Ohio, Industry and Philanthropic Organizations, Office of Local Defense Comm. Coop.(OLDCC)
Audience	Secondary Education, Incumbent Workers, Mainstream Adults, Defense, Veterans	Secondary and Post-Secondary Education, Incumbent Workers, Defense, Veterans	Navy Civilian Artisans: Apprentice, Journeyworker Mastercraftsman	Incumbent Workers, University, and Defense	K-12, Incumbent Workers, Mainstream adults, Community College
Objective	Support the OSD and DoD mission, vision, and purpose as it pertains to the DoD and adoption and optimization of AM. Be an available partner in the creation and scale of impactful and meaningful programming across stakeholders in the DoD and industry defense base.	Creation of a new technology tool linking identified and vetted job roles and competencies which are aligned to the AM Body of Knowledge, to relevant training assets within America Makes, the DoD, industry and academia	Navy directed project in collaboration with OPNAV to build a three-tiered apprenticeship pathway in AM for Navy Civilian Artisans. Program aligns all new content to DoL registered apprenticeship as well as industry credentials	Creation of deep dive training resources across a broad range of AM technologies to impact post-secondary students and defense personnel. Drive AM also includes internships embedded in America Makes members as well as lab capabilities	Varied of projects built with a diverse set of funders to scale programs to meet the strategy of “National Strategy – Local Impact” To date 16 focused regions exist across the nation and growing. SWARM funding is over \$5 million
Impact	Over 10,000 trained via eLearning and instructor led training	Active Program to scale in 2023	Active Program 38 trained in program pilots	Over 2,000 trained within the DoD and Industrial Base	Over 3,000 and counting accessed EWD audiences



Why An Ecosystem approach?

There are **32,540,953 million small businesses** in the U.S.

- **19 percent**, or 6,055,421 firms, have paid employees
- There are **20,516 large businesses**.

The majority of manufacturing firms in the United States are quite small.

- There are **246,155 firms** in the manufacturing sector
- ALL but 3,960 firms considered to be small (i.e., fewer than 500 employees).
- In fact, **3/4 of these firms** have fewer than **20 employees**.

(Source: U.S. Census Bureau, Statistics of U.S. Businesses)



Geographic Representation of America Makes Membership



- 42 States are represented by America Makes members.
- More information is needed to more accurately represent the additive manufacturing ecosystem.

◇ NCDMM

★ HQ

△ Satellite Centers



Accelerate Adoption of AM to Ensure Warfighter Readiness and US Competitiveness

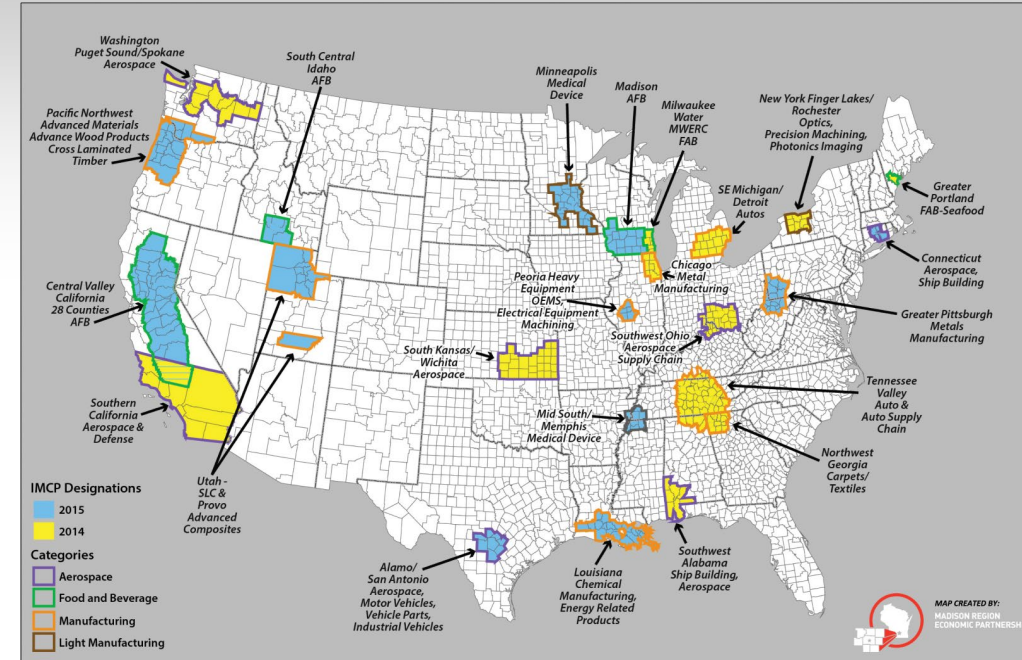
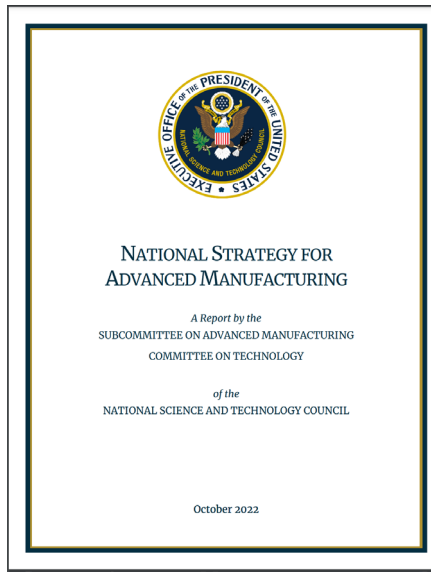
Components of a Functioning Ecosystem

- Technology Development
- Technology Transfer
- Education & Training
- Equipment Availability
- Business Formation
- Innovation and Know How
- Talent – all levels across the enterprise
- Capital – all stages of growth
- Dealmakers and Connectors
- POLICY and VISION



Create Ecosystem for AM business to Form, Grow and Thrive

- Aligning Regional Networks
- Assessing Technology Gaps
- Developing Suppliers to use AM for Defense
- Supporting AM Adoption & Innovation in States
- Policy Alignment



24 DESIGNATED COMMUNITIES. SOURCE: U.S. ECONOMIC DEVELOPMENT ADMINISTRATION



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When America Makes America Works



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Ed Hendricks

NextFlex, Director of Business Development



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ESTABLISHING & GROWING MANUFACTURING ECOSYSTEM

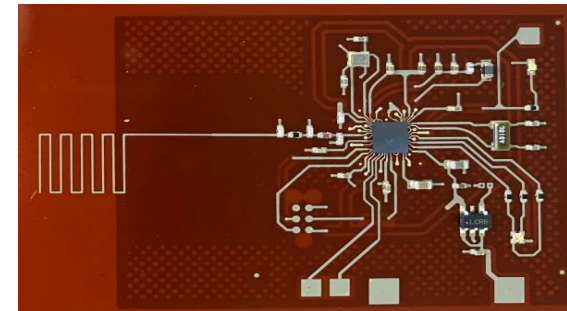
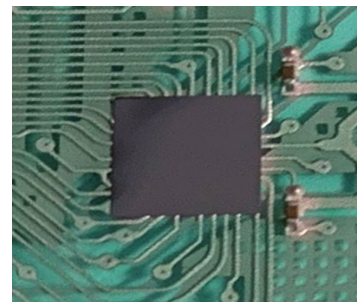
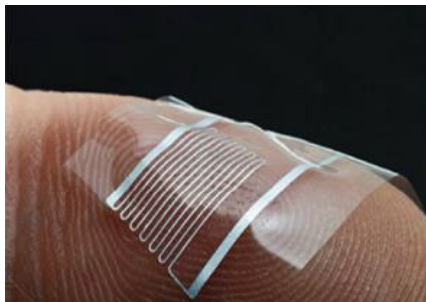
- Lead broad US industry base.
- Projects and technical working groups.
- Engage & include critical supply chains.
- Disseminate information and learning to the community.

ADVANCING TECHNOLOGY & MANUFACTURING

- World class pilot line and engineering services.
- Support US industrial base
- Additive manufacturing tools for advanced electronics packaging.
- Equipment and processes for complex electronics systems.
- Structurally integrated & wearable device manufacturing methods.

SECURING HUMAN CAPITAL

- Attract, recruit, train, and upskill a deep and diverse talent pool for the advanced manufacturing sector
- Expand NextFlex WFD programs into key manufacturing markets.
- Share Best Practices with MILs & industry



FHE - the intersection of additive circuitry, passive devices, and sensor systems that may be manufactured using printing methods (sometimes referred to as printed electronics) & thin flexible silicon chips or multichip interposer structures.

ESTABLISHING & GROWING MANUFACTURING ECOSYSTEM

DESIGN/MANUFACTURING



EQUIPMENT



INDUSTRIAL/AEROSPACE



MATERIALS



MEDICAL/WEARABLE DEVICES



RESEARCH



DESIGN/COMPONENT MANUFACTURING



ACADEMIC



INDUSTRY STANDARDS



SEMICONDUCTOR

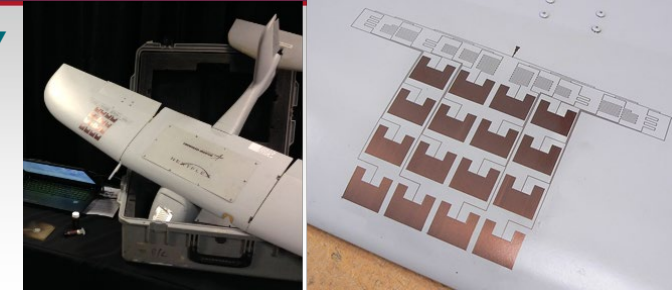


ADVANCING TECHNOLOGY & MANUFACTURING and Securing human Capital

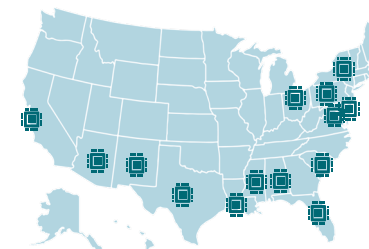
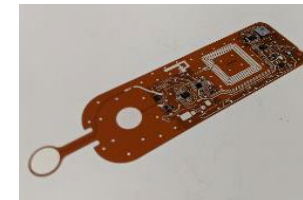


NextFlex convenes members around a shared vision to advance FHE technology and manufacturing and strengthen the industrial base and ecosystem.

- Funded Project Calls to address roadmap gaps.
 - Create collaboration opportunities
 - Shared technical knowledge to benefit full ecosystem
 - Commercialized tools, materials, components, transitioned devices into industry.
- Support of US Gov't Agency Directed Projects
 - Leverage Members and Consortium Partners and/or
 - The NextFlex Technology Hub – where we develop advanced hybrid electronics processes and demonstrate pilot level manufacturing of complex electronic systems with high yield for DoD and commercial customers.
- NextFlex has a comprehensive portfolio of WFD programs focused on **awareness-building**, **recruitment**, **training**, and **upskilling**. Programs are being deployed in **14 states** and have reached over **12,000 participants** to date including approximately **39% women**, **36% under-represented minorities**, **48% low-income**, and **8.7% military-connected**.



UAV Wing Antenna



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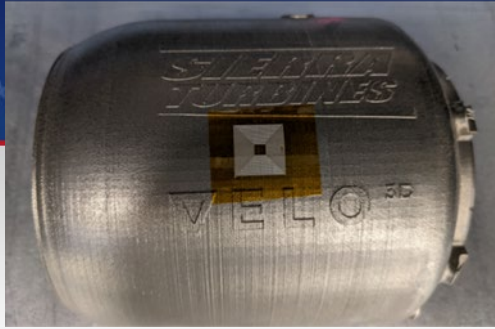
EXAMPLES OF DIRECT SUPPORT TO SMES AND HIGHLIGHT OF THE CADENCE PROGRAM



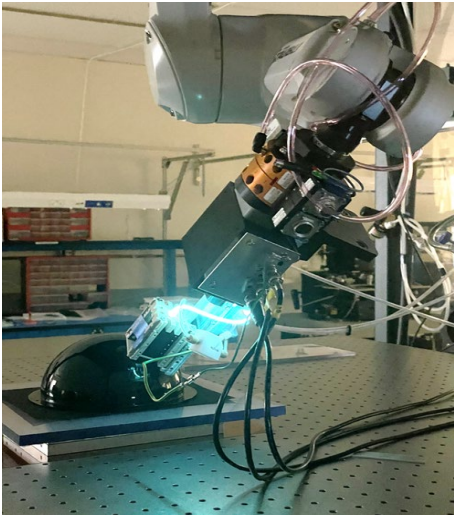
SBIR Support (Small Business Innovation Research Program) - we provide SMEs with manufacturing and engineering support the NextFlex Technology Hub.

Under the DMCSP we participated with the California Advanced Defense Ecosystems & National Consortia Effort (CADENCE)

- NextFlex provided support to eight small businesses in the California by providing access to advanced hybrid electronics technology development and manufacturing.
- CADENCE focused on under-served communities within California – all eight of the SME's were owned or led by veterans, women, or other under-represented populations.
- Support to these SMEs varied – ranging from evaluating fabrication capability, manufacturing process optimization, as well as enhancing product design through the application of Hybrid Electronics Technology.



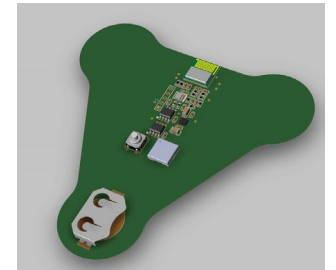
Conformal printing of custom sensor on turbine housing



Installation, characterization & training & antenna design for plasma-jet printing platform.



Successful manufacturing & test of 4G/5G devices and labels



Completed design of a copper-flex sensor module



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LIFT - Driving American Manufacturing Into the Future Through Technology and Talent Development

The Detroit-based nonprofit, public-private partnership between government, industry, and academia driving the adoption of “smarter manufacturing” by solving the manufacturing equation:



MATERIALS
SCIENCE



MANUFACTURING
PROCESSES



SYSTEMS
ENGINEERING



TALENT
DEVELOPMENT



lift

Leading Innovations For Tomorrow

- Integrated Computational Materials Engineering (ICME) and Computational Engineering
- Agile and Smarter Manufacturing
- Advanced Alloy and Process Development
- Multi-Material Joining



Learning Innovations For Tomorrow

- The LIFT Learning Lab
- IGNITE: Mastering Manufacturing (High School)
- Operation Next (CTE)
- World-Class Certification Programs



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The LIFT Advantage

A Think-and-Do Showcase and Sandbox



- ▲ **Trusted Advisor**
With experts in-house and an ecosystem across industries, LIFT is the **trusted advisor** for small and medium-sized manufacturers to help them transition toward a smarter manufacturing future.
- ▲ **Technology Accelerator**
LIFT helps organizations **move emerging technologies** from advanced concepts to commercialization so they can be adopted by industry and the warfighter faster.
- ▲ **Technology Showcase**
Bringing the “art of the possible” to reality, the LIFT **Technology Showcase** is where manufacturers see the benefits of connecting materials, processes, systems and talent.
- ▲ **Connector**
As a public-private-partnership between government, industry and academia, LIFT **connects** needs, ideas and people, to the organizations that can move the needle.
- ▲ **Convener**
With a national network of the Department of Defense, government, academia and industry, LIFT **convenes** experts in smarter manufacturing.
- ▲ **Talent Developer**
Developing new venues, tools and teaching techniques, LIFT’s competency-based, technology-infused **talent development** program is redefining manufacturing education.
- ▲ **Government Partner**
LIFT’s **partnerships across the federal government** eliminate barriers of entry for your organization and ensure rapid and efficient contracting combined with expert program management.

The LIFT Program



- ▲ 100,000 square-foot facility downtown Detroit – The heart of American Manufacturing
- ▲ \$50M in leading edge advanced manufacturing equipment
- ▲ Hosting more than 7,500 visitors annually
- ▲ Over 340 members of the LIFT ecosystem nationally
- ▲ More than 30 active technology projects involving large OEMs and small manufacturers employing over 1,000 people
- ▲ More than 5,000 people engaged in LIFT talent projects daily
- ▲ More than \$260,000,000 in funding has passed through LIFT since 2014





Thank you.



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