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DEPARTMENT OF THE AIR FORCE MANTECH OVERVIEW

ADAM HICKS, ACTING BRANCH TECHNICAL ADVISOR
MANUFACTURING, INDUSTRIAL TECHNOLOGIES, AND ENERGY DIVISION (AFRL/RXM)
MAY 2026

Agenda

- Who is Department of the Air Force (DAF) ManTech?
  - Manufacturing, Industrial Technologies, and Energy Division within Air Force Research Laboratory
- What do we care about?
- How can we work together?

MANTECH MISSION: "To further the national security objectives …through the development and application of advanced manufacturing technologies and processes that will reduce the acquisition and supportability costs of defense weapon systems and reduce manufacturing and repair cycle times across the life cycles of such systems." (10 USC 4841)

OBJECTIVE:

ENABLE THE TRANSITION OF HIGH-VALUE TECHNOLOGY TO THE WARFIGHTER THROUGH THE DEVELOPMENT OF MANUFACTURING FOR THE DEFENSE INDUSTRIAL BASE

- *ACCELERATED AVAILABILITY*
- *TARGETED DEMONSTRATIONS*
- *EXPERT MANUFACTURING ADVICE*
- *COST REDUCTION*
- *THOUGHT LEADERSHIP*

Metrics for Success

10:1 Return on Investment
50% Lead-Time Reduction
Developing Domestic Capability
M'fg Enabled Performance Gains
Shifting Industrial Base Culture

APPROACH:

BE RELEVANT *– Aligned to DAF priorities; Capitalizing on advanced manufacturing trends*

TRANSITION *– Ensure that advanced manufacturing capabilities are available to DoD*

DRIVE AFFORDABILITY *– Aid in the economical and timely acquisition and sustainment of systems*

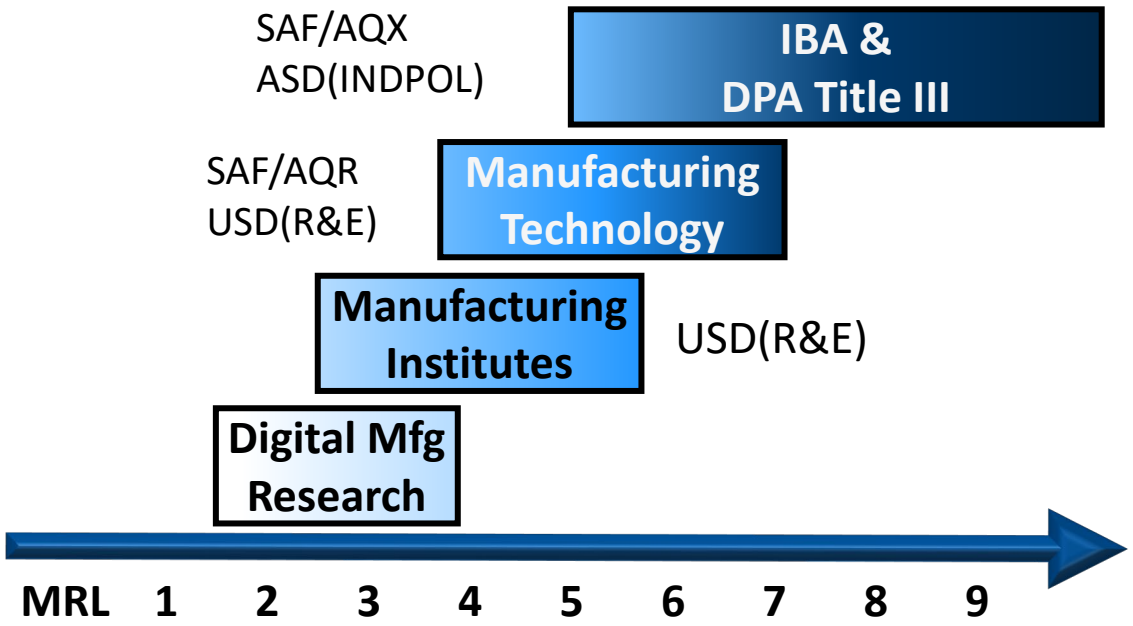
ENABLE *– Advance the maturity of transformational manufacturing processes*

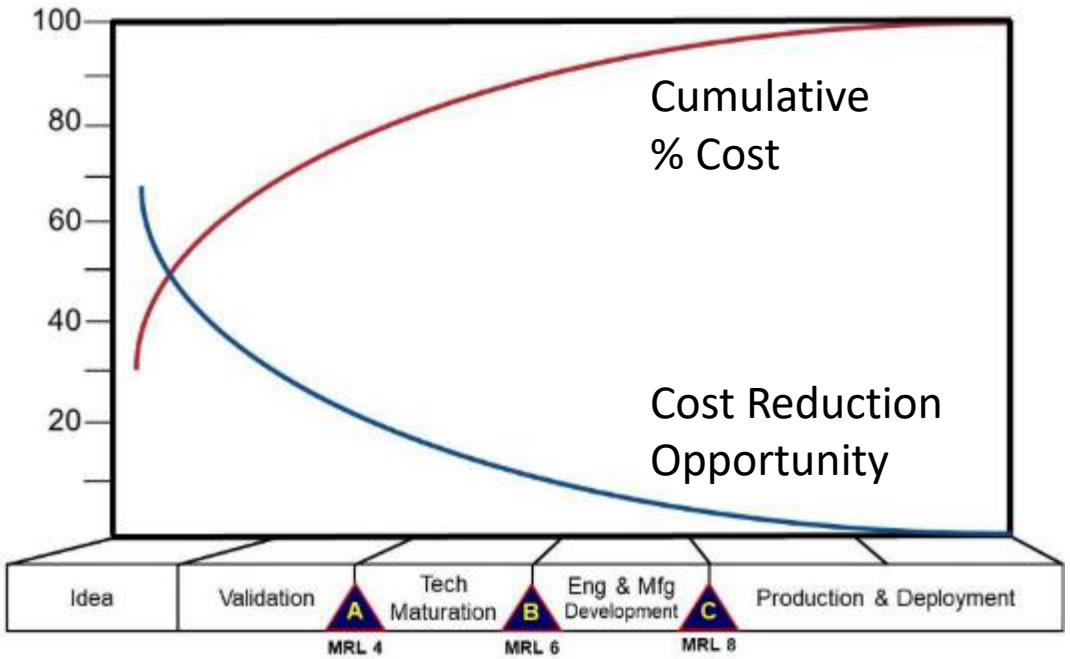
INFLUENCE *– Engaging manufacturing community to drive AF value and interest*

A unique, centralized cadre of manufacturing SMEs serving the manufacturing needs for the entire DAF

AFRL/RXM – S&T for the DAF Industrial Base

- Significant opportunity to realize cost savings by engaging with stakeholders early to promote manufacturable designs and ensure the industrial base will be ready to produce
- Responsive to acquisition programs across the development, production and sustainment lifecycle





AFRL/RXM uniquely addresses manufacturing & industrial base challenges

- ***across manufacturing development lifecycle***
- ***from process conception through full rate production***

Manufacturing, Industrial Technologies, and Energy Division

Division Technical Director

Dr. Jon Miller

Technical Business Manager

Thomas Giovingo

Acting Division Chief
Alan Albert

Acting Deputy Division Chief
Lt Col Drew Beauchamp

Manufacturing Lead for Special Projects

Kevin Tienda

Acting DPA Title III PM

Jeff Hubert

DAF's Manufacturing & Energy Resource

- 80 experienced manufacturing subject matter experts
- Staffing highly leveraged with OSD & SAF funds (~35%)
- ~90% advanced degrees

Digital Manufacturing and Supply Chain Branch

Steve Smith
Branch Chief

Adam Hicks
Acting BTA

Functional Systems Manufacturing Branch

Ryan Schultz
Branch Chief

Dr. Katie Burzynski
Acting BTA

Structural Systems Manufacturing Branch

Dr. Caitlin Bojanowski
Acting Branch Chief

Dr. John Rotella
Acting BTA

Energy Branch

Eric Griesenbrock
Acting Branch Chief

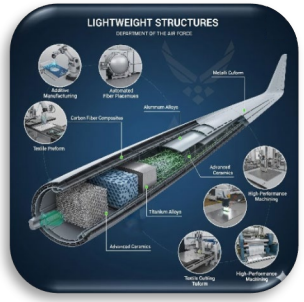
Dr. Ryan Miller
BTA

AFRL Energy Office

Eric Griesenbrock
Team Lead

Manufacturing Competencies: Enduring Technical Needs for the DAF

Lightweight Structures M&M



- Composite Processing
- Carbon Fiber Preforms & Resin Transfer Molding
- Composites for Exquisite Systems

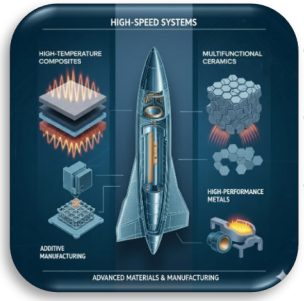
Agile Manufacturing

- Convergent Systems
- Remote Manufacturing Operations

Spectrum Warfare M&M

- Hi-Pwr, Freq-Agile RF
- High Temp Electronics
- Low-latency, High-Bandwidth DSP

M&M for High Speed Systems



- Adv Propulsion & Power
- Airframe Mfg
- Guidance, Nav & Cntrl

Digital Materials & Manufacturing

- Model-Based Qual Assurance
- Secure Collaboration for Supply Networks
- Digital Maturity towards Production Autonomy

Advanced C4I M&M

- Low SWaP-C PNT/alt-PNT Components
- Affordable LOS/BLOS Comms/Datalinks

Space-Environment-Unique M&M

- In-Space Propulsion
- Adv. Thermal Management
- Spacecraft Resilience

Mfg Defense-Critical Materials

- Specialized Alloys
- Rare Earth Elements
- Advanced Composites

ISR M&M : Advanced & Low SWAP-C

- Wideband Apertures/Sys
- Infrared Systems
- Low-Cost Radar

Agile Manufacturing

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Scope

The DAF requires an agile and responsive industrial base to produce systems and components that meet evolving mission requirements. One approach to achieving this objective is to develop, mature and utilize manufacturing processes that are inherently agile by increasing the intelligence of the manufacturing process and combining multiple manufacturing technologies into manufacturing systems that behave as highly flexible, responsive networks.

Competencies

- Automation/Robotics
- Additive Manufacturing
- Metamorphic Manufacturing
- Production Digital Thread
- NDI & Test Systems
- Laser Processing

Applications / Demand Signals

- Hybridized Processes
- Adaptable Fabrication
- Performance-based Design
- Infrastructure-less Automation

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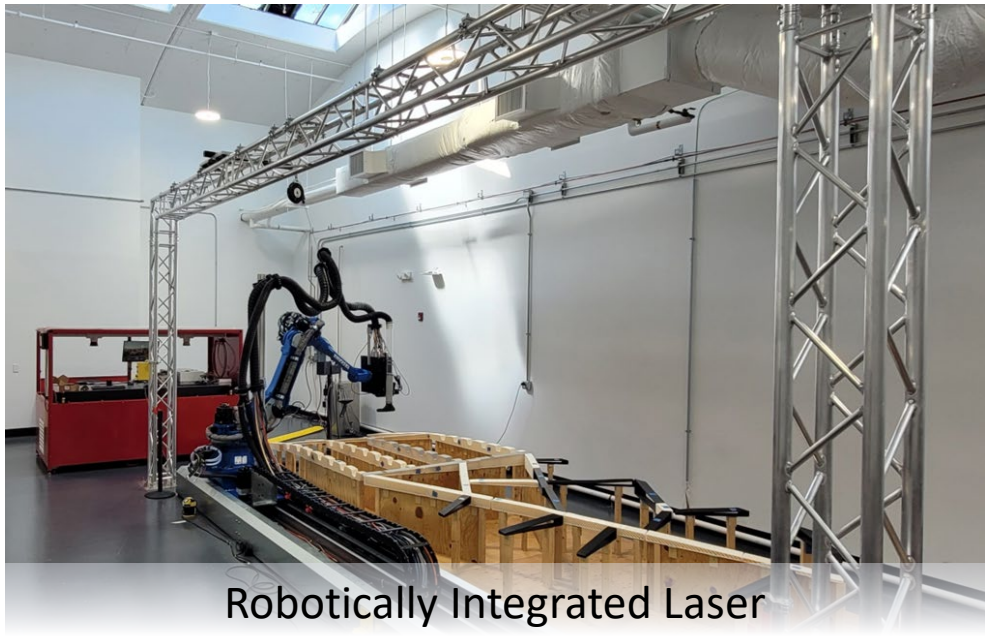
Robo-clasp: Automation of the CLASP Process

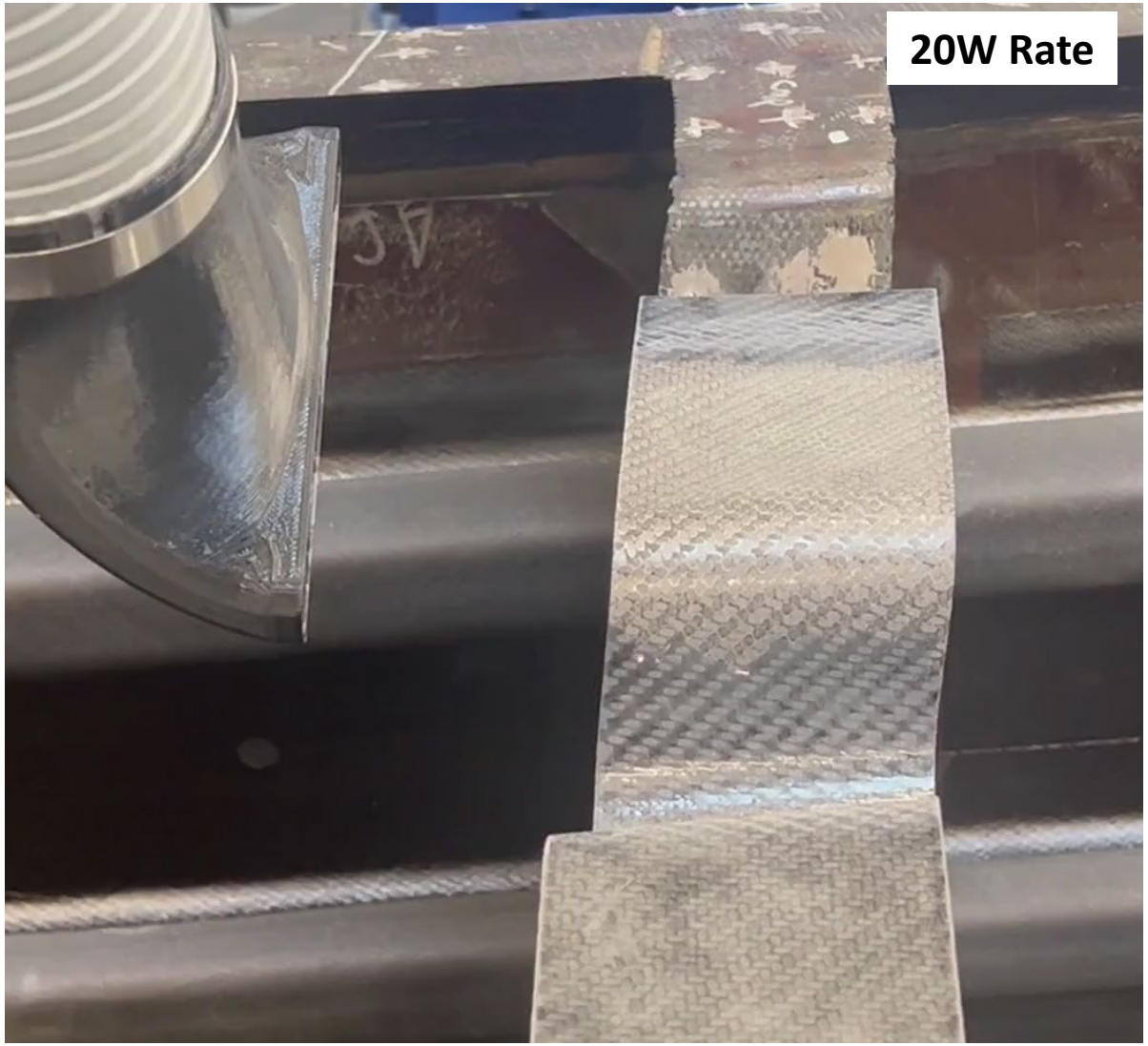
Previous AFRL ManTech Effort

Performer: UDRI

Enabling laser manufacturing at warfighter scale

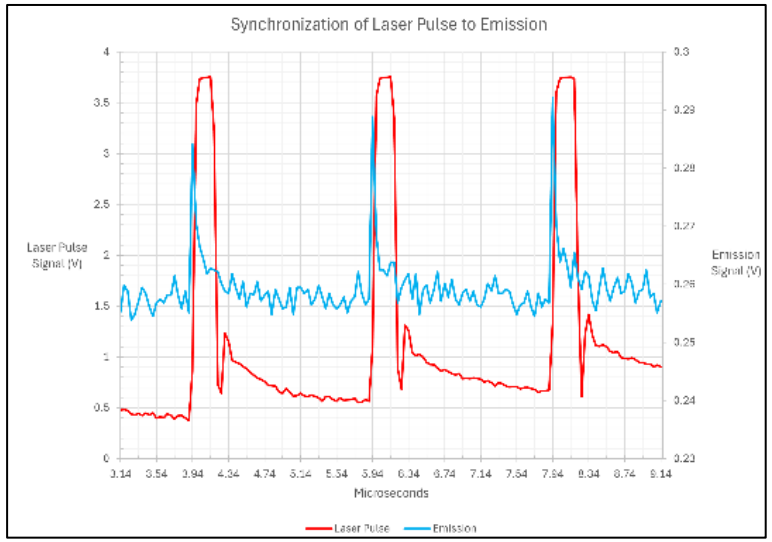


Robotically Integrated Laser

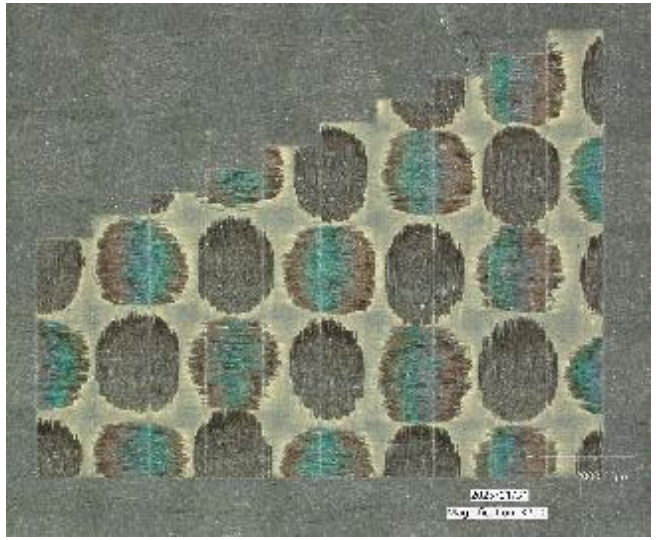


Co-axial Sensing Required for Complex Curvature

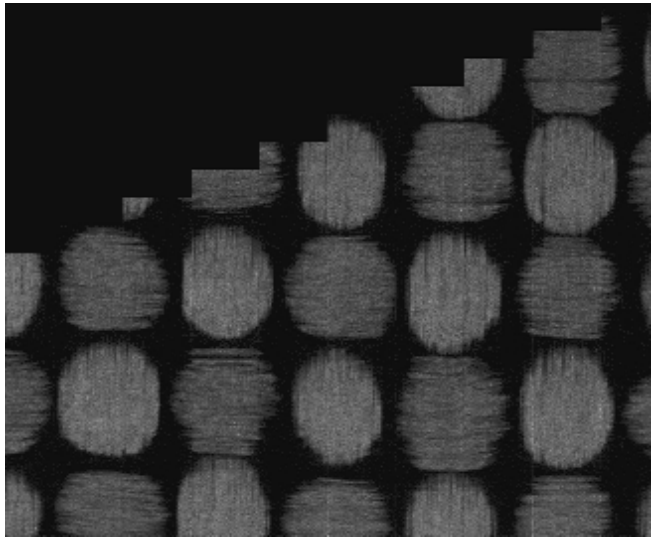
Pulse by Pulse Detection



Post process - visual



In-Situ Signal



77mm long rectangle

Detecting what was removed

- Carbon emissions indicate we are through the resin layer
- Pulse-by-pulse resolution on surface status

Overcoming material variability

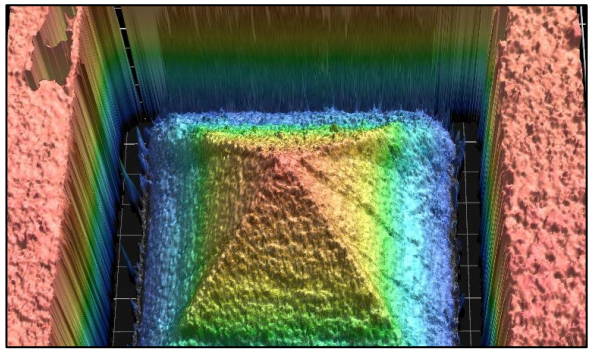
- Top Layer varies in thickness. A “static” process is not possible.
- Enables less damage and makes a more efficient process.

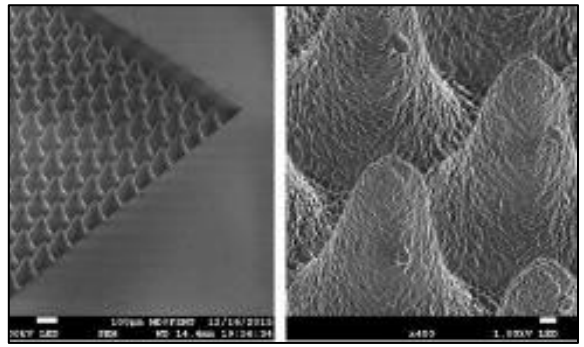
The Future of Advanced Laser Manufacturing (ALM)

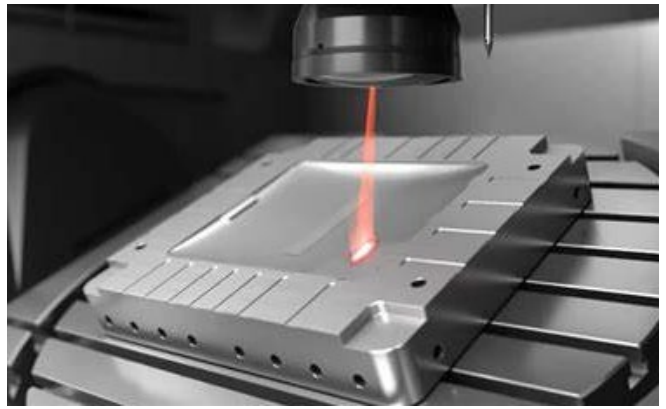
"If I had asked people what they wanted, they would have said **faster horses**." ~ Henry Ford

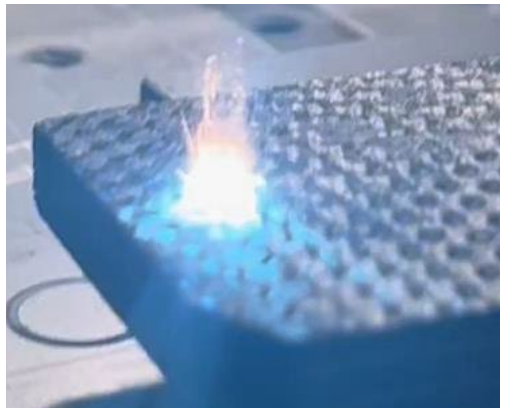
Replacing Legacy Processes

Employing Transformational Capability

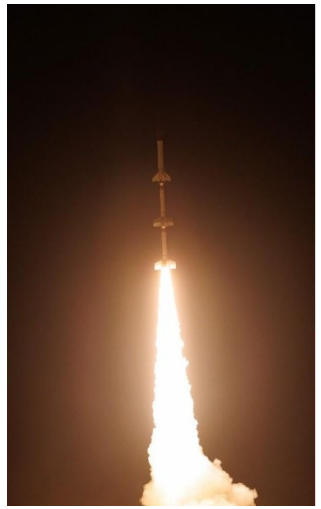




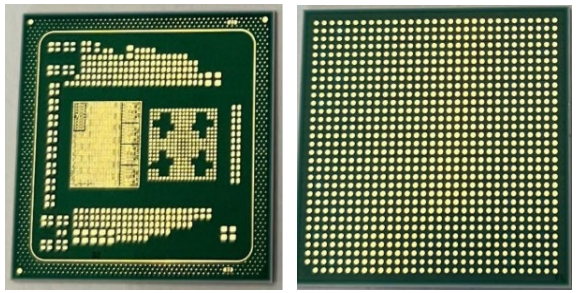




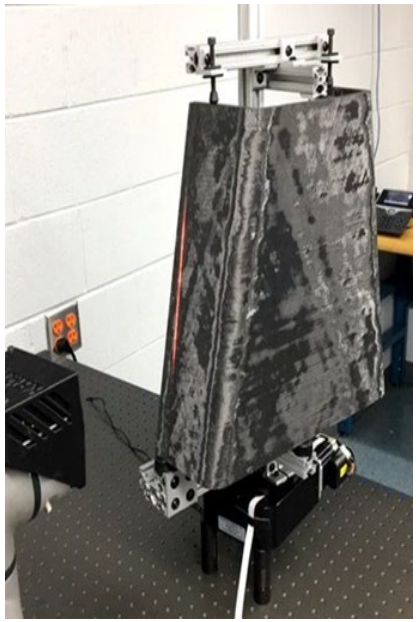
Example highlights from past year



Heat Pipe Demonstration Test in Hypersonic Flight
Kratos Sounding Rocket at Lift Off



First domestically fabricated advanced substrate utilizing domestic build up film



New, affordable domestic supply chain for structural carbon-carbon composite production

Transition New Battery Technology to AFNWC

AFRL & Globe Machine Manufacturing execute successful RapidClave(R) Gen III Functional Acceptance Test

THANK YOU

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DAF MANTECH
TECHNICAL AREA OVERVIEWS

AIR FORCE RESEARCH LABORATORY

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LIGHTWEIGHT STRUCTURES MATERIALS & MANUFACTURING

AIR FORCE RESEARCH LABORATORY

Lightweight Structures Materials & Manufacturing

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Scope

There is growing demand for lower-cost, assembled composite structures with fast processing times. The following technologies are well-poised to meet these needs:

- Automated press-based composite consolidation processes that integrate rapid cure resins with material properties on parity with traditional aerospace resins
- Alternative composite processes such as those that utilize low cost tooling or braided preforms with RTM & VARTM processing
- Robotics and automation for composite layup and to aid in post consolidation processes
- Thermoplastic composite processing, welding and inspection.

Competencies

- Composite Layup
- Composite Consolidation
- Structures Assembly/Inspection

Applications / Demand Signals

- Group 2-3 munitions / missiles
  - ETV Franklin, ERAM
- Group 5 autonomous collaborative platforms
  - YFQ-42A, YFQ-44A, YFQ-48A
- Exquisite manned systems
  - NGAD, NGAL, NGAS

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Lightweight Structures Materials & Manufacturing

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Thrust 1: Press Based Composite Processing

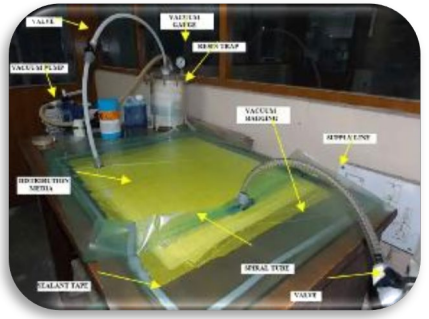
Low cost press tooling, Press forming, Stamp forming, Continuous compression molding, Thermoplastic welding, Thermoplastic weld joint inspection, Thermoplastic repair, Compression Molding, Rapid cure resins

Thrust 2: Carbon Fiber Preforms & Resin Transfer Molding

Large braided structures, Unitized resin infused structures, Low temp VARTM resins, Lost core tooling, Woven and braided pi-preforms, Vacuum assisted resin transfer molding, Rapid cure resins

Thrust 3: Composites for Exquisite Systems

Out of autoclave techniques, process monitoring, inspection, bonding techniques, low-cost tooling solutions



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HIGH-SPEED SYSTEMS MATERIALS & MANUFACTURING

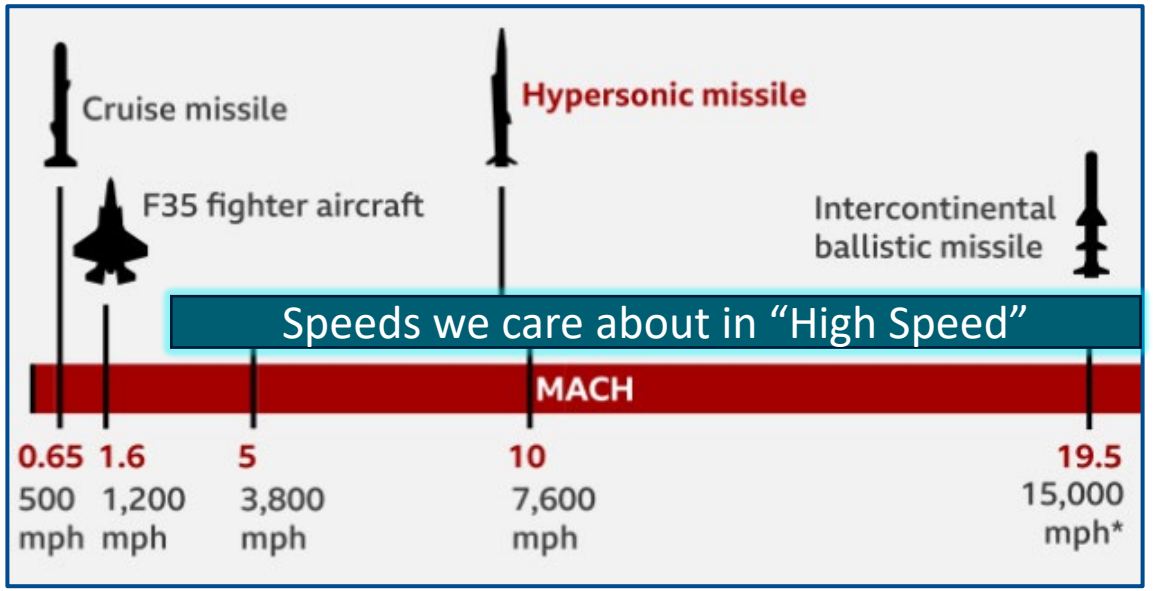
AIR FORCE RESEARCH LABORATORY

High-Speed Systems Materials and Manufacturing

AFRL

Scope

There is a need for available and effective high temperature materials and associated manufacturing that are inherent to systems operating from high-supersonic to hypersonic and reentry speeds. These needs span manufacturing risks for propulsion systems, hot structures, ablatives, thermal protection systems, and mission systems capable of surviving in hot environments for air and space applications.



Competencies

- Refractory Alloys, Superalloys and their Processing
- Ceramic Matrix Composites (CMCs), Carbon-Carbon (C-C), and Ultra-High Temperature Ceramics (UHTCs) and Associated Processing
- Thermal and Environmental Barrier Coatings
- Radomes & Apertures: Materials with Specific Dielectric Properties and the Methods to Produce Hardware
- High Temperature Electronics

Applications / Demand Signals

- High-Speed Strike
- Reusable Strike Aircraft (RSA)
- Hypersonic Affordable Mass Munitions (HAMM)
- Rocket Cargo and Strategic Systems

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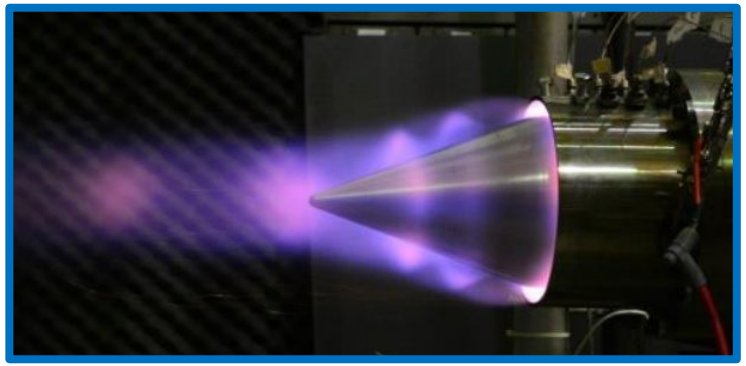
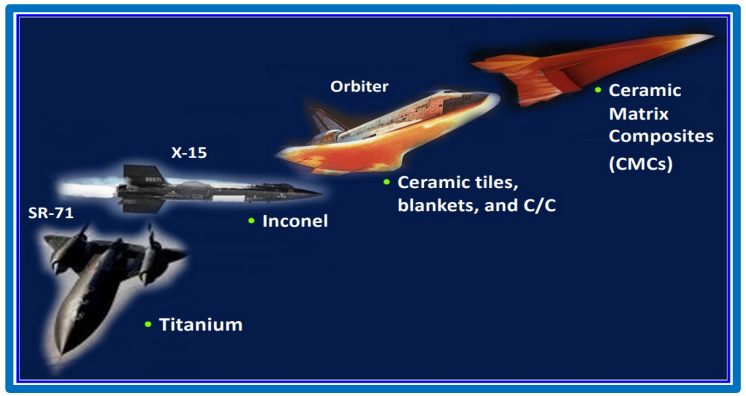
High-Speed Systems Materials and Manufacturing

AFRL

Thrust 1: Advanced Propulsion and Power
Focused on manufacturing next-generation propulsion systems to extend range, speed, and maneuverability, we are advancing technologies needed for scramjets, rotating detonation engines (RDE), high-Mach turbine engines, and associated high-temperature components.



Thrust 2: Airframe System Manufacturing
We are maturing manufacturing of robust airframe systems, with a focus on the "hot structure" required to survive extreme hypersonic aerothermal environments. This involves developing and scaling up processes for large-scale metallic, composite structures, and other advanced materials for thermal protection systems (TPS) and airframes.



Thrust 3: Guidance, Navigation and Control
We are interested in high-temperature electronics, radomes, and robust apertures that can function in hypersonic environments, ensuring the system can effectively locate, track, and prosecute targets.

"We must rebuild the tech pipeline for next generation hypersonics."

- Dr. James Weber, PDH / SHy

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SPACE-UNIQUE MATERIALS & MANUFACTURING

AIR FORCE RESEARCH LABORATORY

Space Unique Materials & Manufacturing

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Scope

The USSF requires a set of exquisite systems supported by proliferated architectures of resilient systems to achieve mission objectives. These systems require innovation in the manufacturing of unique materials and components designed to operate in the space environment to sustain current operations and meet future demands for DAF missions.

Competencies

- Refractory materials manufacturing
- Rad hard electronics
- Space environmental protection

Applications / Demand Signals

- In-space propulsion systems
- In-space thermal management
- Spacecraft resilience
- Power systems

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Space Unique Materials & Manufacturing

AFRL

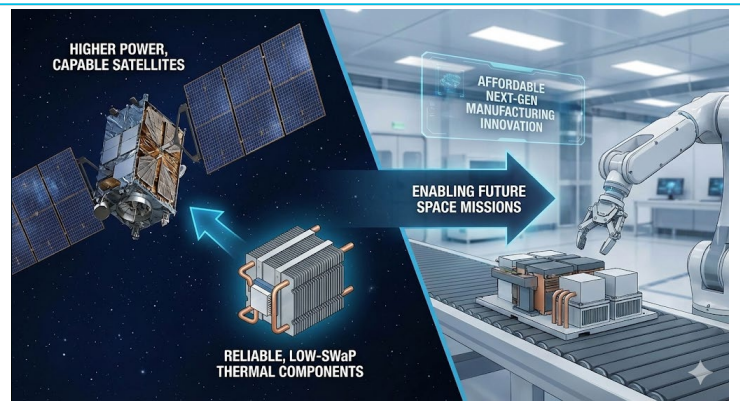
"Sustained space maneuver will change how we operate, opening up new tactics, techniques, procedures and operating concepts, and allowing operations until the mission is complete, not until the fuel we launched with runs out."
Gen. Stephen Whiting, commander of U.S. Space Command, testifies Feb. 29, 2024

Thrust 1: High Thrust In-Space Propulsion

Improve manufacturability of in-space propulsion systems that can deliver both high Isp and high ΔV to ensure reliable production and sufficient quantities to meet USSF demand. Specific components of interest are thrusters, tanks, and pressure transducers, due to long lead times.

Thrust 2: Advanced Passive Thermal Management

Improve manufacturing processes for next generation thermal management technologies such as oscillating heat pipes and variable emissivity materials, to enable greater passive heat extraction from components out to radiators.



Thrust 3: Spacecraft Resilience

Improve manufacturing processes of inherently low SWAP high-Z/low-Z radiation protection materials, to protect spacecraft from radiation effects with a particular aim of enabling the use of COTS electronics.

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ADVANCED AND LOW SWAP-C ISR

Advanced and Low SWAP-C ISR Materials & Manufacturing

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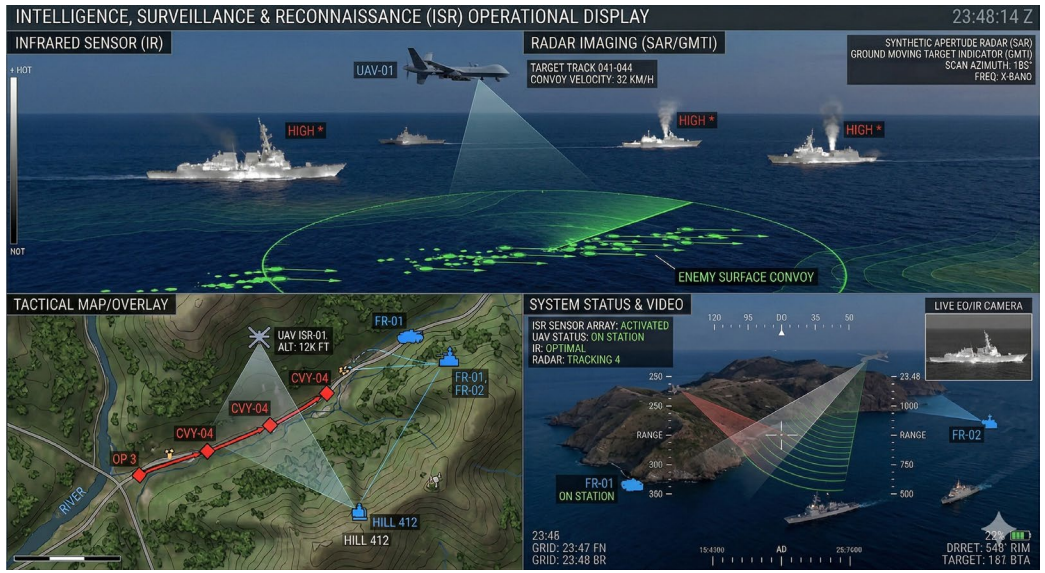
Scope

There is a need to progressively mature optical, infrared, and radio frequency-based sensors to enable exquisite Intelligence, Surveillance and Reconnaissance (ISR) systems and an affordable mass of battlefield sensors. Manufacturing improvements through cost, rate and producibility are sought for these systems and their underlying materials and components.



Competencies

- ROIC and FPA Manufacturing
- EO/IR Hybridization
- RF Devices
- Antenna Design and Fabrication
- LIDAR/LADAR Systems

Applications / Demand Signals

- Moving Target Indicator
- Infrared Search and Track
- Synthetic Aperture Radar
- Low-Cost Phased Arrays
- Wideband Systems

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Advanced and Low SWAP-C ISR Materials & Manufacturing

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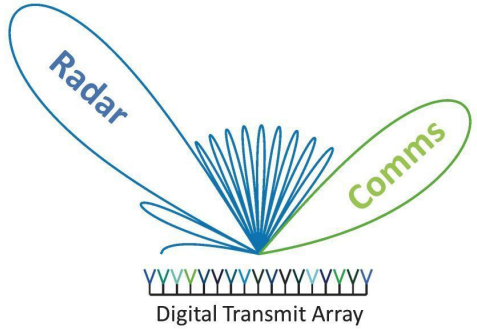
Thrust 1: Wideband Apertures and Systems

Developing advanced wideband systems that can be delivered at speed and scale to support multi-functional applications. Delivering enhanced performance to advanced systems and relevant cost point for pervasive applications.

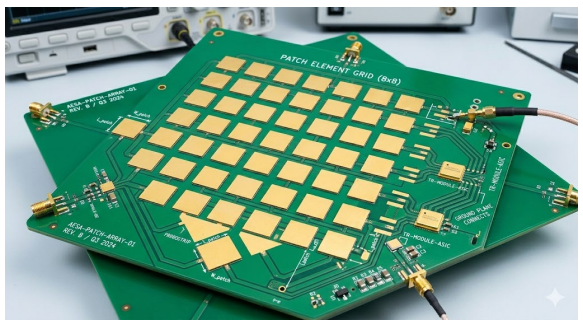


Thurst 2: Infrared Systems

Pervasive infrared sensors delivering more sensors to the warfighter across both air and space domains. Improving manufacturing across infrared products to ensure availability of sensors.

Thurst 3: Low-Cost Radar

Developing solutions to reduce cost and increase manufacturability of phased array systems and support future surge needs.



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ADVANCED C4I MATERIALS & MANUFACTURING

Advanced C4I Materials & Manufacturing

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Scope

There is a need to improve current systems and develop future advanced systems for Command, Control, Communications, Computers and Intelligence (C4I). The DAF's ability to provide timely, reliable, secure information and decision-making capabilities that enable effective command and control of air and space forces across the full spectrum of operations relies on maturing manufacturing processes to enable cost, size, rate and producibility goals.

Competencies

- Communications (SATCOM/Datalinks)
- PNT/alt-PNT (IMU's, Atomic Clocks, Magnetometers, etc.)
- Edge Compute

Applications / Demand Signals

- Autonomous Collaborative Platforms
- Munitions
- SWaP/thermal constrained applications

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Advanced C4I Materials & Manufacturing

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Thrust 1: Low SWaP-C PNT/alt-PNT Components

- Mature/Scale-up manufacturing processes of low SWaP-C PNT/alt-PNT components to accelerate transition to autonomous collaborative platforms and munitions by FY30
- Chip Scale Magnetometer manufacturing scale-up
- Quantum IMU manufacturing improvements

Thrust 2: Affordable LOS/BLOS Communications/Datalinks

- Mature/scale-up manufacturing processes to enable affordable LOS/BLOS comms/datalinks and accelerate transition to autonomous collaborative platforms and munitions by FY30
- Manufacturing of low-cost datalinks/comms
- Hybrid SATCOM manufacturing improvements

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SPECTRUM WARFARE

Spectrum Warfare Materials & Manufacturing

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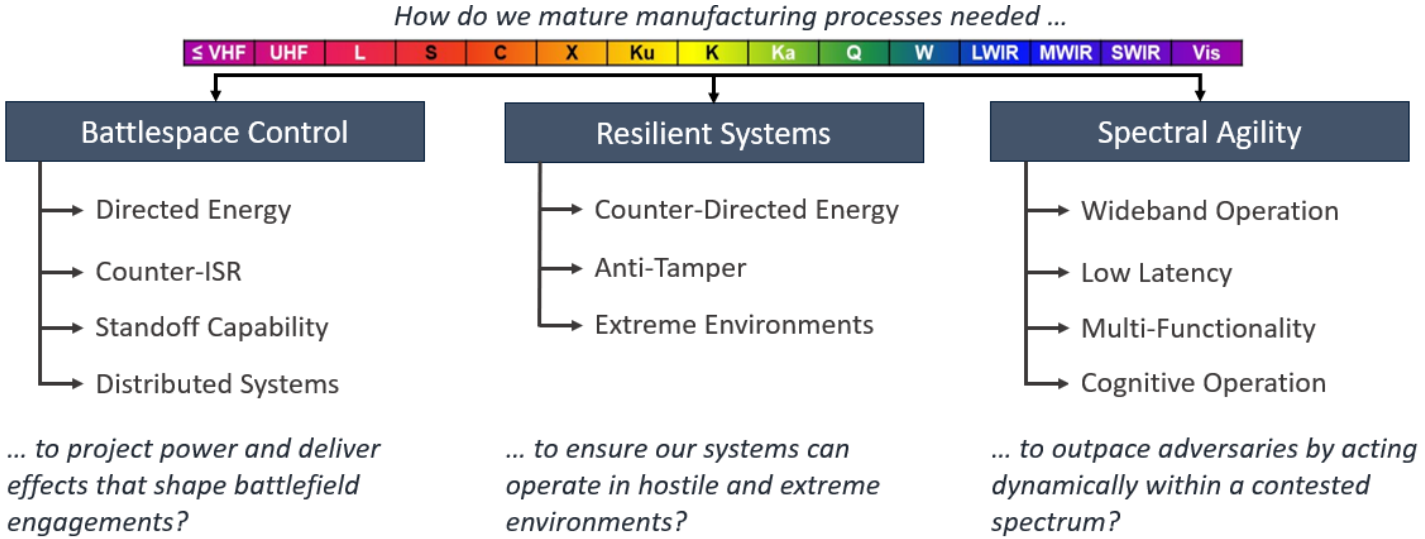
Scope

The DAF requires electronic and photonic systems capable of projecting power and outpacing adversaries across the electromagnetic spectrum in all environments. To enable quantity, rate and capability, manufacturing technologies are required for these systems and their subcomponents, including manufacturing of advanced substrates.



Competencies

- Advanced Packaging
- Microelectronics & Photonics
- Functional Materials & Substrates
- Advanced Electronic Warfare

Applications / Demand Signals

- High Power Electronic Attack
- LPI Threat Detection
- Counter Directed Energy
- Hypersonic Electronic Subsystems
- Dynamic Electromagnetic Spectrum Operation

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Spectrum Warfare Materials & Manufacturing

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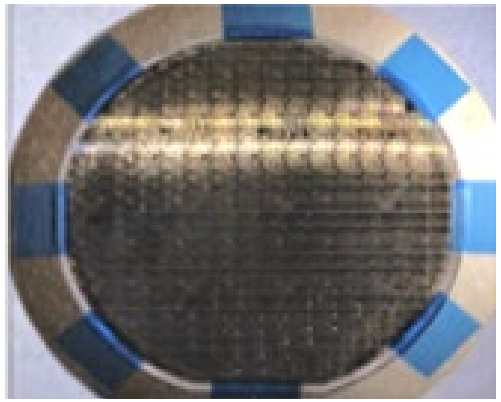
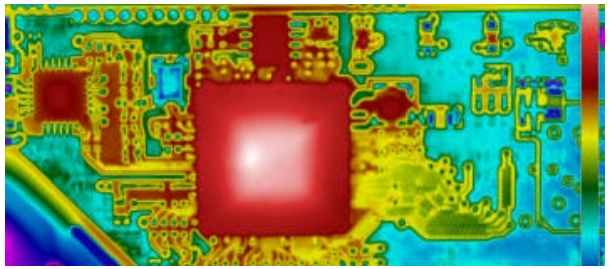
Thrust 1: High-Power, Frequency-Agile RF Devices

Mature and scale manufacturability of substrates, devices, and components enabling RF operation through mmWave, increasing tactical range, operability, and survivability in contested environments.



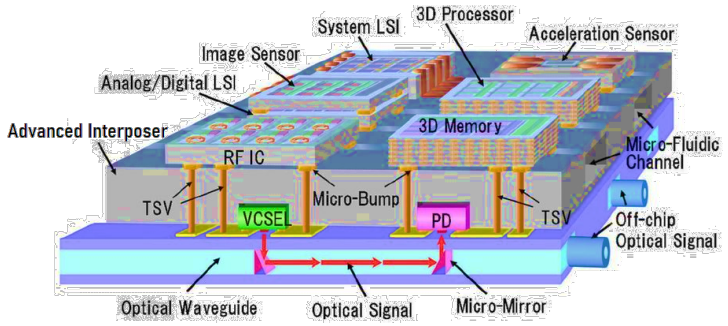
Thrust 2: High Temperature Electronics

Develop electronic materials, components, and integration technologies capable of reliable operation in 500°C environments, ensuring critical system performance on hypersonic platforms and reducing cooling demand for high-power systems.



Thrust 3: Low-Latency, High-Bandwidth Signal Processing

Mature manufacturing technologies for highly integrated, low-SWaP RF systems capable of high data throughput, high instantaneous bandwidth, low loss, and low latency in dynamic and congested environments.



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DIGITAL MATERIALS AND MANUFACTURING

Digital Materials and Manufacturing

AFRL

Scope

There is a desire to expedite manufacturing by converging operational and information technologies (OT/IT), i.e., Industry 4.0, and ultimately delivering weapon systems faster with a quality rating at mass and scale. There is interest in achieving this objective by operationalizing production data, from manufacturing planning through supply networks, to influence lifecycle decisions for DAF needs with security and trust.

Competencies

- Information Modeling and Systems Thinking
- Multi-Modal Data Registration
- Zero Trust Architectures
- Multi-Party Model Encryption
- Multi-Domain Optimization
- Verification, Validation, and Uncertainty Quantification

Applications / Demand Signals

- Model-Based Quality Assurance (MBQA)
- Adaptive Qualification to Expedite System Acceptance
- Anomaly Understanding and Opportunity Discovery across Supply Networks
- Non-Conformance and Inconsistency Identification across distributed production

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Digital Materials and Manufacturing

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Thrust 1: Model-Based Quality Assurance

Build upon maturing digital standards to bridge the critical data gap between system-level requirements and manufacturing-based key quality characteristics, eliminating reliance on bespoke inspection solutions

Goal: Accelerate weapon system delivery through model-based acceptance

Thrust 2: Secure Collaboration for Supply Networks

Establish secure, end-to-end digital asset sharing between the DoW and the defense industrial base leveraging secure enclaves to protect intellectual property and continuously monitor for anomalies and inconsistencies

Goal: Establish end-to-end supply network visibility

Thrust 3: Digital Maturity towards Production Autonomy

Scale automated business and engineering processes to expedite the production lifecycle, i.e., realize manufacturing at speed, with advanced approaches in verification, validation, and uncertainty quantification (VVUQ)

Goal: Remove human latency in production to achieve agility and flexibility

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AGILE MANUFACTURING

AIR FORCE RESEARCH LABORATORY

Agile Manufacturing

AFRL

Scope

The DAF requires an agile and responsive industrial base to produce systems and components that meet evolving mission requirements. One approach to achieving this objective is to develop, mature and utilize manufacturing processes that are inherently agile by increasing the intelligence of the manufacturing process and combining multiple manufacturing technologies into manufacturing systems that behave as highly flexible, responsive networks.

Competencies

- Automation/Robotics
- Additive Manufacturing
- Metamorphic Manufacturing
- Production Digital Thread
- NDI & Test Systems
- Laser Processing

Applications / Demand Signals

- Hybridized Processes
- Adaptable Fabrication
- Performance-based Design
- Infrastructure-less Automation

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Agile Manufacturing

Thrust 1: Convergent Systems

Implementation of an actionable digital backbone coupled with disparate manufacturing systems to enable acting as a single streamlined unit e.g., interconnectivity, adaptable manufacturing, performance-based design.

Thrust 2: Remote Manufacturing Operations

Focus on manufacturing and logistics support in surge demand with minimal “on the ground” infrastructure and Manpower e.g., untethered robotics, containerized solutions, operations with limited manufacturing capability (brown field), and operations with no manufacturing capability (green field).

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