AFRL

Materials and Manufacturing Directorate Overview

MARCH 2026

AIR FORCE RESEARCH LABORATORY

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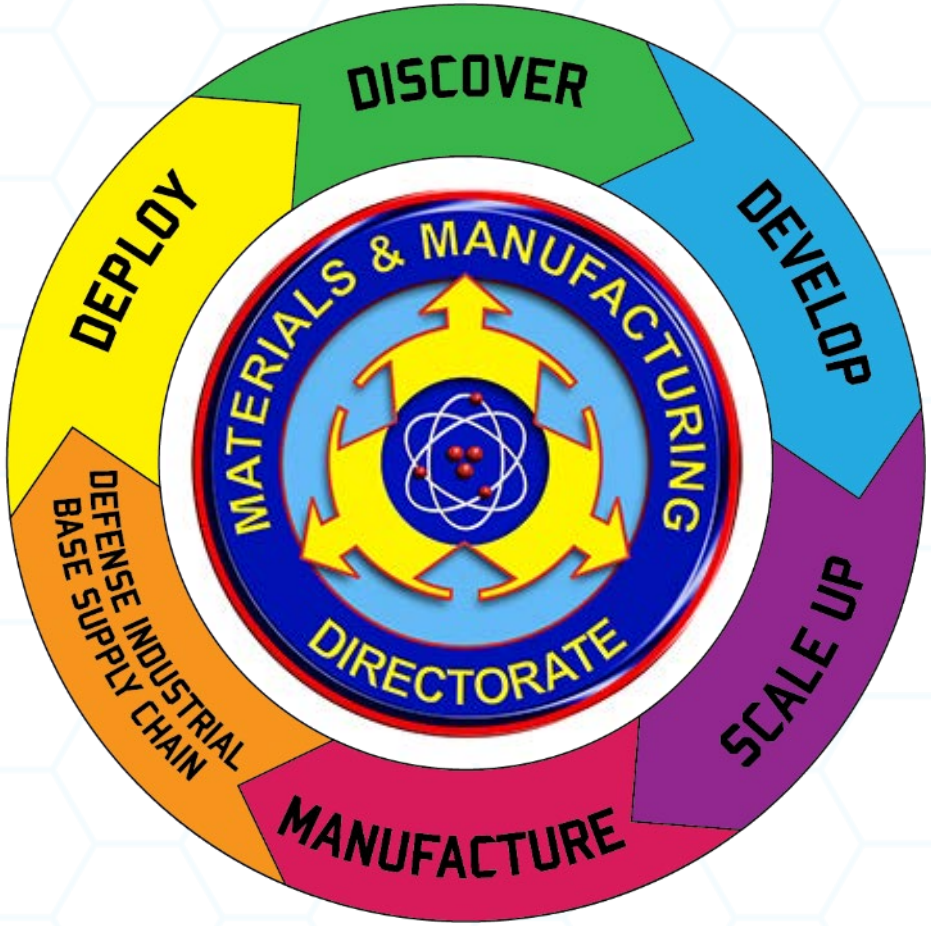
Manufacturing and Sustainability of the World's Most Advanced Aerospace Materials

The Full Spectrum of Materials and Manufacturing Competencies

Metals - Ceramics - Polymers - Semiconductors - Composites - Bio

RX – Providing Complete Life Cycle of Capability Delivery



- **DISCOVER**
  Identify cutting edge scientific phenomena
- **DEVELOP**
  Reduce the risk to implement new technologies
- **SCALE UP**
  Make it big (or small) enough & in sufficient quantity to meaningfully impact the application.
- **MANUFACTURE**
  Produce it at a rate, cost and quality relevant for implementation
- **DEFENSE INDUSTRIAL BASE SUPPLY CHAIN**
  Create, modernize, or expand US industry capacity to meet DAF demand/requirements
- **DEPLOY**
  Transition war-winning technologies to DoD operators

Dedicated to the Digitization of the Materials Life Cycle

LAB FACILITIES

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Internal Development Capabilities

Materials Characterization Facility (MCF)

- State of the art microscopy
  - Cryo-Transmission Electron Microscopy (TEM)/Scanning Transmission Electron Microscopy (STEM)
  - Energy Filtered TEM/Electron Energy Loss Spectroscopy (EELS)
- X-ray tomography capabilities

High-Energy Advanced Materials Research (HAMR)

- High-temp characterization of materials exposed to laser sources
- Nation's largest Continuous Wave IR Laser
- Space environmental testing/sim
- High-temp RF aperture materials characterization

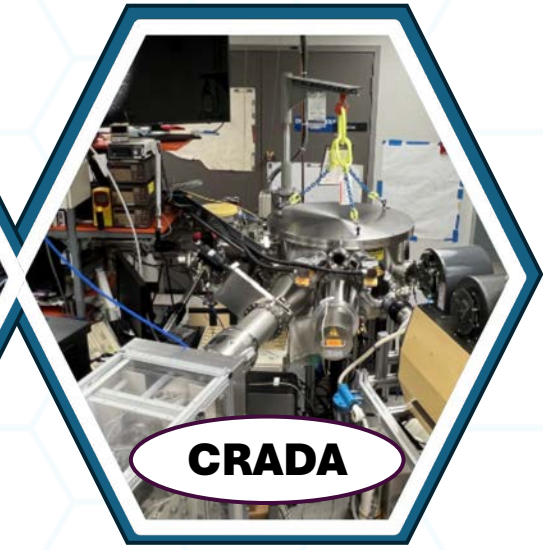
Special Test and Research (STAR) Lab

- One-of-a-kind facility to provide the US government with independent capability for specialty material development, evaluation, and failure analysis
- Erosion characterization for high-speed flight & extreme environments

Rapid Response/Failure Analysis Lab

- Rapid research to solve most urgent M&P problems
- One-stop shop for dev. & op. systems
- ID root cause, characterize & define specs
- Support to AF Safety and Airworthiness

Optical Measurements Facility (OMF) + Space Combined Effects Phenomenology Test & Research Experiments (SCEPTRE) Facility COMPASS



- Space environmental effects simulation (LEO, MEO)
- National-level database of hyperspectral, polarimetric & ladar signatures (w/ NGA)
- Properties for signature, hardening, and space

PARTNERSHIPS

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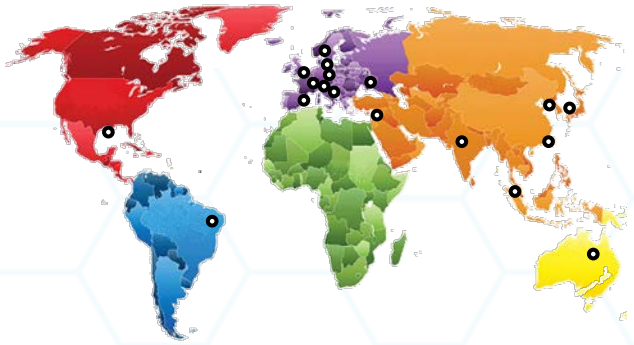
Partnerships: Accelerating Solutions to Our Customers

Industry, Agency, Program Office 50+ CRADAs

Global R&D 81 Active



Manufacturing USA Leadership (CTO, PM, DPM ..) in 6 of 10 $1B+ Federal; $2B+ non-federal 1,300+ companies, Univ., and Non-profits

Centers of Excellence New M&P Skills Cost Share 50+ faculty & 200+ students 30+ CTR & Civ hire

Education Partnership Agreements 20+ for donation, joint R&D & loans

Agency Alliances:

People Exchange:

QUESTIONS?

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