

National Aeronautics and
Space Administration

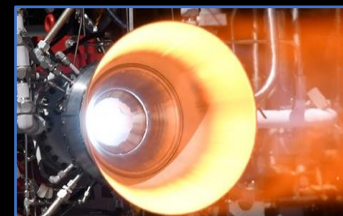
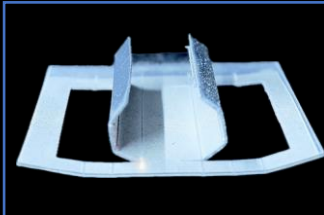
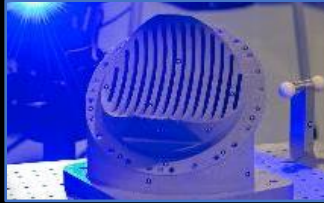


Advanced Manufacturing

Chris Protz

NASA Manufacturing Is:

National Aeronautics and
Space Administration





<https://www.nasa.gov/moontomarsarchitecture/>



<https://www.nasa.gov/spacetechnologies/civil-space-shortfall-ranking/>



<https://www.federalregister.gov/documents/2025/06/20/2025-11379/notice-of-request-for-information-national-strategic-plan-for-advanced-manufacturing>

EXPLORE: Develop technologies supporting emerging space industries



Priorities - Targeted advanced manufacturing outcomes aligned with space industry trends that will shape the course of research and development over many years

In-Space Manufacturing and Space Infrastructure



> 50% Mass reduction, > 99% 3D printer readiness. A catalyst for space infrastructure and economic opportunities



3D Printing / Additive Manufacturing



>50% Cost reduction, 12 months instead of five years, Parts reduction >100 to 1



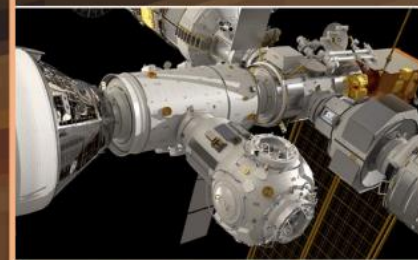
Digital Transformation Digital Twins and Artificial Intelligence



>50% of physical resources replaced with virtual
More intelligent and more accurate predictions and capabilities



Lightweight Composite Spacecraft



30% - 50% More payload, equipment, and experiments



MATERIALS AND PROCESSES LABORATORY

1 Office | 3 Divisions | 6 Branches

150 Civil Servants | 187 Contractors | 22 Facilities

FOCUS AREAS AND NEW CAPABILITIES



MATERIAL AND ENGINEERING SUPPORT

- **M&P Technical Information System (MAPTIS)**
- Materials Database Management
- Materials Selection and Control
- M&P Controls
- Contamination and Foreign Object Debris Control
- Materials Obsolescence



TESTING AND ENVIRONMENTAL EFFECTS

- **Hydrogen Testing**
- **Space Environmental Effects Testing**
- **Debris and Weather Impact Testing**
- Mechanical Property Testing
- Tribology
- Metrology
- Analytical Chemistry
- Flight Experiments



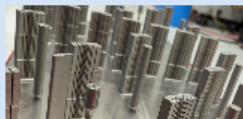
DAMAGE TOLERANCE, NDE AND FAILURE ANALYSIS

- **Damage Tolerance Determinations**
- **NDE Inspection Process Development and Application**
- **Material Diagnostics and Failure Analysis**
- Fracture Control Board
- Fracture Control and Analysis
- Fatigue and Fracture Test Data Assessment



MATERIAL SCIENCE

- **Microgravity (μ g) Simulation with Electromagnetic, Electrostatic, and Aqueous Levitation Methods**
- μ g Flight Experiment Development
- Refractory and Propulsion Alloy Development
- Integrated Computational Materials Engineering (ICME)
- Space and Physical Sciences: Metals, Glasses, Polymers, Semiconductors, Bio-materials, Ionic Liquids



MATERIALS & PROCESSES (METALS AND NON-METALS)

- **TPS Process Development**
- **Nuclear Fuel Development and Testing**
- **Cryogenic Insulation**
- Polymers and Composites Test and Application
- Ceramics and Ablatives



MANUFACTURING

- **Automated Fiber Placement**
- **Additive Manufacturing**
- **Digital Manufacturing**
- **Large Scale/Flight Hardware Manufacturing**
- Solid State Welding
- Large Scale Process Development / Tooling and Manufacturing

Bold = Agency uniqueness or leadership

• Advanced Manufacturing

- Materials and Manufacturing modeling and simulation
- Integrated Computational Materials Engineering (ICME)
- Digital Twins

• PLANET Chamber

- Planetary, Lunar, and Asteroid Natural Environment Testbed
- Dust Mitigation
- In-Space Manufacturing Advancement Center (ISMAC)
- In-Space welding/manufacturing



The Many Paths to Partnership:



Dual-Use Technology Cooperative Agreement Notice (CAN)

Space Act Agreements (SAA)

Small Business Innovative Research (SBIR)

Small Business Technology Transfer (STTR)

NASA Announcement for Collaborative Opportunities (ACOs)

Procurement Contracts, Grants