



NASA 's Composites Portfolio
Department of Energy Workshop
Fiber Reinforced Polymer
Composites Manufacturing

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NASA Centers and Mission Areas



Human Exploration and Operations

Science Payloads Manufacturing development

Orion Multi-Purpose Crew Vehicle

White Light Scattering and Photogrammetry

The Space Launch System

Space Stage 700 Ingot

Manufacturing Working and Simulation

Space Technology

NASA and Boeing's workers working together to assemble development of robots

Large Scale Composite Fiber Placement Machine - Composite Gyrotron

Electron Beam Feature Fabrication

Composite Gyrotron (CGT) Process Development

Space Station Manufacturing

Science

Manufacturing of COMPOSITE ROVER

Developing microtechnology for advanced sensors and mechanical systems

Processing of composites using data and fibers optimized through open innovation

Comprehensive Processing of Wettable Liquids

JWST Mirror Telescope Precision Mirror Manufacturing

Aeronautics Research

Lightweight Composite Materials

Carbon Nanotube (CNT) Technology "Fuzzy Fibers" 3D

Multi-Ship Pressure Cell

Strengthening 48-Inch long crown panel

Composites Gyrotron (CGT) Process Development

Manufacturing Technology, Inc.

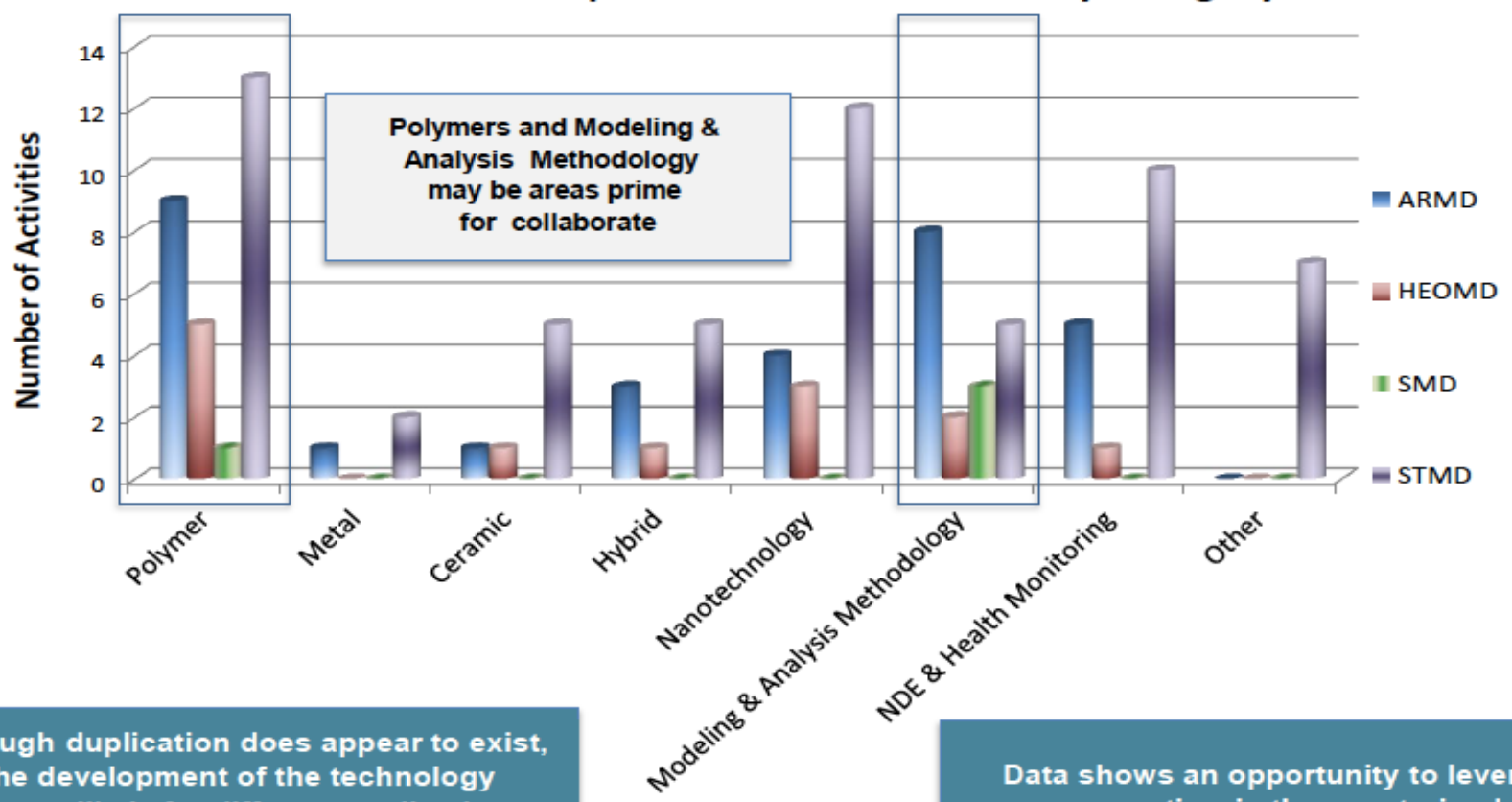
Composites support all of the NASA Mission Areas



The NASA Composites Portfolio



Number of Activities per Mission Directorate by Category



Polymers and Modeling & Analysis Methodology may be areas prime for collaborate

Although duplication does appear to exist, the development of the technology is most likely for different applications (e.g. aircraft, launch vehicles, spacecraft)

Data shows an opportunity to leverage expertise in the constrained fiscal environment

The Problem – The Solution



Table 7.3 Top 5 Polymer Matrix Composite Technology TRLs

Technology Gap	Current TRL	Expected TRL in 2 years*
Develop out-of-autoclave processes to dramatically reduce costs	4	5/6
Develop a low-mass, cost-effective composite joint design development approach for fracture-critical applications	4	N/A
Develop damage prediction of composite structure	2	3
Develop modeling and simulation of manufacturing processes	3	6
Develop digitally integrated, science-based materials, design, manufacturing, and certification	3	4
Develop in-situ NDI/NDE technology for integrated systems, reduced testing, and cost reductions	3	N/A
Develop composite sensors	4/5	N/A
Develop continuously tow-steered composites for optimized structures	4	N/A
Develop improved structural certification for composite structures	2	3
Develop and infuse new low-cost, high-performance materials	3	5
Develop and characterize passive thermal control materials	3	N/A
Develop in-space repair of damaged composite structures	2	5
Develop rapid/efficient material property development of composites	2	4
Develop composite materials information management	5	N/A
Develop adhesives for cryogenic applications with high G1C/K1C	3	5
Develop hybrid and multifunctional structures for thermal, radiation, impact, and lightweight structural applications	3	5

Develop technologies and capabilities that make missions more affordable, more capable and more reliable Value to NASA - Value to the Nation

Significant Projects



Composite Cryotank



James Webb Space Telescope Primary Mirror Backplane Structure

Advanced Composites Project

- Reduce timeline to develop and certify composite materials and structures
- Boost American industry and help maintain a U.S. global leadership in the field of composite materials
- Infuse next-generation, physics-based tools and streamlined processes to accelerate the development and regulatory acceptance of advanced composite structures for aeronautics vehicles manufactured from qualified or industry standard composite materials

Polymer Matrix Composites Community



- **The establishment of a core team; which represents the NASA centers, directorates, and requisite disciplines.**
- **The creation of a Sub-Community Engineering Network that integrates across requisite fundamental disciplines; such as Materials, Manufacturing, NDE, and Structures.**
- **The development of a foundation for agency-wide collaboration and discipline advancement.**
- **Develop a strategy to address NASA Technical Challenges**
 - Manufacturing
 - Certification / Modeling / Excessive Reliance on Testing
 - Material Property Characteristics
 - Foster Confidence/Familiarity in Use of Composites
 - Address Discipline Unique Challenges
 - Develop/Sponsor composite design, analysis, manufacturing training classes
 - Develop Composite Structures Design guidelines
 - Standards