2016 MRS Spring Meeting
Current Topics in Materials Science and Policy

Overview of Federal Advanced Manufacturing Initiatives

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Materials and Manufacturing are Critical to all NASA Mission Areas
Space Technology...
.... an Investment for the Future

- Enables a **new class of NASA missions** beyond low Earth Orbit.
- **Delivers innovative solutions** that dramatically improve technological capabilities for NASA and the Nation.
- Develops technologies and capabilities that make NASA’s missions **more affordable and more reliable**.
- Invests in the economy by **creating markets and spurring innovation** for traditional and emerging aerospace business.
- **Engages the brightest minds** from academia and small businesses in solving NASA’s tough technological challenges.

**Value to NASA**

- The NASA Workforce
- Academia
- Small Businesses

**Value to the Nation**

- The Broader Aerospace Enterprise

**Benefits from STMD:**

A generation of studies and reports (40+ since 1980) document the need for regular investment in new, transformative space technologies.

**Cumulative University Partnerships in Early Stage**

- Over 700 STMD projects w/ Academic Partnerships

[Image of partnership presentations]
Technology Demonstration Missions bridges the gap between early proof-of-concept tests and the final infusion of cost-effective, revolutionary technologies into successful NASA, government and commercial space missions.

Small Spacecraft Technology Program develops and demonstrates new capabilities employing the unique features of small spacecraft for science, exploration and space operations.

Game Changing Development seeks to identify and rapidly mature innovative/high impact capabilities and technologies that may lead to entirely new approaches for the Agency’s broad array of future space missions.

NASA Innovative Advanced Concepts (NIAC) nurtures visionary ideas that could transform future NASA missions with the creation of breakthroughs—radically better or entirely new aerospace concepts—while engaging America’s innovators and entrepreneurs as partners in the journey.

Center Innovation Fund stimulates and encourages creativity and innovation within the NASA Centers by addressing the technology needs of the Agency and the Nation. Funds are invested to each NASA Center to support emerging technologies and creative initiatives that leverage Center talent and capabilities.

Space Technology Research Grants seek to accelerate the development of “push” technologies to support future space science and exploration needs through innovative efforts with high risk/high payoff while developing the next generation of innovators through grants and fellowships.

Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) Programs provide an opportunity for small, high technology companies and research institutions to develop key technologies addressing the Agency’s needs and developing the Nation’s innovation economy.

Centennial Challenges directly engages nontraditional sources advancing technologies of value to NASA’s missions and to the aerospace community. The program offers challenges set up as competitions that award prize money to the individuals or teams that achieve a specified technology challenge.

Flight Opportunities facilitates the progress of space technologies toward flight readiness status through testing in space-relevant environments. The program fosters development of the commercial reusable suborbital transportation industry.

Transformative & Crosscutting Technology Breakthroughs

Pioneering Concepts/Developing Innovation Community

Creating Markets & Growing Innovation Economy
Engage Academia: tap into the talent base, challenging faculty and graduate students to examine the theoretical feasibility of ideas and approaches that are critical to making science, space travel, and exploration more effective, affordable, and sustainable.

NASA Space Technology Research Fellowships
- Graduate student research in space technology; research conducted on campuses and at NASA Centers and not-for-profit R&D labs

Early Career Faculty
- Focused on supporting outstanding faculty researchers early in their careers as they conduct space technology research of high priority to NASA’s Mission Directorates

Early Stage Innovations
- University-led, possibly multiple investigator, efforts on early-stage space technology research of high priority to NASA’s Mission Directorates
  - Paid teaming with other universities, industry and non-profits permitted

Reinvigorate the pipeline of high-risk/high-payoff low-TRL space technologies
Strategic Planning

- NRC Roadmaps and Strategic Space Technology Investment Plan Updates
- STMD Strategic Implementation Plan
- Objectives and Principles
- Balance across TRL/Programs and technology areas
- Continue to have competed and guided projects with centers, industry and academia
- Collaborations with other government agencies
- Public Private Partnerships
The Budget Process

President submits budget

House submits budget Draft

Senate submits budget Draft

House and Senate must agree and pass a budget resolution

Congress authorizes budget for NASA

Congress appropriates budget for NASA

President signs final budget
The Budget Process - Really
Interagency Advanced Manufacturing National Program Office (AMNPO)

Executive Office of the President

Advanced Manufacturing Partnership (AMP/PCAST)

Advanced Manufacturing National Program Office (hosted by DOC - NIST)

NSTC - Advanced Manufacturing Subcommittee
PCAST: The Independent Basis of NNMI
President’s Council of Advisors on Science and Technology

PCAST 2011
Recommends Advanced Manufacturing Initiative as national innovation policy

PCAST 2012
Recommends Manufacturing Innovation Institutes to address key market failure

PCAST 2014
Recommends strong, collaborative network of Manufacturing Innovation Institutes
NNMI: Addressing the “Scale-up” Gap

Focus is to address market failure of insufficient industry R&D in the “missing middle” or “industrial commons” to de-risk promising new technologies.
Public Engagement on Design
Workshops & Request for Information

Broad & Diverse Stakeholder Input
1,200 voices on the NNMI Design!

- Industry 31%
- Academia 31%
- All Other 10%
- Economic Development 6%
- Research & non-profits 8%
- Federal State & Local Gov’t 14%

- Rensselaer Polytechnic Institute
  Troy New York
- Cuyahoga Community College
  Cleveland Ohio
- University of Colorado
  Boulder, Colorado
- National Academies Beckman Center
  Irvine California
- U.S. Space and Rocket Center
  Huntsville, Alabama
The Institute Design
Creating the space for Industry & Academia to collaborate

White House Report
NNMI Framework Design
January 2013
The NNMI Mission

“The Network serves the Institutes, the Institutes connect through the Network, and the Program serves the Nation.”

Program Mission (Institutes + Network)
Advance American domestic manufacturing innovation by creating an effective manufacturing research and development infrastructure for U.S. industry and academia to solve industry-relevant problems.

Institute Mission
Create and strengthen American manufacturing hubs through sustainable industry-led innovation institutes that create, showcase, and deploy new capabilities.

Network Mission
Maximize the integrated impact of the manufacturing innovation institutes on U.S. manufacturing competitiveness.
Building the Network
Network Status and FY16 Plans

Future Network Goal: 45 Regional Hubs

Forthcoming Awards

Flexible Hybrid Electronics
San Jose, CA

Additive Manufacturing
Youngstown, OH

Integrated Photonics
Rochester, NY

Advanced Textiles
Smart Manufacturing

New Institutes Planned for 2016

Open topic competitions

Selected topic competitions supporting agency mission, using agency authorities and budgets

Digital Manufacturing
& Design
Chicago, IL

Lightweight Metal
Manufacturing
Detroit, MI

Advanced Fiber-Reinforced
Polymer Composites
Knoxville, TN

Wide Bandgap
Semiconductors
Raleigh, NC
Recent– NNMI Reports

First Annual Report on the NNMI Program

First Strategic Plan on the NNMI Program

A Snapshot of Priority Technology Areas Across the Federal Government
• Establish a presence, at scale, in the “missing middle” of advanced manufacturing research

• Create an Industrial Commons, supporting future “manufacturing hubs”, with active partnering between all stakeholders

• Emphasize/support longer-term investments by industry

• Combine R&D with workforce development and training

• **Overarching Objective:** Unleash new U.S. advanced manufacturing capabilities and industries – for stronger global competitiveness and U.S. economic & national security