



2016 MRS Spring Meeting Current Topics in Materials Science and Policy

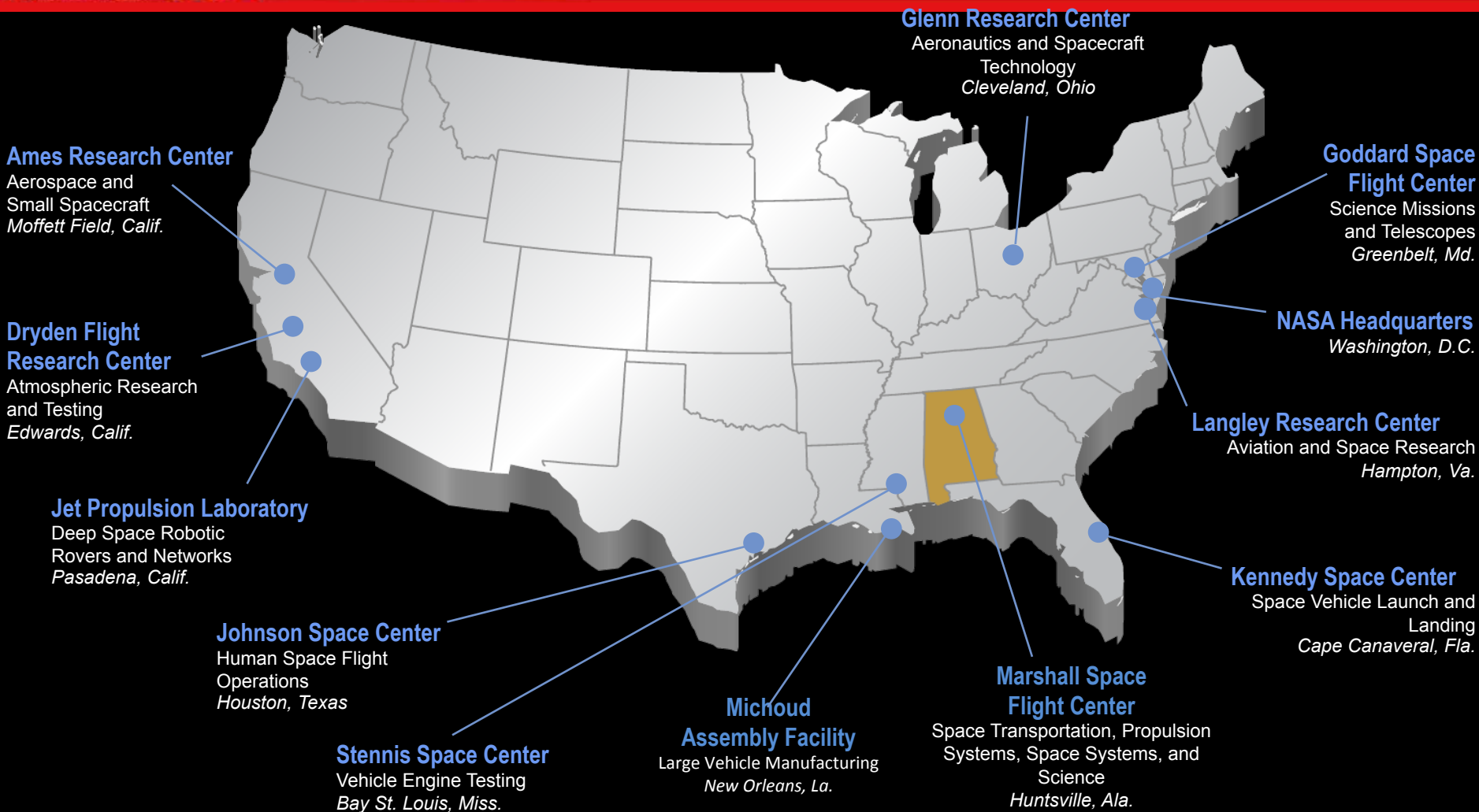
Overview of Federal Advanced Manufacturing Initiatives

Presented by:
Mr. John Vickers
Principal Technologist, NASA

March 2016



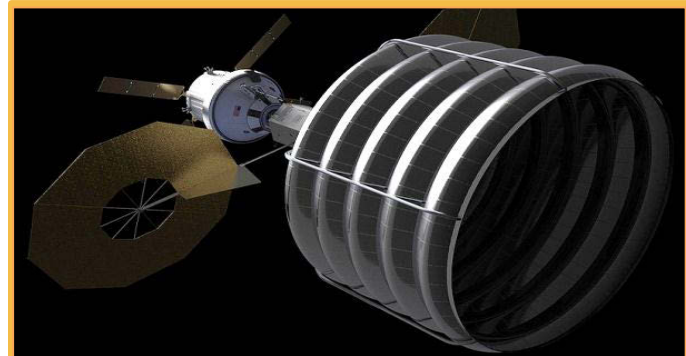
NASA Around the Country



The National Aeronautics and Space Administration



**Human Exploration
and Operations**



**Space
Technology**



Science



**Aeronautics
Research**

Materials and Manufacturing are Critical to all NASA Mission Areas

Space Technology...

.... an Investment for the Future



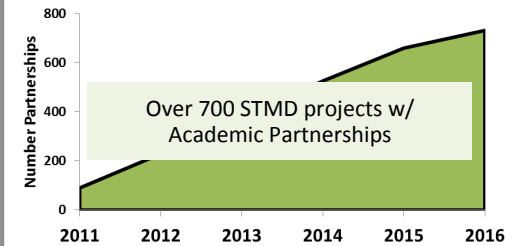
- Enables a **new class of NASA missions** beyond low Earth Orbit.
- **Delivers innovative solutions** that dramatically improve technological capabilities for NASA and the Nation.
- Develops technologies and capabilities that make NASA's missions **more affordable and more reliable**.
- Invests in the 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.

Addresses National Needs

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

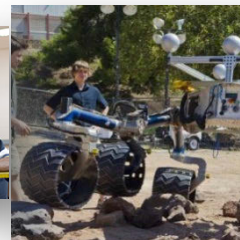
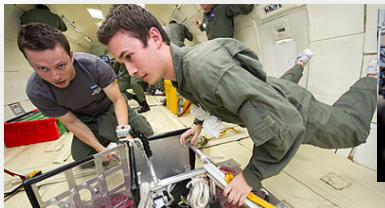


Cumulative University Partnerships in Early Stage



Value to NASA

Value to the Nation



Benefits from STMD:

The NASA Workforce
Academia
Small Businesses
The Broader Aerospace
Enterprise



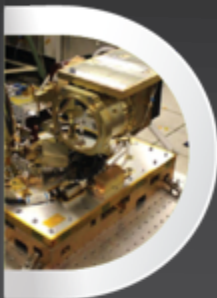
Space Technology Portfolio



Transformative & Crosscutting Technology Breakthroughs

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.



Pioneering Concepts/Developing Innovation Community

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.



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.

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.



Creating Markets & Growing 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.

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.





Space Technology Research Grants (STRG)



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



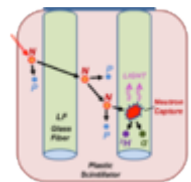
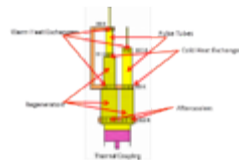
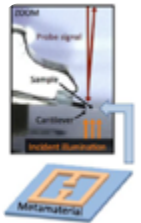
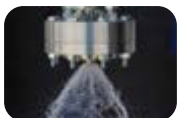
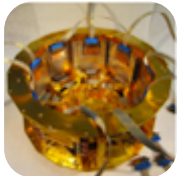
Early Career Faculty

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

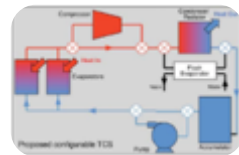


Early Stage Innovations

- 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



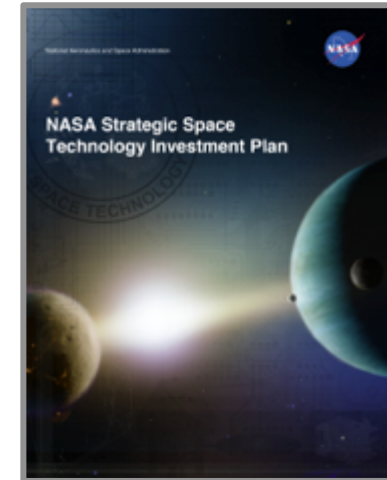
Reinvigorate the pipeline of high-risk/high-payoff low-TRL space technologies



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

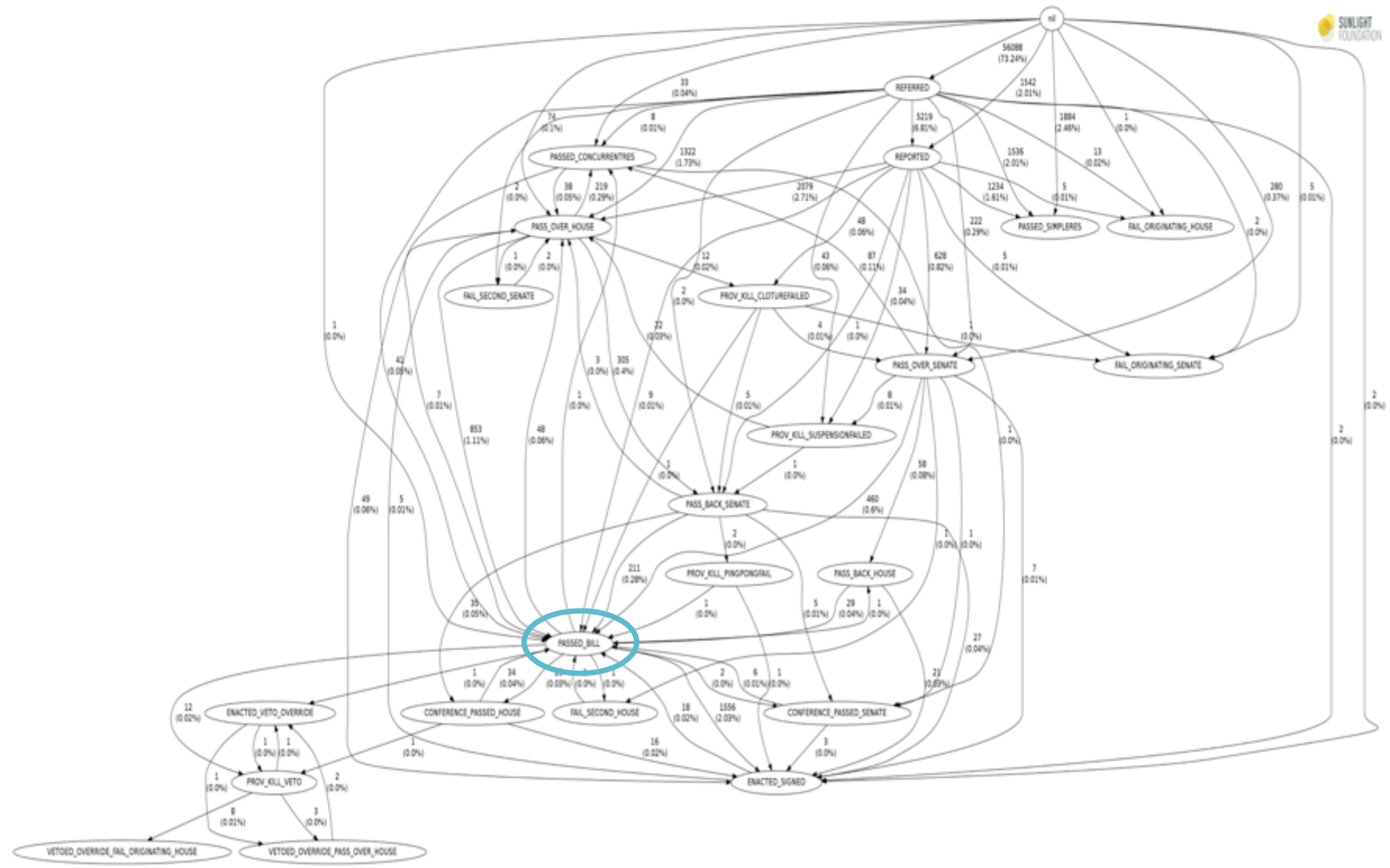


President signs final budget





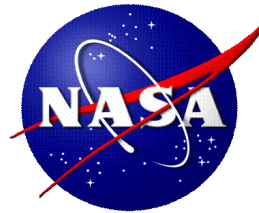
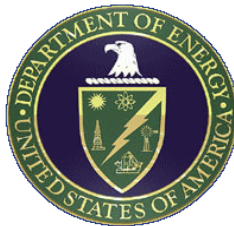
The Budget Process - Really



Interagency Advanced Manufacturing National Program Office (AMNPO)



Executive Office of the President



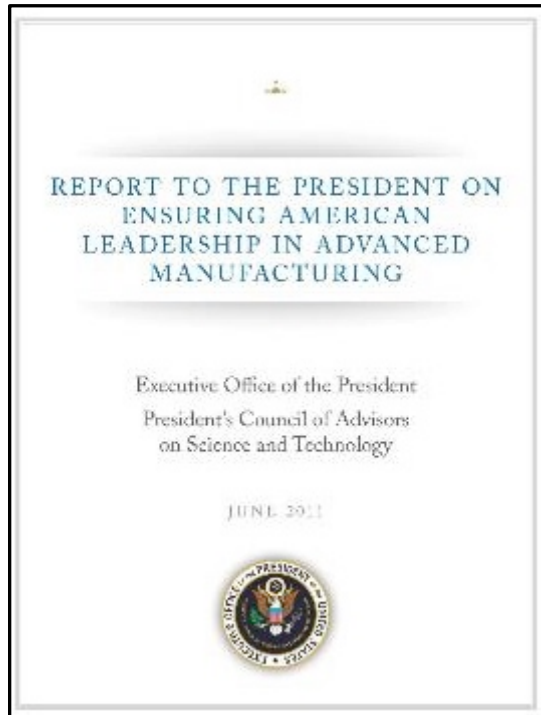
Advanced Manufacturing Partnership (AMP/PCAST)

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

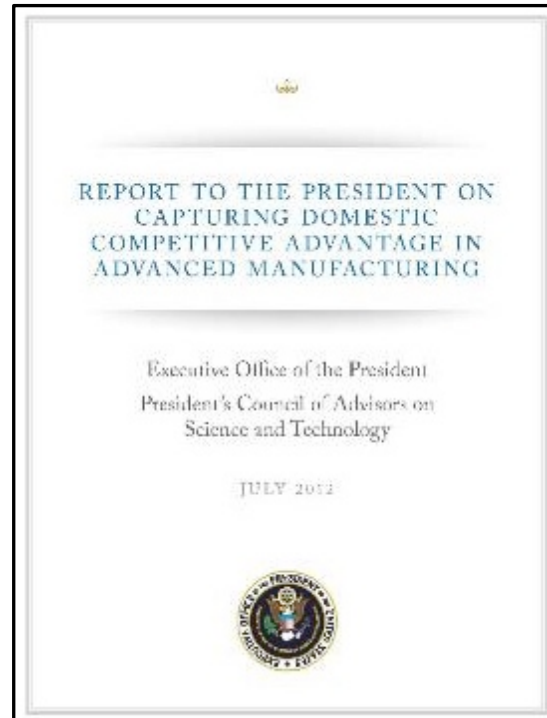
NSTC - Advanced Manufacturing Subcommittee

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

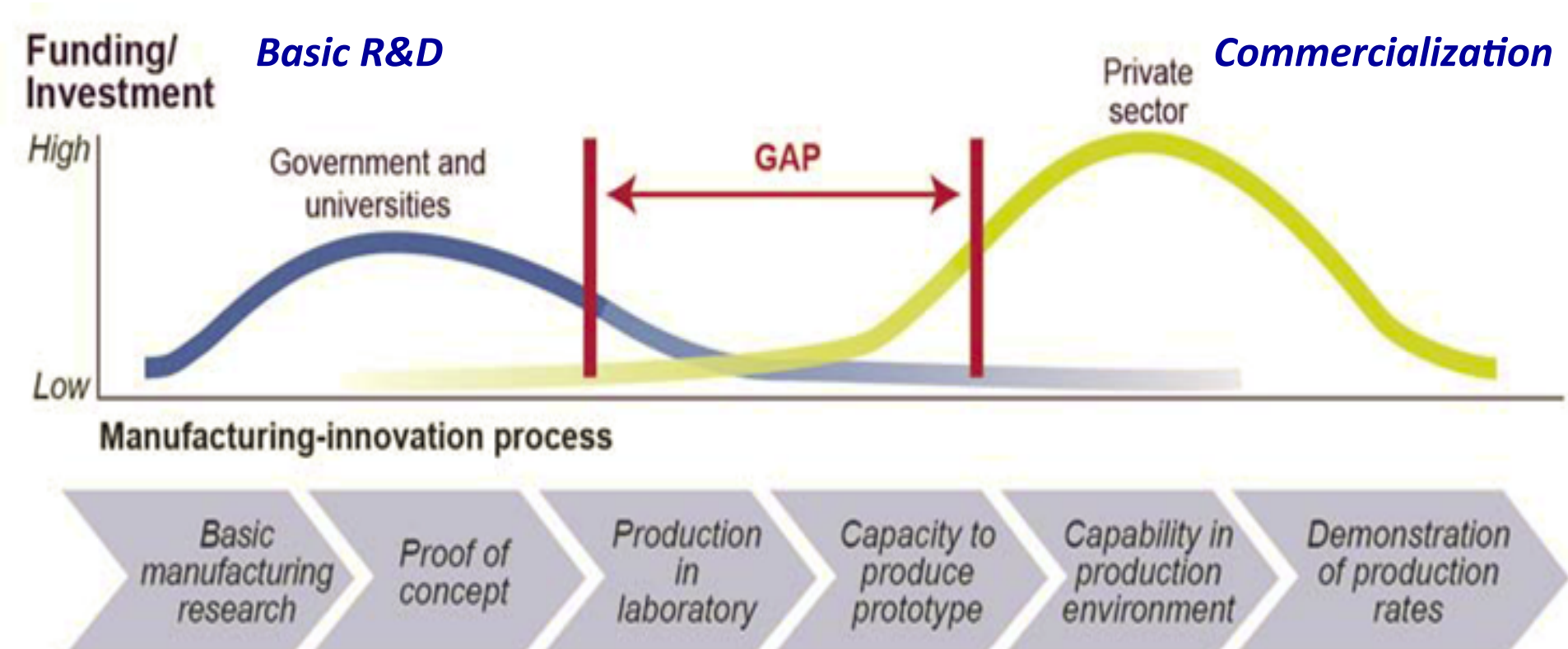


PCAST 2014
Recommends strong, collaborative network of Manufacturing Innovation Institutes

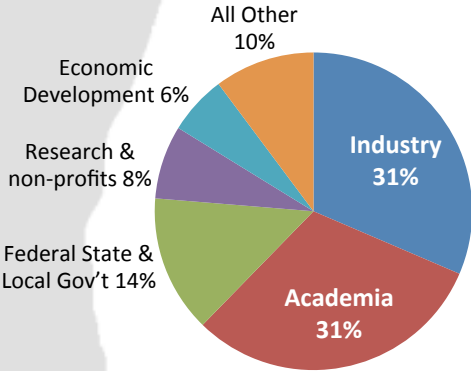
NNMI: Addressing the “Scale-up” Gap



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!***



**Rensselaer Polytechnic Institute
Troy New York**



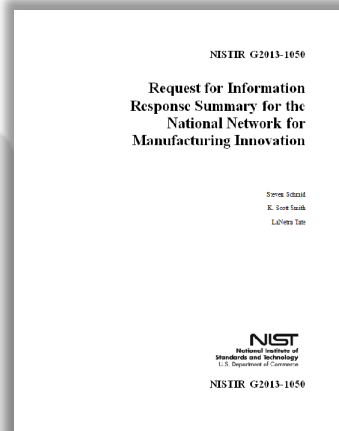
**University of Colorado
Boulder, Colorado**



**Cuyahoga Community College
Cleveland Ohio**



**National Academies Beckman Center
Irvine California**

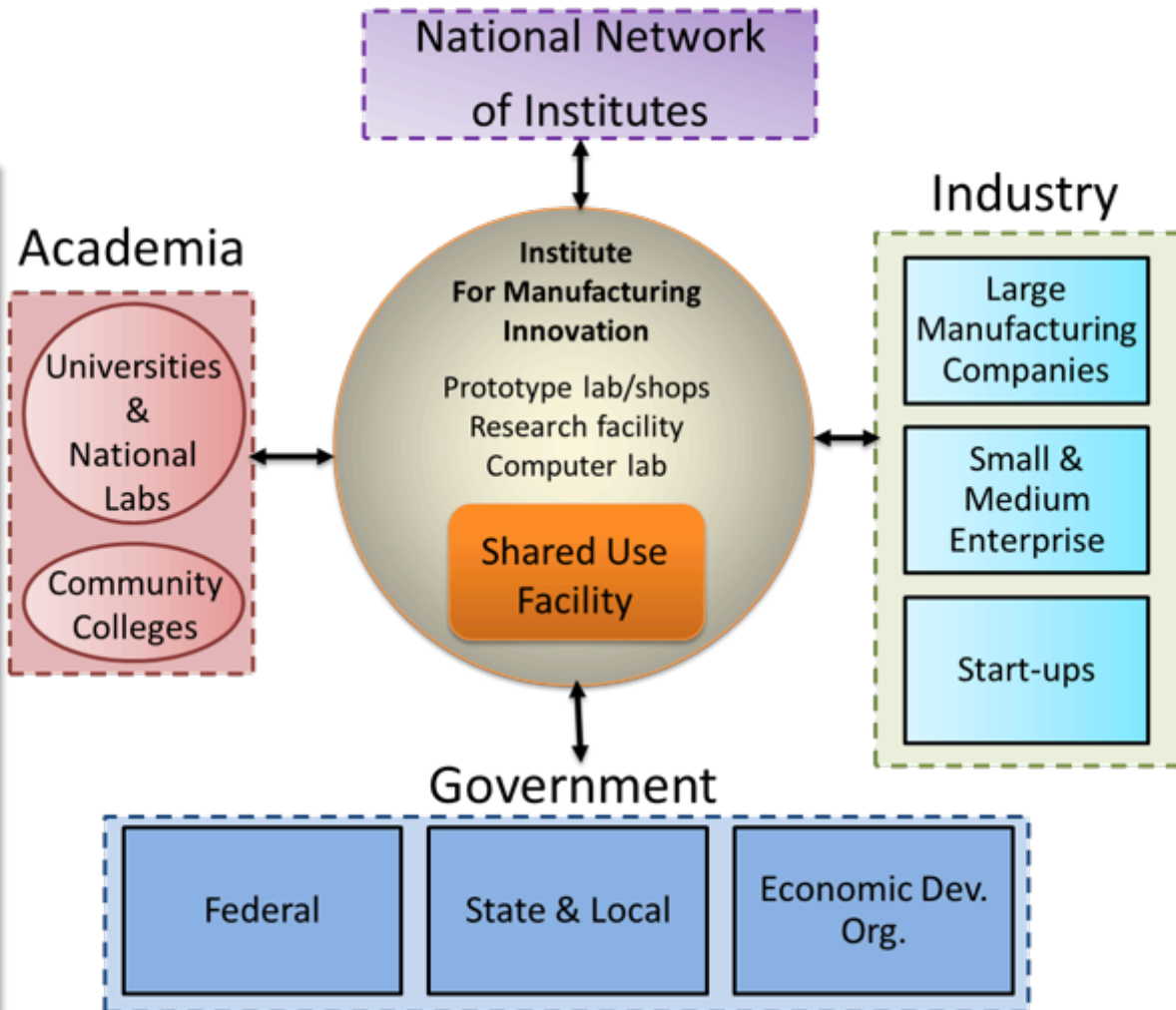
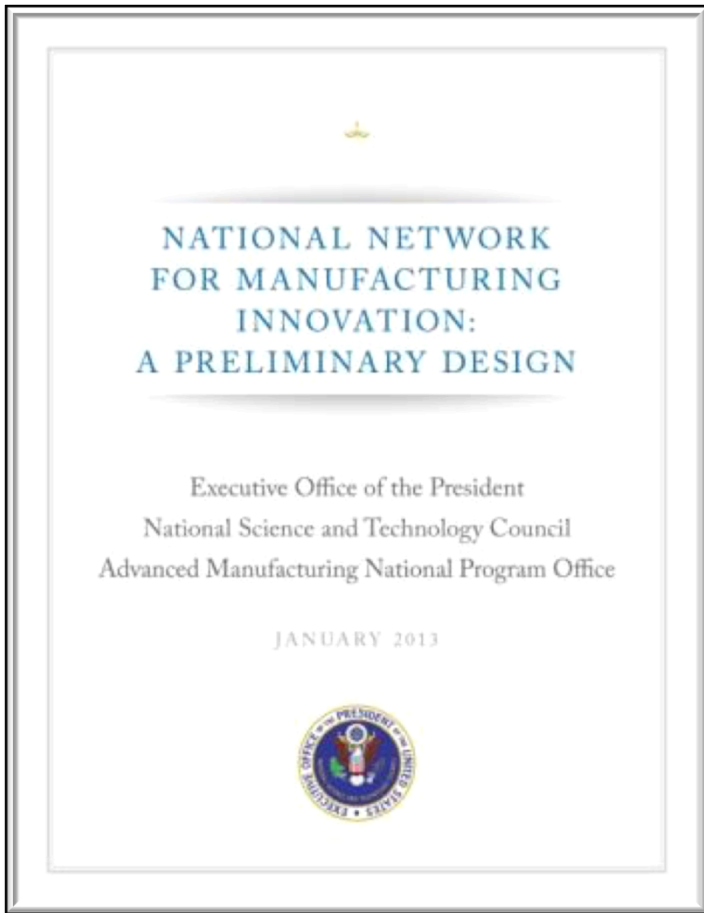


**U.S. Space and Rocket Center
Huntsville, Alabama**

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

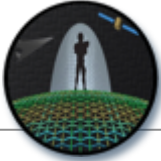
Maximize the integrated impact of the manufacturing innovation institutes on U.S. manufacturing competitiveness.

Building the Network

Network Status and FY16 Plans

Future Network Goal: 45 Regional Hubs

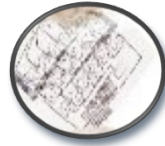
Forthcoming Awards



Advanced Textiles



Smart Manufacturing



Flexible Hybrid Electronics
San Jose, CA



Additive Manufacturing
Youngstown, OH



Integrated Photonics
Rochester, NY

New Institutes Planned for 2016



Open topic competitions



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



Digital Manufacturing & Design
Chicago, IL



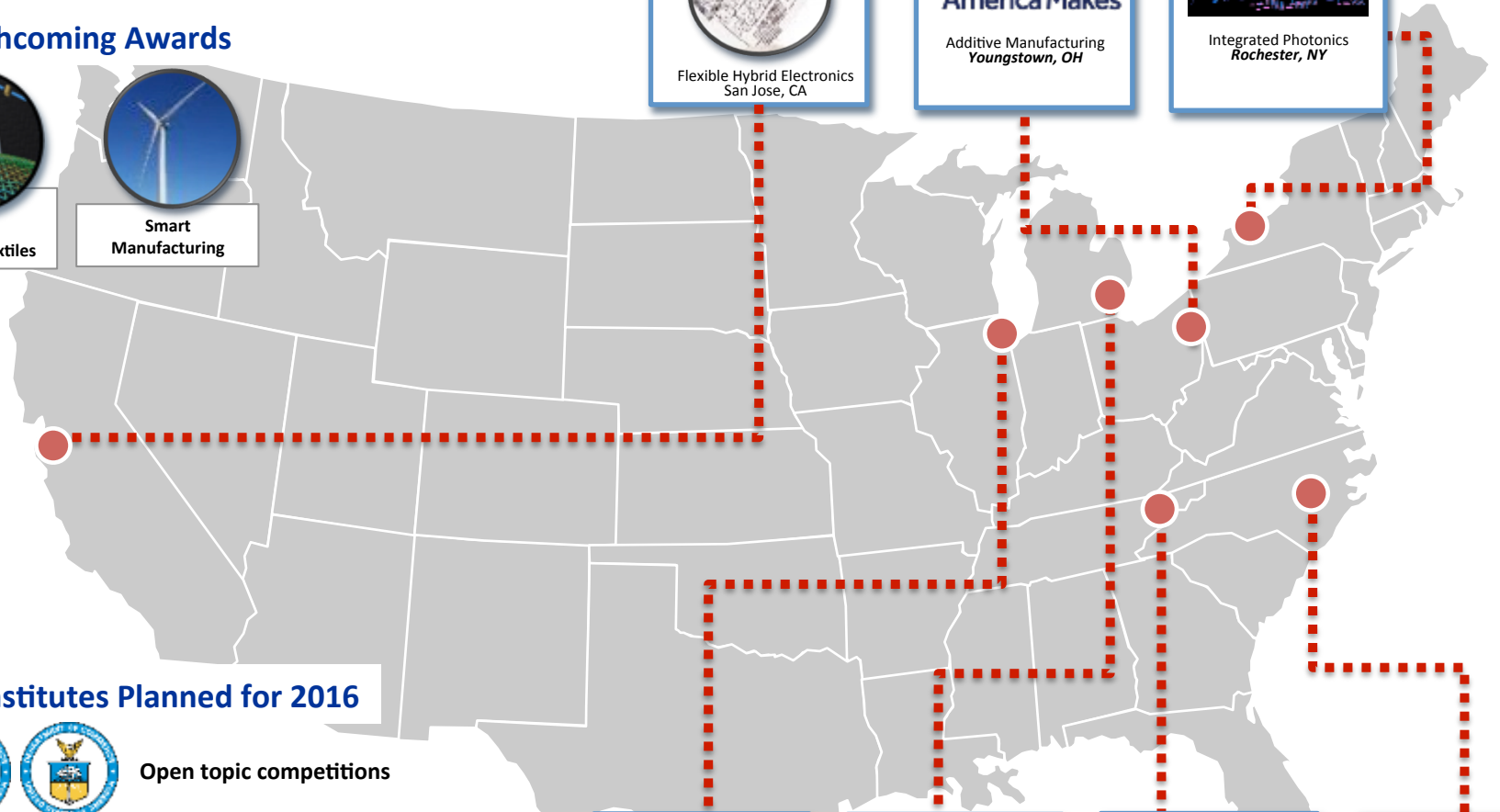
Lightweight Metal Manufacturing
Detroit, MI



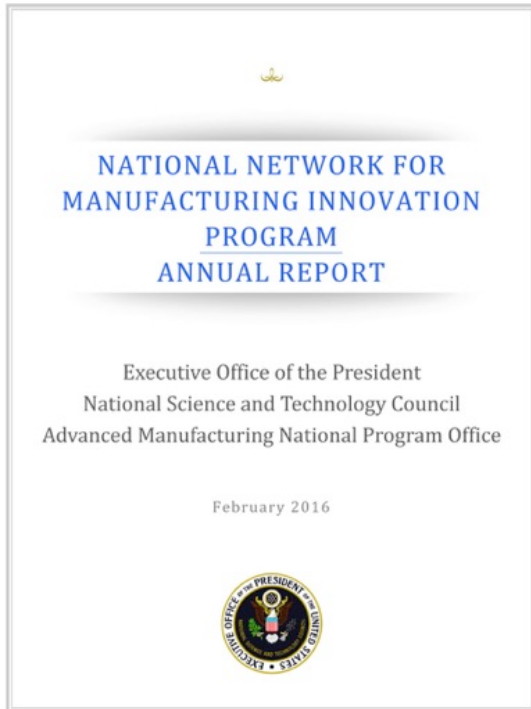
Advanced Fiber-Reinforced Polymer Composites
Knoxville, TN



Wide Bandgap Semiconductors
Raleigh, NC



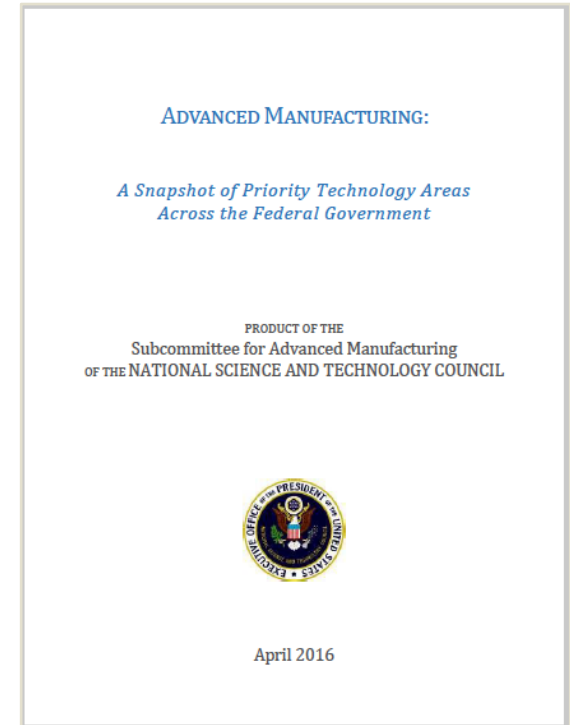
Recent– NNMI Reports



**First Annual Report
on the NNMI Program**



**First Strategic Plan
on the NNMI Program**



**A Snapshot of Priority
Technology Areas Across
the Federal Government**

NNMI: Enabling a Manufacturing Renaissance

Accelerating Discovery to Application to Production



- 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***





Technology Drives Innovation

www.nasa.gov/spacetech