AI and Advanced Manufacturing Technology
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NASA Manufacturing is...

Technology Challenges

- In-space/on-orbit manufacturing
- Additive Manufacturing
- Composites
- Metals Processes
- Advanced Materials
- Digital Manufacturing (e.g. process modeling)
- and more... (e.g. NDI)

Infusion / Cost / Performance / Transformative / Crosscutting
Additive Manufacturing at NASA

3D Printer Micro-G Experiment 1998-2012
First 3D Printer in Space 2014
ISS Made in Space Additive Manufacturing Facility 2016
Refabricator Late 2018
“FabLab” Facility 2020
IRMA (Archinaut, Dragonfly, CIRAS) 2015 – present

AM Prototype Engine
Digital Transformation

Desired Future State

• Data Can Be Integrated and Automatically Couple the Virtual and Physical
• Digital Twin – Digital representation of a physical process/system/object
• Digital Thread – Communication framework that allows a connected data flow

Digital Transformation Major Trends

✓ Industry 4.0
✓ MGI/ICME
✓ Digital Twin / Digital Thread
✓ Big Data / Data Analytics
✓ AI / VR / AR
✓ Robotics / Autonomous Systems
✓ Model-based Engineering (MBx)
✓ 3D Printing
✓ Discipline Physics-based Models
✓ Integrating Science / Engineering
✓ Biomimetics
✓ Collaboration environments
✓ And more...

Digital Integration Allows Predictive, Detective, and Corrective – Real Time Accurate Decisions
National & Global Alignment

Manufacturing USA – National Network of Manufacturing Institutes

- Flexible Hybrid Electronics
  - San Jose, CA

- Smart Sensors and Digital Process Control
  - Los Angeles, CA

- Digital Manufacturing & Design
  - Chicago, IL

- Sustainable Manufacturing
  - Rochester, NY

- Integrated Photonics
  - Albany, NY

- Regenerative Manufacturing
  - Manchester, NH

- Advanced Fibers and Textiles
  - Cambridge, MA

- Modular Chemical Process Intensification
  - New York, NY

- Bio-pharmaceutical Manufacturing
  - Newark, DE

- Lightweight Metals
  - Detroit, MI

- Additive Manufacturing
  - Youngstown, OH
  - El Paso, TX

- Advanced Composites
  - Knoxville, TN
  - Detroit MI

- Advanced Robotics
  - Pittsburgh, PA

- Wide Bandgap Semiconductors
  - Raleigh, NC

- Advanced Composites
  - El Paso, TX

- Advanced Manufacturing
  - Youngstown, OH

- National & Global Alignment
  - Manufacture USA – National Network of Manufacturing Institutes

- U.S. MATERIAL GENOME INITIATIVE / National Nanotechnology Initiative
- UK Catapult Centers
- Fraunhofer Institutes, Others....

- Develop and transition new manufacturing technologies
- Educate, train, and connect the manufacturing workforce
- Expand the capabilities of the domestic manufacturing supply chain
Thank You

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