

The background of the slide is a composite image of space. On the left, a large, detailed view of the Moon's surface is shown, with its characteristic grey and white craters and maria. To its upper left, the reddish-orange surface of Mars is visible. A small rocket ship is positioned between the Moon and the center of the slide, emitting a bright blue beam of light that extends towards the right. The sky is a deep, dark blue, filled with numerous small white stars. In the bottom right corner, the silhouette of a person's head and shoulders is visible, looking towards the left. The bottom edge of the slide shows a dark, silhouetted horizon line, possibly representing a landscape or a ship's deck, with a faint orange and yellow glow suggesting a sunset or sunrise.

**EXPLORESPACE TECH**  
TECHNOLOGY DRIVES EXPLORATION

# NASA Digital Transformation and Digital Twin

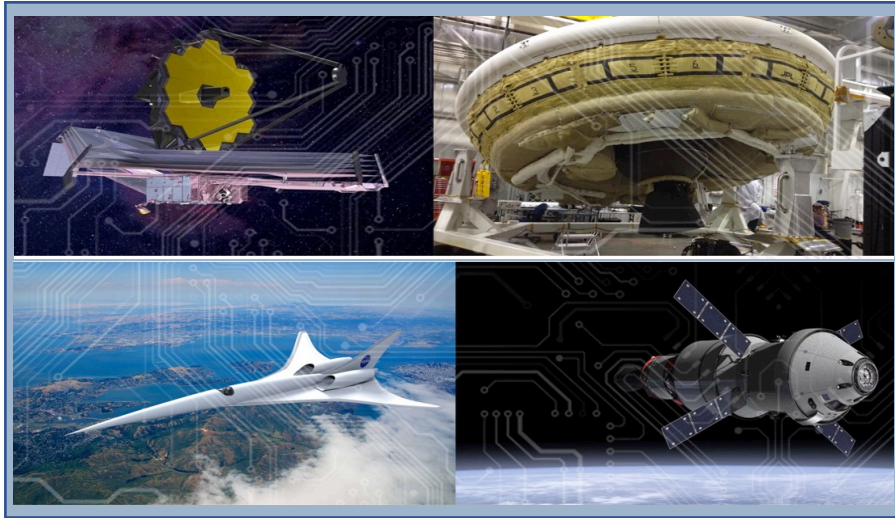
## AIAA SciTech

John Vickers, Principal Technologist | 01.07.20



# NASA Digital Transformation Initiative

Dramatically enhances NASA's mission impact by engaging digital convergence by reinventing mission and mission support processes, products, and capabilities



## Approach: Catalyze DT

- Developing enterprise DT strategy and roadmaps
- Supporting stakeholder implementation of roadmap projects
- Sponsoring/co-sponsoring pilot projects
- Brokering DT partnerships
- Advocating for DT and disseminating DT knowledge
- Tracking the state of DT across Agency



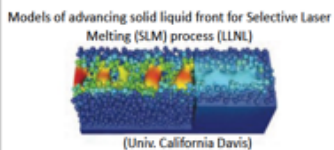
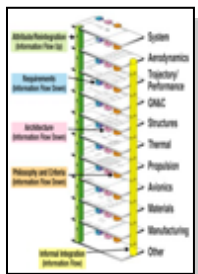
# Digital Twin

## 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 Pipeline – 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...*



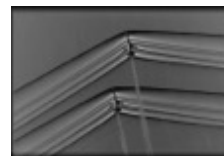
NASA's 3D-Printed Habitat Challenge  
Credits: Team SEArch+/Apis Cor



NASA Laser Powder Bed AM



Supersonic Shock Interaction



Astronaut Scott Kelly on a Spacewalk



## Digital Twin

Requirements



Materials



Design



Analysis



Manufacturing

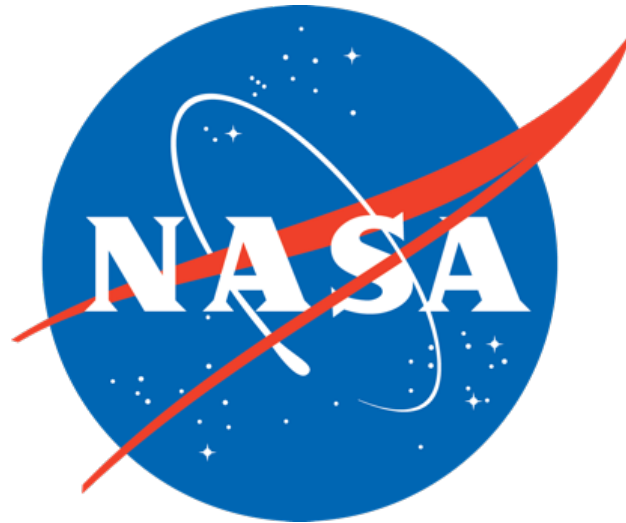


Operations



Maintenance & Repair

Digital Integration Allows Predictive, Detective, and Corrective –  
Real Time Accurate Decisions



Thank You

[john.h.vickers@nasa.gov](mailto:john.h.vickers@nasa.gov)