In-Situ Resource Utilization with Advanced Manufacturing

National Aeronautics and Space Administration

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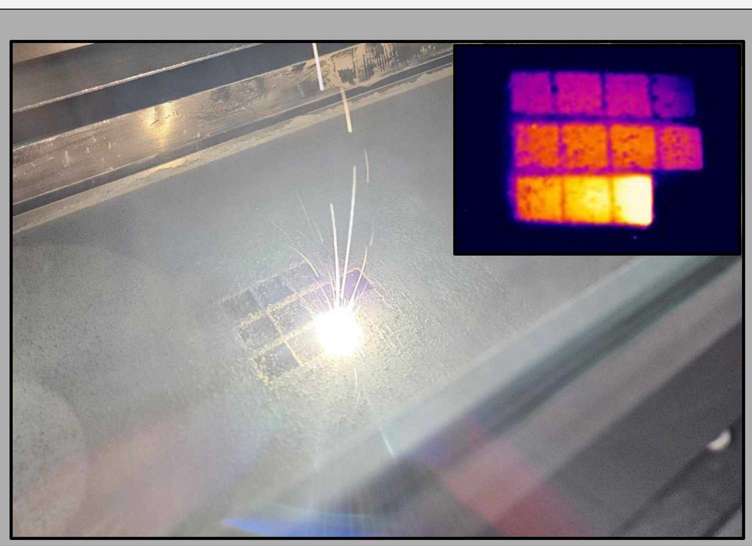
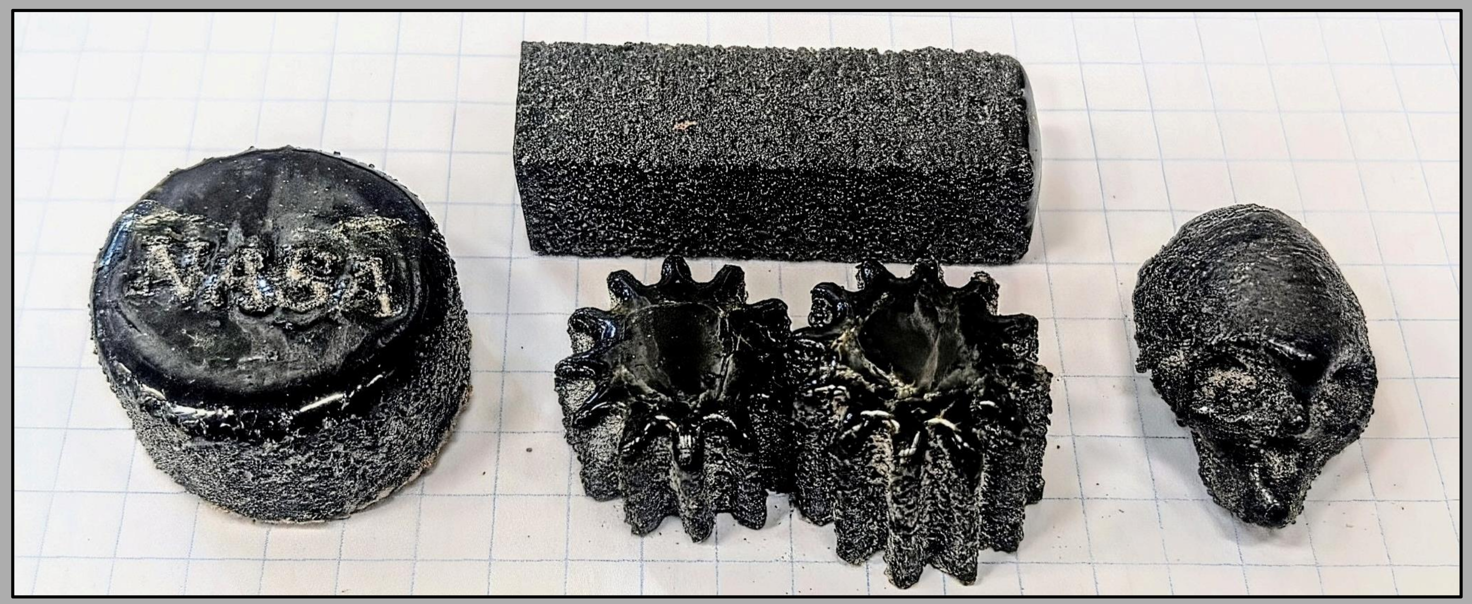
Powder Bed Fusion: Breakthroughs in Laser Additive Manufacturing of Regolith

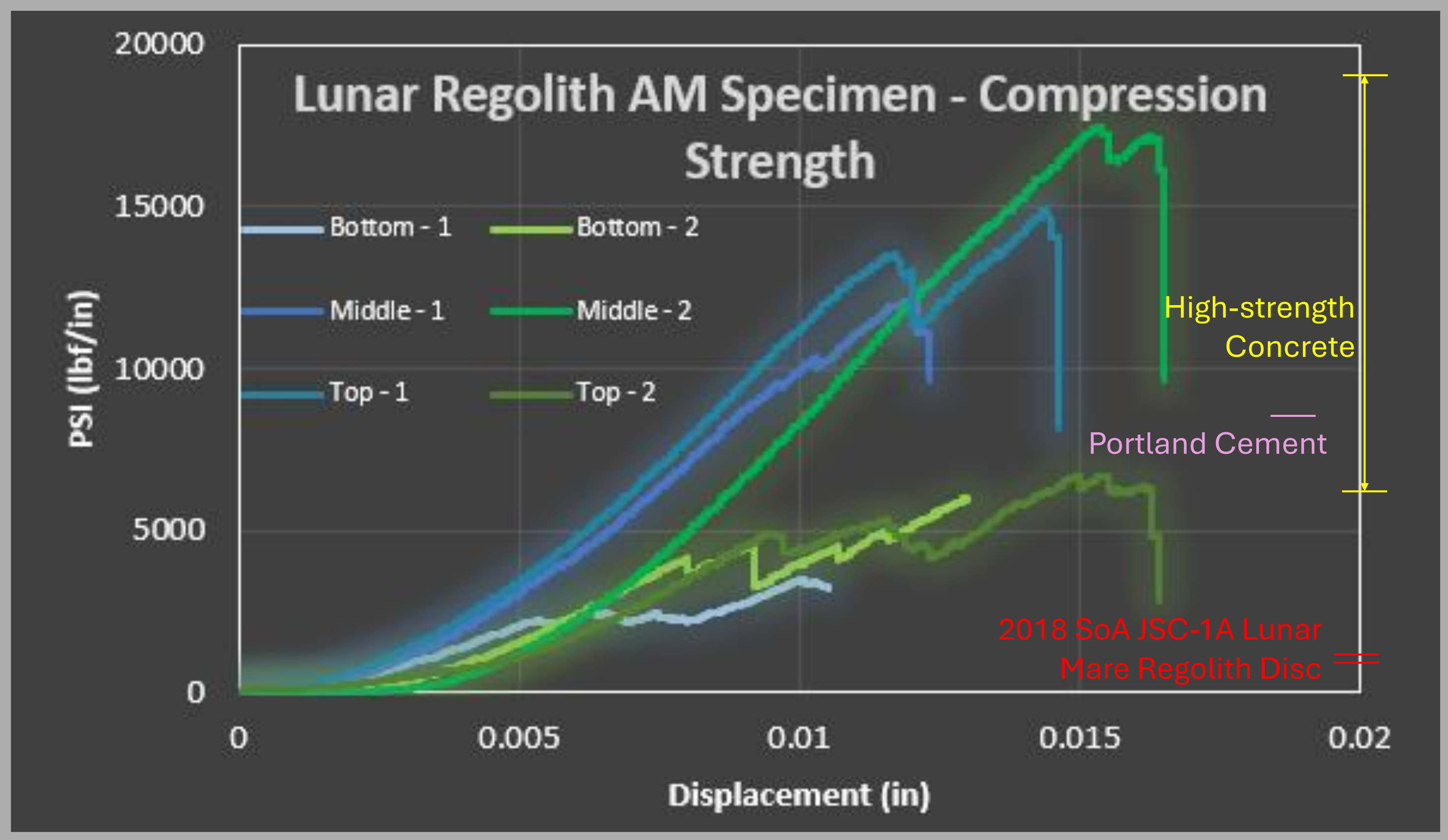
Specialized AM System



In-situ Thermal Imaging

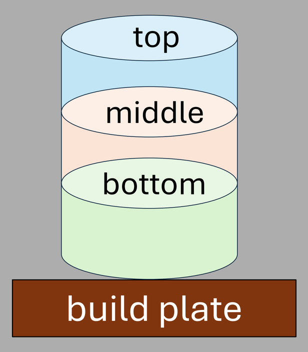


Successful High-Resolution Parts: Brick, NASA Logo, Gears, and Skull (Organic Shape)



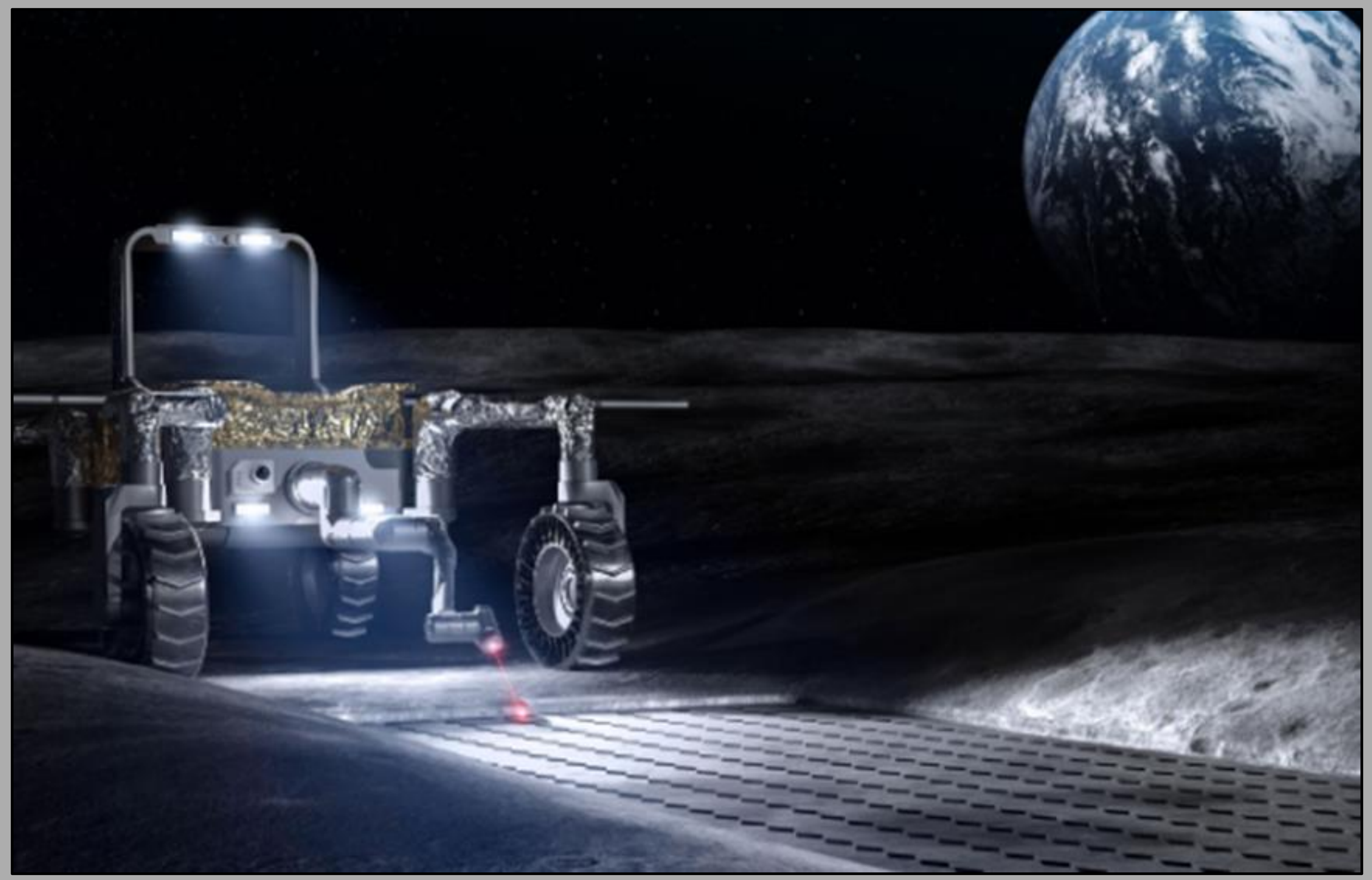
Test description: with ASTM C39, two as-built 0.5" diameter cylindrical specimens were cut and loaded with compression to failure at a crosshead speed of 0.01 in/min

Maximum compression strength found was 17,435 psi.



Enabling Lunar Infrastructure Additive Manufacturing with Regolith via Laser Consolidation

Simulant Name: LHS-1 Highlands Simulant
Reference Material: Average lunar highlands
Uncompressed Bulk Density: 1.27 g/cm^3
Median Particle Size: 51μm
Particle Size Range: <0.04 μm – 1000 μm
(Credit: Space Resource Technologies)



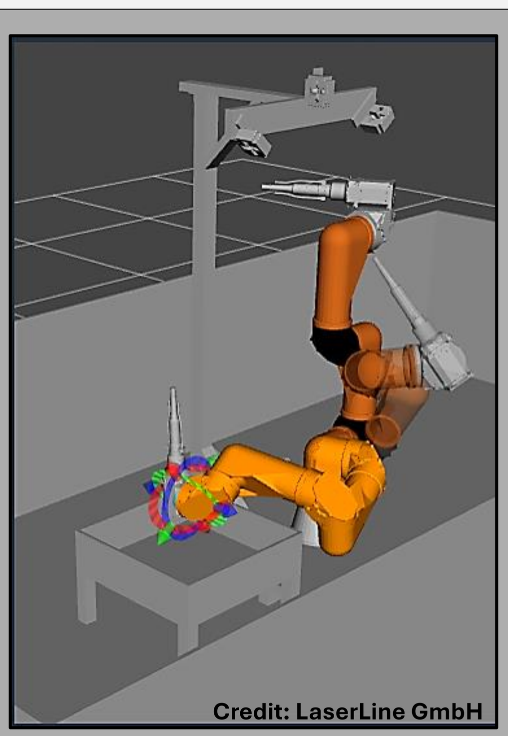
NASA Prints the Future of Lunar Infrastructure with Moon Dust (Credit: Motiv Space Systems)

Applications: Habitats, Roadways, Launch and Landing Pads, Communication and Power Towers, Radiation Shielding, Replaceable Parts, etc.

Next Project Steps:

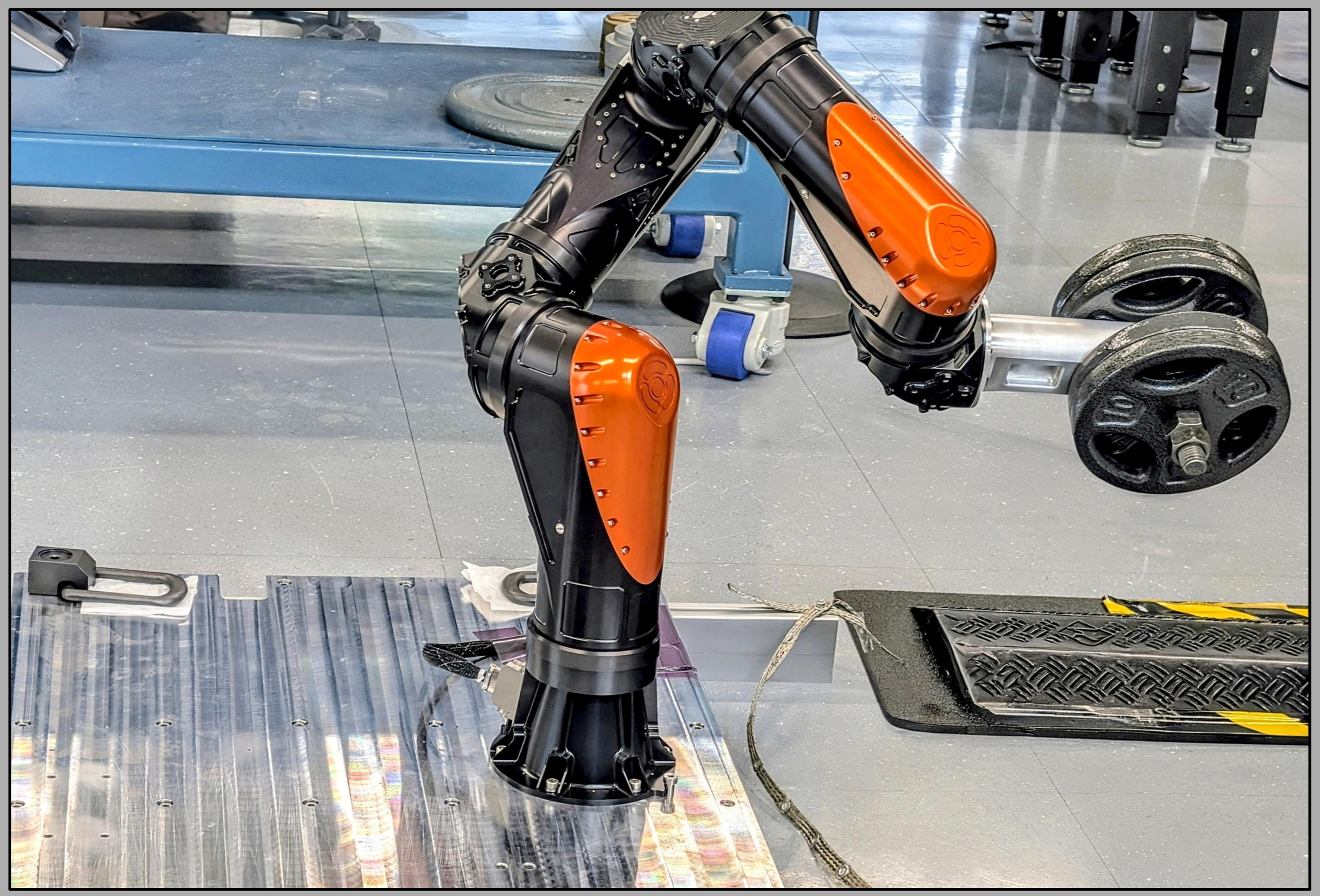
- Printing in vacuum
- Parameter development for scaling parts beyond 1 inch diameter
- Baseline Material Characterization Testing
- Furthering in-situ monitoring
- Preparing for Martian regolith tests

Directed Energy Deposition: Advanced Robotics for Additive Manufacturing in Dirty Vacuum Environments

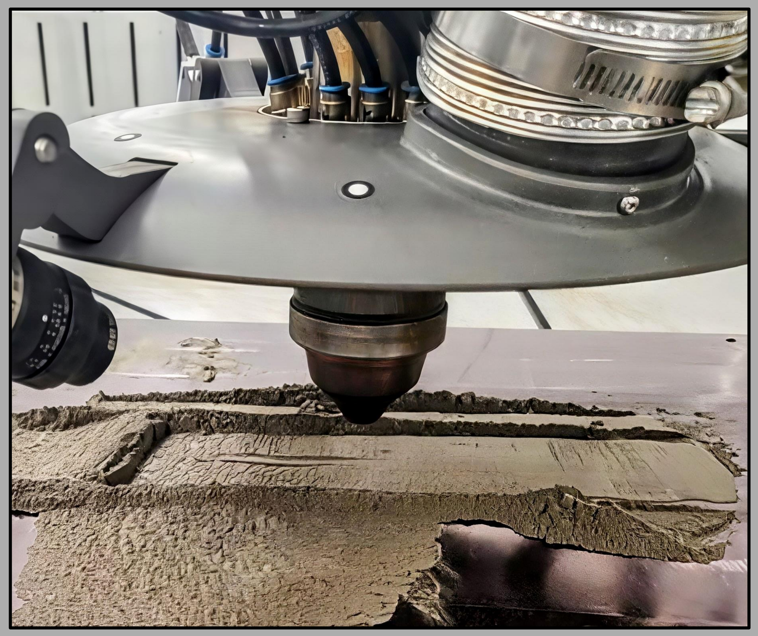


Arm Path Planning Simulation in ROS2

ET20 V20 Vacuum Chamber



Multi-Tool Robotic Platform for In-Situ Lunar Manufacturing from Motiv Space Systems



Laser Consolidated Lunar Regolith Simulant using Directed Energy Deposition