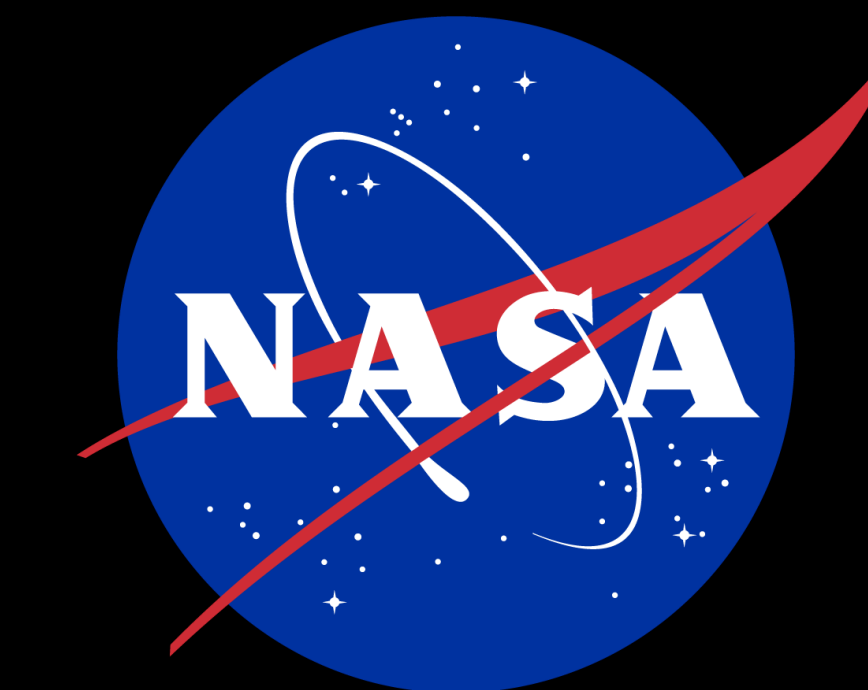


Outfitting the In-Space Manufacturing Advancement Center (ISMAC)



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Marshall Space Flight Center has begun investment into a new collaborative workspace where ISM technologies can be advanced utilizing multidisciplinary teams. Equipment has been commissioned to explore ISM technologies related to electronics, welding, additive manufacturing, recycling, and metal extraction from Lunar or Martian regolith. This is an overview of the latest capabilities outfit to the new In-Space Manufacturing Advancement Center (ISMAC):

Acoustic Levitation



Containerless manipulation of materials in shirt-sleeve environments can be obtained through acoustic levitation. Humidity and temperature can be controlled through dehydration or solidification to simulate manufacturing pursuits in orbit. Similarly, dry materials such as regolith simulant can be manipulated to test for sorting and beneficiation of raw materials for further processing.

In-Space Welding



A handheld laser welding unit is available to simulate welding applications in microgravity and surface conditions. Work to-date has been in conjunction with the flat floor facility to test methods that may be used in future ISAM and other microgravity applications. A planned vacuum glovebox will leverage additional in-space welding efforts.

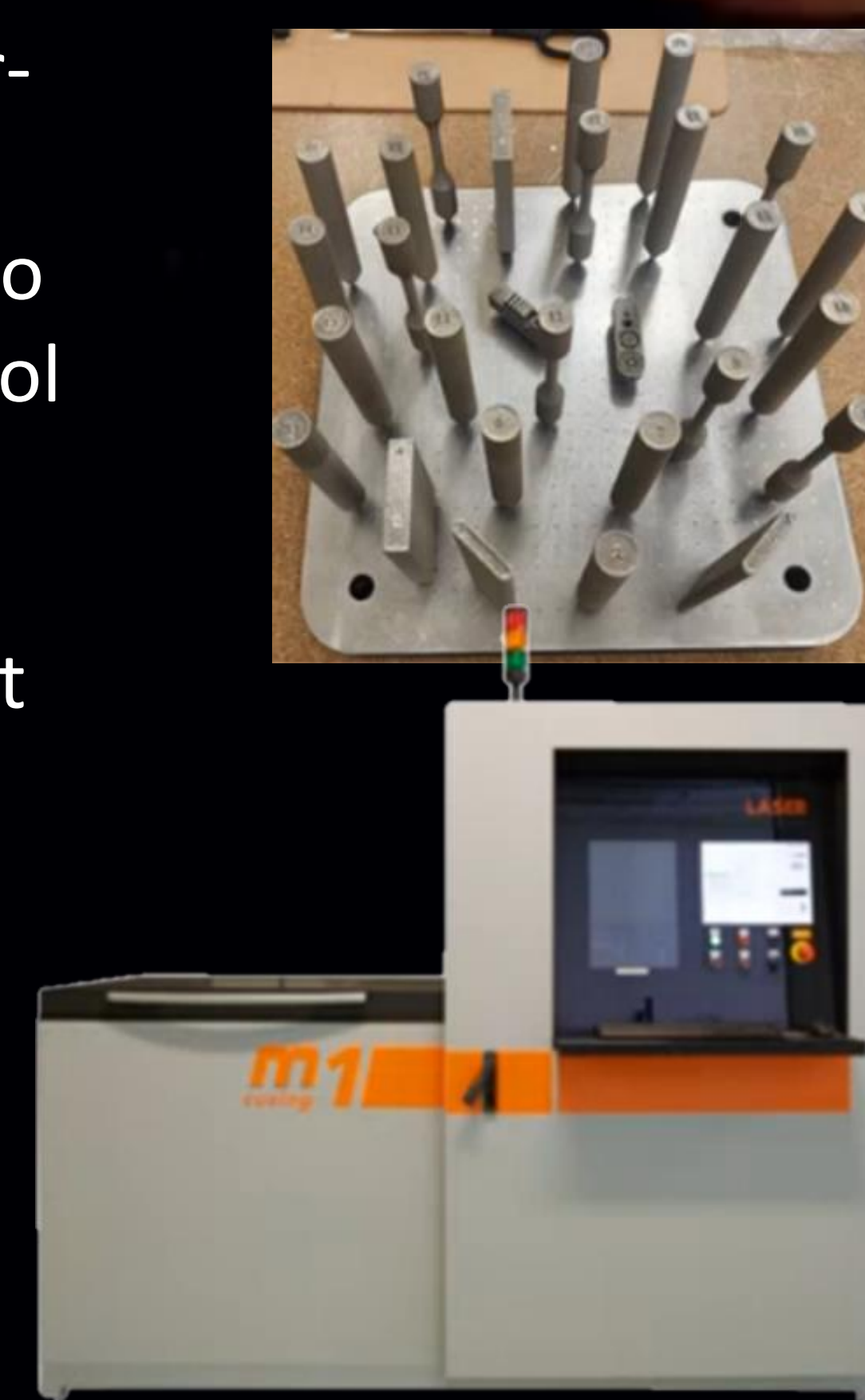
Powder Analysis

A suite of testing capability has been added to characterize and quantify the flow rates, flowability, angle of repose, cohesive index, and spreading, and other properties of any given powder. This allows for a greater understanding of not just regolith simulants (or samples) but also any metallic, ceramic, or pelletized polymer powders developed for manufacturing and/or recycling.



Regolith AM

An existing laser powder-bed fusion printer was completely overhauled to allow open-source control and provide thermal in-situ monitoring to allow for printing development of exotic materials including Lunar and Martian regolith. A test-print in Inconel 718 recently confirmed system readiness.



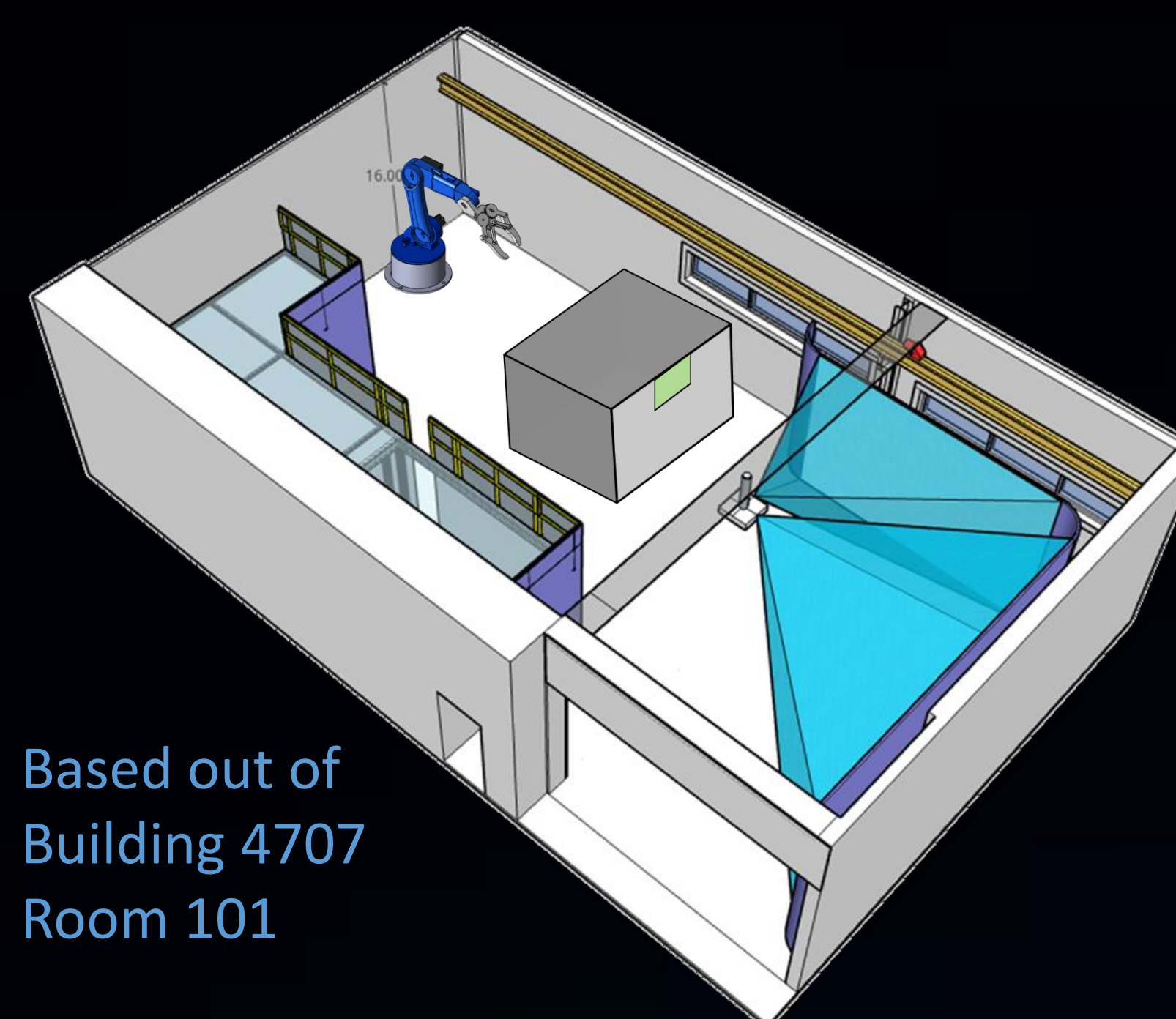
Variable Gravity Simulation

A novel method of simulating micro- to extreme gravity has been introduced. This robotic arm is being programmed to drive modular payloads through various parabolic arcs tailored to provide processing time under desired "gravity" conditions.



3D Lidar Scanning

Lidar technology is not limited by the low-angle lighting conditions of the Lunar surface or shadows generated in orbit, making it a critical technology for study and integration into navigation applications and real-time dimensional analysis of construction and manufacturing efforts. The newly commissioned unit was recently used to scan the large hydrogen tank at HTF and, after post-processing, to generate a detailed engineering model for use.



Based out of Building 4707 Room 101



Robotic Test Platforms

Raising the TRL of various ISM technologies will require integration into larger autonomous systems. Rover units outfitted with robotic arms and customizable payload handling have been designed to act as the ISMAC demonstration test bed this end. The units can be used in isolation, together, or integrated into larger manufacturing ecosystems as the level of advancement increases towards implementation.

