

Moon-to-Mars Planetary Construction Technology (MMPACT) Scoop, Tamp, Filter (STF) Sub-System

Robert P. Mueller¹, Evan Bell, Eric Smith, Beau Peacock, Nathan Gelino, David Edwards, Laurent Sibille, Jonathan Gleeson, Thomas Lipscomb, Jared Long-Fox
¹Granular Mechanics & Regolith Operations (GMRO) lab, Swamp Works, Exploration & Research Technologies, Kennedy Space Center, National Aeronautics & Research Administration (NASA), Mail Stop UB-R1, KSC, FL 32899

ABSTRACT

NASA's Space Technology Mission Directorate "champions technologies needed to live on and explore the Moon" [1]. This includes capabilities that capitalize on existing lunar resources and carry out surface manufacturing and construction activities. The goal of the Moon-to-Mars Planetary Construction Technology (MMPACT) Project is to mature these two capabilities. The primary resource on the Moon and the primary feedstock for manufacturing and construction is regolith. In the past, astronauts launched, landed, and lived in a spacecraft. NASA envisions a future where we make living spaces on the lunar surface instead. The innovative technologies required for lunar surface construction may be something never seen before, or they may be adaptations of existing technologies. This paper summarizes recent efforts to develop and test a scoop, tamp and filter (STF) sub-system to prepare and deposit lunar regolith for a laser-based vitreous material transformation system being developed under a NASA contract by ICON, inc., which is hoped to eventually be used for automated additive construction with indigenous regolith on the Moon.

GOAL

Develop, deliver, and demonstrate on-demand capabilities to protect astronauts and create infrastructure on the lunar surface via construction of landing pads, habitats, shelters, roadways, and blast shields using lunar regolith-based materials.

OBJECTIVES

- Develop and demonstrate additive construction capabilities for various structures as materials evolve from Earth-based to exclusively *In Situ* Resource Utilization (ISRU)-based.
- Develop and demonstrate approaches for integrated sensors and process monitoring in support of *in situ* verification & validation of construction system and printed structures.
- Test and evaluate materials from candidate processes for use in the lunar environment.
- Validate that Earth-based regolith simulants and testing environments are sufficient analogs for lunar operations

References:

[1] https://www.nasa.gov/directorates/spacetech/Lunar_Surface_Innovation_Initiative