

IAF SPACE EXPLORATION SYMPOSIUM (A3)  
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A MISSION ARCHITECTURE FOR LUNAR ROBOTICALLY BASED REGOLITH INCORPORATED  
CONSTRUCTION: LUNAR-BRIC.

**Abstract**

An end-to-end mission plan is proposed for construction on the lunar surface with the use of Regolith Containment Units (RCUs) which are akin to terrestrial sandbags. The proposed architecture uses in situ regolith as the bulk of the building material, and semi-autonomous and/or fully autonomous decentralized robotic systems for their assembly.

The proposed architecture lends itself to early lunar construction efforts in a number of different ways. Firstly, this technology requires low down mass and power, while providing radiation, micrometeorite, and rocket exhaust protection. Secondly, the RCUs can be deployed in a myriad of ways to meet different mission needs. They could also be reused with the introduction of more advanced technologies are deployed on the lunar surface. Thirdly, the variability in surface composition both laterally across the surface and with depth, remains an uncertainty for early lunar construction efforts. Such differences could result in shifting foundations. The RCUs offer a level of compliance to accommodate any shifts in the foundation (regolith) sub-structure. Lastly, the RCUs themselves can be engineered with additional technology such as sensors (i.e. radiation level measurement), lighting, and navigation-location emitters to provide basic infrastructure to the lunar base.

The architecture outlined in this work will cover the basic elements required for an end-to-end system:

- Assessment – where the regolith surface and sub-surface is tested for suitability of construction. This ensures that the resulting constructed element has a lower probability of shifting owing to regolith settling.
- Excavation – where the regolith is excavated and transported to a RCU filling element. This provides a steady supply of building material to a centralized element for packaging into RCUs.
- RCU Filling – Where the Regolith Containment Units are filled with excavated material and formed into construction units. This ensures that the constructed “bricks” are uniform, and any onboard sensors are initiated.

- Construction – Where the RCUs are placed to form a berm/blast wall, landing pad skirting, habitat module protection or rover “barn”. This would provide protection from radiation, micrometeorites, or rocket exhaust plumes.

Such a system would pave the way for enhanced lunar exploration and habitation endeavors through the construction of an Artemis basecamp and beyond.