NASA SBIR 2009 Phase I Solicitation

X3.02 Lunar ISRU Development and Precursor Activities

Lead Center: JSC

Participating Center(s): GRC, KSC, MSFC

The incorporation of ISRU concepts is an on-going effort which requires an evaluation of the benefits and risks through computer modeling and testing under laboratory, analog field, and simulated lunar environmental conditions (1/6 g and vacuum). While excavation and oxygen extraction from regolith are included in lunar architecture plans, it is recognized that evaluating the feasibility and benefits of other technologies and concepts not ready for insertion into these efforts should be pursued. This subtopic is aimed at providing development support capabilities and hardware to advanced potentially beneficial ISRU concepts not yet ready for incorporation into current ISRU system laboratory and field test activities. Proposals aimed at the following are of particular interest:

- Mineral beneficiation concepts to separate iron oxide-bearing material from bulk regolith; up to 20 kg/hr based on hydrogen reduction. Hardware/concepts need to be designed for compatibility with both 1/6 g flight experiments and ground vacuum experiments.
- Lunar regolith storage and granular flow computer models, devices, and instruments to evaluate regolith flow and manipulation under 1/6 g flight and ground vacuum experimental conditions.
- Granular materials mixing and separation for reactor feedstock conditioning: remove material > 0.5 cm diameter before dumping into storage bin during excavation operation for oxygen extraction from regolith.
- Processing concepts for production of carbon monoxide, carbon dioxide, and/or water from plastic trash and dried crew solid waste using solar thermal or electrical/heat energy. In-situ produced oxygen or other reagents/consumables must be identified and quantified; recycling schemes for reagents to minimize consumables should be evaluated.
- Thermal energy storage and utilization using bulk or processed regolith.

Phase 1 proposals should demonstrate technical feasibility of the technology and/or subsystem through laboratory validation of critical aspects of the innovation proposed, as well as the design and path toward delivering hardware/subsystems in Phase 2.