NASA SBIR 2009 Phase I Solicitation

X2.02 Spacecraft Habitation Systems, Water Recovery and Waste Management

Lead Center: ARC

Participating Center(s): GRC, JSC, KSC, MSFC

Habitation, water recovery and waste management systems supporting critical needs for lunar mission architectures are requested. Improved technologies are needed for clothing/laundry, recovery of water, recovery of other resources, stabilization of wastes and safe long term storage of waste residuals. Proposals should explicitly describe the weight, power, and volume advantages of the proposed technology and be compatible with the lunar and microgravity environments described in the overall X2 topic description.

Clothing/Laundry Systems

Clothing and towels are a major consumable and trash source. Advanced durable fabrics to enable multiple crew wear cycles before cleaning/disposal are required. The laundry system should remove/stabilize combined perspiration salt/organic/dander and lunar dust contaminants, preserve flame resistance properties and use cleaning agents compatible with biological water recovery technologies. Proposals using water for cleaning should use significantly less than 10 kg of water per kg of clothing cleaned.

Waste Management

Wastes (trash, food scraps, feces, water brines, clothing) must be managed to protect crew health, safety and quality of life, to avoid harm of planetary surfaces, and to recover useful resources. Areas of emphasis include: stabilization (particularly water removal and recovery) and solid waste storage and odor control (e.g., catalytic and adsorptive systems). Preferred stabilization methods will dry solids to less than 60% water activity and sterilize and/or prevent microbial growth. Waste compactors must reduce trash to less than 10% of hand compacted volume after any spring-back. Odor control technologies should reduce gaseous contaminants in air to below NASA's Space Maximum Allowable Concentration levels and below the human odor threshold. Lunar-Martian storage containers are desired that are lightweight, low in resupply stowage volume, easily deployable and capable of containing space mission wastes and residuals on Lunar or Martian surfaces without rupture for 400 years.

Water Recovery

Efficient technologies are desired for treatment to potability of wastewater including urine, brines, humidity condensate, hygiene water, and in situ lunar water. Areas of emphasis include: primary treatment reducing 1000

mg/L TOC to less than 100mg/L, post-treatment reducing 100 mg/L TOC to