NASA SBIR 2005 Phase I Solicitation

X12.06  Habitation Systems

Lead Center: JSC

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

Habitation Systems

Habitation systems for future crewed micro-gravity transits, reduced gravity planetary lunar or Martian surfaces, and long duration, deep-space environments are requested. Products can include basic research, system analysis, mockup evaluation, functionality demonstrations/tests, and actual prototype hardware. Exploration missions away from low Earth orbit greatly limit allowable consumables and require development of innovative low maintenance, re-configurable, and reusable systems. Minimal volume configurations (or dual use) during non-use mission phases are highly desirable.

Habitation systems should consider the following broad themes: re-configurable crew volumes for multi-gravity environments (micro and reduced gravity), multi-use work stations, multi-gravity translation strategies, crew radiation exposure mitigation, physically and psychologically ergonomic personal volumes, automated deployment, quiescent operations between missions, multi-purpose stowage systems for food/trash, advanced hygiene systems, and automated housekeeping/self-repairing habitat surfaces, durability, commonality of hardware/systems, and low total life-cycle costs. Specific areas in which advanced habitability system innovations are solicited include:

Wardroom Systems: Erectable or inflatable systems that support crew dinning, conference, external viewing (windows), illumination, and relaxation activities. Includes off-nominal uses (emergency medical or repair) while maintaining hygienic conditions.

Galley Systems: Systems requiring minimal crew preparation (heating, cooling, and rehydration) for food heating and accurate water dispensing. Specific areas include systems that allow individual crew meal flexibility and high-energy efficiency.

Crew Hygiene Systems: Low maintenance/self-cleaning fecal, urine, menstrual, emesis, hand/body wash, and grooming systems. Specific areas include non-foaming separators and no-rinse/non-alcohol hygiene products. Toilet systems should consider air, liquid, vacuum, and low-gravity transport methods. Collected waste should be prepared for recovery or long-term stabilization. Integrated hygiene systems should provide, acoustic and odor
isolated private crew volumes compatible with multi-gravity interfaces.

**Crew Accommodation Systems:** Reconfigurable, deployable, or inflatable integrated crew accommodations that provide visual and acoustical isolated crew volumes for sleeping, audiovisual communication/entertainment, personal stowage, quiet ventilation/thermal control, and radiation exposure reduction/safe-haven.

**Clothing Systems:** Low mass reusable or long usage clothing options that meet flammability, out gassing, and crew comfort requirements. Used clothing cleaning/drying systems with low-water usage and non-toxic detergents/enzymes compatible with biological water reclamation systems or non-water cleaning methods.

**Stowage Systems:** Interior/exterior stowage systems for partial gravity environments that maximize usable volume and include contents identification and inventory control systems. Long-term external stowage for biological or other wastes on a planetary surface that safe and consistent with planetary protection policies.