NASA SBIR 2010 Phase I Solicitation

X3.02  Human Accommodations and Interfaces with Spacecraft Life Support

Lead Center: ARC

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

Clothing

The requirements for crew clothing are balanced between appearance, comfort, wear, flammability and toxicity. Ideally, crew clothing should have durable flame resistance in a 34% O\textsubscript{2} (by volume) enriched atmospheric environment. Fabrics must enable multiple crew wear cycles before cleaning/disposal.

Laundry

The laundry system should remove/stabilize combined perspiration salt, organic, dander and planetary dust contaminants, preserve flame resistance properties of the fabrics, and use cleaning agents compatible with water recovery technologies including biological processes. Proposals using water for cleaning should use significantly less than 10 kg of water per kg of clothing cleaned.

Human Metabolic Waste Collection and Processing

Advanced methods of collection (human interfaces) and management are needed. Microgravity technology is needed to collect, provide odor control, stabilize, process for water recovery, reduce volume and dispose of feces. Areas of emphasis include: stabilization, water removal and recovery, and volume reduction. Human urine or water collection systems that require minimal/no airflow and allow >99% capture efficiency with non-contact crew interfaces are needed. Systems should include ability to separate liquid and air without rotary separators and be tolerant of urine precipitates and particulates from the crew cabin (originating from the crew, clothing, and equipment).

Quiet Ventilation Fans

Ventilation fans with inherent minimal acoustic generation in the range of human hearing are desired. Fans must not rely on passive acoustic mufflers, duct treatments, or mass for acoustic attenuation. Fans must have intrinsic aero-mechanical, rotary support, and electrical drive elements that reduce acoustic generation and provide high efficiency. Fans should be tolerant (prevent deterioration of flow performance or be periodically self cleaning) of particulates from the crew cabin (originating from the crew, clothing and equipment).