NASA SBIR 2006 Phase I Solicitation

X14.02 Lunar In Situ Autonomous Health Monitoring

Lead Center: JSC

Participating Center(s): ARC, GRC

Exploration missions to the lunar surface will be characterized by science goals and objectives which will require crewmembers to actively investigate the accessible exterior environment via Extravehicular Activity (EVA). During the EVA sorties, it will be critical for the crewmembers to be able to monitor their personal health status and to make decisions based on feedback from intrinsic biomedical monitoring systems. Furthermore, it will be necessary to simplify these systems for rapid donning and doffing, automatic checkout capability, annunciation and guidance during suit anomalies, and ensuring the health and safety of each crewmember. Therefore, the sensors that will be used for biomedical monitoring need to be low profile (perhaps incorporated into an undergarment), accurate, reliable, and with as few wires as possible. In addition, the use of electrodes with electrode gel and overtapes has not been highly successful, resulting in skin irritation, adhesion problems, stowage concerns and limited life/inventory issues. Furthermore, our experience has demonstrated that commonality between and among systems is highly beneficial. For this reason, the biomedical sensors used for monitoring EVA should be applicable for intravehicular use as well. Some of the parameters that would be desirable for EVA monitoring include:

- Metabolic Rate
- Heart Rate
- Thermal Control
- ECG (possible)
- Oxygen Consumption Rate
- $\text{CO}_2$ Level (in the oronasal area)
- $\text{CO}_2$ Generation Rate
- Core and/or Skin Temperature
- Radiation Monitoring (possible)
- Oxygen Saturation Level
In addition, development of device(s) capable of being used in an IVA system which is common with the EVA system is highly desirable. All of these, whether used for IVA or EVA, must be comfortable for the crewmember, allow the crewmember to continue performing tasks, and must not preclude normal activities when used for IVA monitoring (e.g. hygiene, eating, working at the computer, and exercising).