



## **NASA SBIR 2008 Phase I Solicitation**

### **X10.02 EVA Suit Monitoring and Treatment**

**Lead Center:** JSC

**Participating Center(s):** ARC, GRC

Proposals may respond to one or more of the following areas:

#### **Through-Suit Medication Delivery**

NASA operations concepts envision contingencies where astronauts may be required to wear Extra Vehicular Activity (EVA) suits for up to 120 hours. If a crewmember requires medication while in a suit, a method of administration must be developed that does not compromise the integrity of the suit, nor the environment it provides. Current concepts for the EVA suit include a self-sealing diaphragm through which injections could be given. However, fluid management in microgravity presents problems with filling a syringe and delivering medication in such an environment. The three main concerns are preventing bubbles from being injected, appropriate fluid management, and excessive volume requirements for pre-loaded syringes. Due to uncertainties about when such an event might occur, the system would have to function in the range of gravity levels between 0 to 1G, as well as pressure levels from vacuum to 1 atmosphere, and require very little volume and no power. Accordingly, NASA seeks proposals detailing concepts for such a system.

**Phase 1 Requirements:** Phase 1 would include appropriate trade studies, design concepts, and any limited laboratory proof-of-concept testing required to support Phase 2 development.

**Phase 2 Requirements:** Phase 2 would include fabrication, testing, and validation of breadboard hardware that could be delivered to NASA for evaluation at the conclusion of Phase 2. Phase 2 would be a commercial system that NASA or a prime contractor could integrate within the Exploration Medical Kit.

#### **Biosensors for Lunar EVA Suits**

During surface Extravehicular Activities (EVAs), it is anticipated that the flight surgeons will need the ability to monitor heart rate, heart rhythm (ECG), derived core body temperature, and calculated metabolic rate to ensure the health and safety of the crewmember. Of particular interest are technologies that would allow data to be collected, with minimal crew time or effort required to don/doff the measurement hardware, while also maintaining crew comfort (i.e., sensors NOT involving skin preparation, gels, or taping). Also of interest are technologies/systems that would allow the collection of robust, diagnostic quality signals even during periods of strenuous lunar surface operations (lifting, climbing ladders, recovering from falls, and assembling structures).

**Phase 1 Requirements:** Phase 1 should deliver prototype functioning sensors, but not necessarily in their final form. A report showing prototype function versus a benchmark system's function will be provided. Also a

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roadmap to getting to the final sensor will be provided.

Phase 2 Requirements: Phase 2 should deliver sensors in their spaceflight-friendly, miniaturized form. Data from spaceflight analog testing using protocols delivered from NASA will also be expected.