



NASA SBIR 2008 Phase I Solicitation

X11 Behavioral Health and Performance

The Behavioral Health and Performance topic is interested in developing strategies, tools, and technologies to mitigate Behavioral Health and Performance risks. The Behavioral Health and Performance topic is seeking tools and technologies to prevent performance degradation, human errors, or failures during critical operations resulting from: fatigue or work overload; deterioration of morale and motivation; interpersonal conflicts or lack of team cohesion, coordination, and communication; team and individual decision-making; performance readiness factors (fatigue, cognition, and emotional readiness); and behavioral health disorders. For 2008, the Behavioral Health and Performance topic is interested in the following technologies: Crew Cohesion Monitoring Technologies; Behavioral Assessment Tools; and an Individualized Fatigue Meter. Proposals may respond to one or more of these areas.

Subtopics

X11.01 Behavioral Assessment Tools

Lead Center: JSC

During Exploration Missions, and especially during a Mars Mission, real time communication between the crew and flight surgeons and crew and mission control will not be available as it is now on ISS and the Shuttle. Flight surgeons have stated the need for unobtrusive monitoring tools that are transparent to crews, require minimal crew time or effort, and that help detect if crews are having difficulties with coping with the spaceflight environment. The aim of this subtask is to provide tools that will automatically generate feedback for astronauts and flight surgeons, regarding team cohesion and behavioral health status of crews in-flight.

Requirements for Behavioral Assessment Tools:

- Be unobtrusive;
- Be transparent to crews;
- Require minimal crew time or effort.

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

Crew Cohesion Monitoring Technology

Detect if crews are having difficulty with team cohesion within the spaceflight environment.

Phase 1 Requirements: Phase 1 will involve an assessment of current methods through which to monitor/measure cohesion within the military and other agencies will be provided. Recommendations regarding enhancements to current technology or the development of a new technology will be presented. The spaceflight environment (current and future) and models related to team cohesion will be assessed in order to determine the optimal requirements for developing a Crew Cohesion Technology suitable for NASA human space exploration. The resulting deliverable will be requirements for a Crew Cohesion Monitoring Technology.

Phase 2 Requirements: Phase 2 requires the development of a prototype Crew Cohesion Monitoring Technology based on accurate models and Phase 1 findings. The prototype will include the hardware, manual and trouble-shooting guide, and results from evaluation and testing the functionality of the prototype device.

Behavioral Health Assessment Tool

Detect if crews are facing increased risk related to interpersonal and psychosocial issues, or other behavioral health problems, and provide feedback to the crewmember and flight surgeon.

Phase 1 Requirements: During Phase 1, the current and future spaceflight environment will be assessed in order to determine the optimal requirements for providing Behavioral Health Assessment tools suitable for NASA human space exploration. An analysis of current methods through which to assess behavioral health status will be provided. Recommendations regarding enhancements to current technology (and how these enhancements will be implemented), or the development of a new technology will be presented. These recommendations will be documented along with a plan to take to Phase 2.

Phase 2 Requirements: Phase 2 requires the development of a prototype Behavioral Health Assessment Technology based on accurate models and Phase 1 findings. The prototype will include the hardware, manual and trouble-shooting guide, and results from evaluation and testing the functionality of the prototype device.

Individualized Fatigue Meter

Design and/or enhance a fatigue meter that would provide immediate feedback to the individual regarding their specific alertness or fatigue levels. Specifically, the feedback from the Fatigue Meter shall be based at a minimum, on the following factors, but other relevant factors can be included:

- A clear, concise method for indicating alertness or fatigue state to the user;
- Length and restfulness of sleep;
- Quantity and quality of physical activity;
- Wavelength and timing of light exposure;
- Heart rate;
- Body temperature.

Phase 1 Requirements: Fatigue Meter Evaluation €“ A market analysis and a literature review of the state of the art current tools will be conducted. Recommendations regarding enhancements to current technology (and how those enhancements will be implemented), or the development of a new technology will be presented. The spaceflight environment (current and future) and mathematical models related to sleep and performance will be assessed in order to determine the optimal requirements for developing a Fatigue Meter suitable for human space exploration. These recommendations will be documented along with a plan to take to Phase 2.

Phase 2 Requirements: Fatigue Meter Prototype developed based on accurate models and Phase 1 findings. Develop prototype hardware. Develop manual and trouble-shooting guide. Evaluate and test the functionality of the prototype device.

