



NASA SBIR 2009 Phase I Solicitation

X12 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 2009, the Behavioral Health and Performance topic is interested in the following technologies: Crew autonomy assessment tools and unobtrusive behavioral health monitoring tools. Proposals may respond to one or more of these areas.

<http://humanresearch.jsc.nasa.gov/elements/smo/nra.asp>

<http://www.nsbri.org/Research/Psycho.html>

Subtopics

X12.01 Crew Autonomy Assessment for Exploration

Lead Center: JSC

The NASA Behavioral Health and Performance Program Element (BHP) identifies and characterizes the behavioral health and performance risks associated with training, living and working in Space, and return to Earth. BHP develops strategies, tools, and technologies to mitigate these risks. Currently, BHP has the need for behavioral health and assessment tools relevant to autonomy during Exploration Missions.

The aim of the current task is to identify the optimal level of autonomy by providing a tool that will objectively and unobtrusively measure both crew autonomy and its relevant outcomes (performance, empowerment, satisfaction, cohesion, etc.). The technologies will be able to provide data for BHP to interpret how changes in crew autonomy

during a mission influence the relevant team outcomes that are measured.

Objectives:

- Determine optimal level of autonomy needed for different spaceflight missions or mission phases;
- Design and/or enhance unobtrusive tools that measure crew autonomy and its relevant team outcomes;
- Establish how autonomy levels change within and across missions;
- Interpret how these changes in autonomy influence important team outcomes.

Requirements: The Crew Autonomy Assessment shall:

- Be unobtrusive
- Require minimal crew time or effort
- Detect changes in team (ground and flight crew) autonomy and team outcomes (those that are chosen)

Phase 1 Requirements: Develop Requirements for Crew Autonomy Assessment

- An assessment of current methods through which to monitor/measure autonomy and relevant team outcomes within the DOD and other agencies will be provided;
- An assessment of current technologies that unobtrusively monitor crew autonomy and relevant team outcomes (if any) will also be conducted;
- Recommendations regarding enhancements to current technologies or the development of new technologies will be presented;
- The spaceflight environment (current and future) and models related to autonomy and its relevant team outcomes will be assessed in order to determine the optimal requirements for developing a Crew Autonomy Assessment suitable for NASA human space exploration.

Phase 2 Requirements: Crew Autonomy Assessment Prototype developed based on accurate models and Phase 1 findings.

- Develop prototype hardware;
- Develop manual and troubleshooting guide;

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- Evaluate and test the functionality of the prototype device.

X12.02 Behavioral Health Monitoring Tools

Lead Center: JSC

The NASA Behavioral Health and Performance Program Element (BHP) identifies and characterizes the behavioral health and performance risks associated with training, living and working in Space, and return to Earth. BHP develops strategies, tools, and technologies to mitigate these risks. Currently, BHP has the need for behavioral health monitoring tools specific to the long duration Exploration Mission environment.

The aim of the current task is to provide requirements for a tool that will unobtrusively monitor behavioral health of the individual crew member while on a mission. The objective of this technology would be to monitor changes in behavioral health and automatically generate meaningful feedback for astronauts and flight surgeons, regarding their individual behavioral health status.

The technologies will unobtrusively monitor markers of behavioral health such as body language and voice acoustics (not including facial recognition software).

The technologies will provide meaningful feedback to the astronaut and flight surgeon regarding behavioral health status; if decrements in behavioral health are detected, the technologies should provide feedback regarding potential causes of decrements.

Requirements: The Behavioral Health Assessment Tool shall:

- Be unobtrusive and function autonomously;
- Require minimal crew time or effort to train and utilize;
- Monitor objective indications of behavioral health;
- Provide meaningful feedback to astronauts and flight surgeons regarding individual behavioral health status;
- If decrements are detected, the technologies shall provide meaningful feedback to astronauts and flight surgeons regarding potential causes of decrements and recommendations for potential countermeasures.

Phase 1 Requirements: Develop Requirements for Behavioral Health Monitoring Technology

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- An assessment of current methods through which to monitor behavioral health during autonomous missions within DOD and other agencies will be provided;
 - An assessment of current technologies that unobtrusively monitor behavioral health (not including facial recognition software) will also be conducted;
 - 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 behavioral health will be considered in order to develop requirements for a Behavioral Health Monitoring Technology suitable for NASA human space exploration missions.

Phase 2 Requirements: Behavioral Health Monitoring Technology Prototype developed based on accurate models and Phase 1 findings.

- Develop prototype hardware/software;
- Develop manual and troubleshooting guide;
- Evaluate and test the functionality of the prototype device.