Active Projects

NASA Seeking: Non-invasive Neuromodulation Technologies for Astronaut Performance and Behavioral Health

Sectors: Healthcare

Overview:

NASA's Johnson Space Center's Behavioral Health and Performance Operations group is seeking non-invasive neuromodulation technologies and expertise to enhance astronaut training, selection, provide behavioral health support during long-duration space missions, and recovery/reintegration post-missions.

Background:

Long-duration space missions present unique behavioral health challenges due to isolation, confinement, and distance from Earth. Traditional interventions such as pharmaceuticals are consumable, require a consistent supply, and may degrade in potency over time, which pose difficulties for long duration missions. Non-invasive neuromodulation offers promising alternatives for treating mood disturbances, enhancing training performance, and providing autonomous behavioral health interventions.

In addition to in-flight applications, NASA is also seeking terrestrial use cases, such as training enhancements and post-flight recovery technologies.

Background:

Long-duration space missions present unique behavioral health challenges due to isolation, confinement, and distance from Earth. Traditional interventions such as pharmaceuticals are consumable, require a consistent supply, and may degrade in potency over time, which pose difficulties for long duration missions. Non-invasive neuromodulation offers promising alternatives for treating mood disturbances, enhancing training performance, and providing autonomous behavioral health interventions.

In addition to in-flight applications, NASA is also seeking terrestrial use cases, such as training enhancements and post-flight recovery technologies.

Constraints:

- Effectiveness for one or more of the following non-invasive applications:
  - Mood support
  - Training enhancement
  - Accelerated learning
  - Improved cognitive performance
  - Stress management
  - Post-flight recovery
  - Observation of non-invasive neurological stimulation
- Scientific evidence and validation through clinical research, studies, and/or regulatory approval
- Requirements for space flight-specific applications:
  - Compact, lightweight design suitable for spaceflight
  - Autonomous operation capability (limited real-time ground support)
  - Safe operation in spacecraft environments

Possible Non-Invasive Solution Areas:

- Brain stimulation technologies (tDCS, TMS, ultrasound, etc.)
- Wearable and/or autonomous neuromodulation devices
- Neuroimaging and real-time monitoring technologies (fNIRS, EEG)
- Multimodal neuromodulation (light, sound, vibration, olfactory)
- Peripheral and autonomic nerve stimulation of performance pathways
- Responsive neurostimulation and machine learning-enabled adaptive systems
- Cognitive training and rehabilitation technologies (e.g., targeting recovery pathways similar to stroke recovery)