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NEUROFEEDBACK PROTOCOLS FOR THE SUPPORT OF EXPLORATION-CLASS CREW  
PERFORMANCE

**Abstract**

The characteristics unique to exploration-class missions will require sustained, autonomous performance by crew over extended timelines. To address this need, ongoing work focuses on a crew-centered orientation that aims to reduce reliance on exogenous countermeasures and shift focus toward internally derived resources for performance outcomes. In alignment with NASA's Human Research Roadmap "red" risks, these protocols are designed to support crew quantitative and qualitative performance and increase metrics of resilience. To achieve these outcomes, multimodal training relies on EEG-based neurofeedback and brain-computer interface to bridge the qualitative-quantitative gap for performance metrics. Resilience in this approach is viewed as intrinsic, and as the core substrate for the support of health and performance in the exploration-class setting. Among protocols, alpha-wave training has been shown to support performance in high-performing individuals, and may hold a key role in the use of neurofeedback in sustained performance. The integrated approach to training developed here emphasizes the ongoing role of such protocols throughout the course of an exploration timeline. This line of inquiry may also be supported by increased demand for commercial human spaceflight, directly addressing the data shortage that has traditionally precluded the collection of large data sets. This work is part of a larger series that addresses the foundational components of the support of crew health and performance.