

RESULTS OF THE FIELD TEST AND DEFINING SENSORIMOTOR FITNESS FOR DUTY STANDARDS

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The primary goals of the Field Test were (1) to determine functional abilities associated with long-duration space flight crews beginning as soon after landing as possible (< 2 hours), and (2) to characterize the time course of recovery with additional follow-up measurement sessions within 24 hours after landing. The NASA and Russian teams have collected data on a total of 39 different United States Orbital Segment (USOS) and Russian crewmembers, with 9 Russian crewmembers being tested twice (total of 48 tests). Eighteen subjects (7 Russian, 11 USOS) completed a reduced Field Test (pilot) protocol and 30 subjects (19 Russian and 11 USOS) participated in the full Field Test. This presentation will focus on a subset of the measures that will be used in the upcoming ground study to determine sensorimotor fitness for duty standards, namely: tandem walk, obstacle walk, eye-hand coordination task, finger-to-nose task, and Computerized Dynamic Posturography (CDP). Exploration-class missions including Artemis, Gateway, and beyond will require a new level of autonomy around periods of gravitational transition, where sensorimotor disturbances increase. The operational support that is available upon return to Earth including rescue teams, medical interventions, and the ability to rest as needed will not be available after landing on the lunar or Martian surface. Because of this, there is a need to define fitness for duty standards that will help inform crew capabilities during and soon after gravitational transitions.

Due to the new requirements of the exploration environment, we must utilize a set of *exploration field measures*, for which no previous spaceflight data exists to define fitness for duty standards. A Sensorimotor Adaptation Analog (SAA) that can provide different levels of acute disorientation through combined vestibular, visual, and proprioceptive disruptions will be used to increase the range of performance in *exploration field measures*, simulating the moderate-to-severe performance decrements observed in spaceflight. The levels of SAA will be titrated and validated by comparison to *gold standard measures* that have a wealth of spaceflight data at different time points during recovery. These data will be pulled directly from the results of Field Test and help ensure the range of performance while being exposed to SAA mimics the range of performance from pre-flight to immediately postflight in Field Test subjects. Specifically, we will be using the tandem walk, obstacle walk, eye-hand coordination task, finger-to-nose task, and CDP as the *gold standard measures*. Referencing this Field Test data in the form of *gold standard measures* will also help us characterize and contextualize how each magnitude of SAA disorientation compares to recovery from long-term microgravity exposure.