

The Functional Task Test (FTT): An interdisciplinary testing protocol to investigate the factors underlying changes in astronaut functional performance

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Exposure to space flight causes adaptations in multiple physiological systems including changes in sensorimotor, cardiovascular, and neuromuscular systems. These changes may affect a crewmember's ability to perform critical mission tasks immediately after landing on a planetary surface. The overall goal of this project is to determine the effects of space flight on functional tests that are representative of high priority exploration mission tasks and to identify the key underlying physiological factors that contribute to decrements in performance. To achieve this goal we developed an interdisciplinary testing protocol (Functional Task Test, FTT) that evaluates both astronaut functional performance and related physiological changes. Functional tests include ladder climbing, hatch opening, jump down, manual manipulation of objects and tool use, seat egress and obstacle avoidance, recovery from a fall and object translation tasks. Physiological measures include assessments of postural and gait control, dynamic visual acuity, fine motor control, plasma volume, orthostatic intolerance, upper- and lower-body muscle strength, power, endurance, control, and neuromuscular drive. Crewmembers perform this integrated test protocol before and after short (Shuttle) and long-duration (ISS) space flight. Data are collected on two sessions before flight, on landing day (Shuttle only) and 1, 6 and 30 days after landing.

Preliminary results from both Shuttle and ISS crewmembers indicate decrement in performance of the functional tasks after both short and long-duration space flight. Ongoing data collection continues to improve the statistical power required to map changes in functional task performance to alterations in physiological systems. The information obtained from this study will be used to design and implement countermeasures that specifically target the physiological systems most responsible for the altered functional performance associated with space flight.