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| <b>Fiscal Year:</b>                               | FY 2015   | <b>Task Last Updated:</b>             | FY 10/28/2014     |
| <b>PI Name:</b>                                   | Reschke, Millard F Ph.D.  |                                       |                   |
| <b>Project Title:</b>                             | Recovery of Functional Performance Following Long Duration Space Flight (Field Test)  |                                       |                   |
| <b>Division Name:</b>                             | Human Research  |                                       |                   |
| <b>Program/Discipline:</b>                        | HUMAN RESEARCH  |                                       |                   |
| <b>Program/Discipline--Element/Subdiscipline:</b> | HUMAN RESEARCH--Biomedical countermeasures  |                                       |                   |
| <b>Joint Agency Name:</b>                         |   | <b>TechPort:</b>                      | No                |
| <b>Human Research Program Elements:</b>           | (1) <b>HHC:</b> Human Health Countermeasures  |                                       |                   |
| <b>Human Research Program Risks:</b>              | (1) <b>Cardiovascular:</b> Risk of Cardiovascular Adaptations Contributing to Adverse Mission Performance and Health Outcomes<br>(2) <b>Sensorimotor:</b> Risk of Altered Sensorimotor/Vestibular Function Impacting Critical Mission Tasks |                                       |                   |
| <b>Space Biology Element:</b>                     | None  |                                       |                   |
| <b>Space Biology Cross-Element Discipline:</b>    | None  |                                       |                   |
| <b>Space Biology Special Category:</b>            | None  |                                       |                   |
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| <b>PI Organization Type:</b>                      | NASA CENTER   | <b>Phone:</b>                         | 281-483-7210      |
| <b>Organization Name:</b>                         | NASA Johnson Space Center   |                                       |                   |
| <b>PI Address 1:</b>                              | 2101 NASA Pkwy # ONE, SK272   |                                       |                   |
| <b>PI Address 2:</b>                              | Neuroscience Laboratories   |                                       |                   |
| <b>PI Web Page:</b>                               |   |                                       |                   |
| <b>City:</b>                                      | Houston   | <b>State:</b>                         | TX                |
| <b>Zip Code:</b>                                  | 77058-3607  | <b>Congressional District:</b>        | 36                |
| <b>Comments:</b>                                  |   |                                       |                   |
| <b>Project Type:</b>                              | FLIGHT,GROUND   | <b>Solicitation / Funding Source:</b> | Directed Research |
| <b>Start Date:</b>                                | 10/22/2013  | <b>End Date:</b>                      | 10/31/2021        |
| <b>No. of Post Docs:</b>                          | 0   | <b>No. of PhD Degrees:</b>            | 0                 |
| <b>No. of PhD Candidates:</b>                     | 0   | <b>No. of Master' Degrees:</b>        | 0                 |
| <b>No. of Master's Candidates:</b>                | 0   | <b>No. of Bachelor's Degrees:</b>     | 0                 |
| <b>No. of Bachelor's Candidates:</b>              | 0   | <b>Monitoring Center:</b>             | NASA JSC          |
| <b>Contact Monitor:</b>                           | Norsk, Peter  | <b>Contact Phone:</b>                 |                   |
| <b>Contact Email:</b>                             | <a href="mailto:Peter.norsk@nasa.gov">Peter.norsk@nasa.gov</a>  |                                       |                   |
| <b>Flight Program:</b>                            | ISS   |                                       |                   |
| <b>Flight Assignment:</b>                         | ISS Postflight studies  |                                       |                   |
| <b>Key Personnel Changes/Previous PI:</b>         | None  |                                       |                   |
| <b>COI Name (Institution):</b>                    | Kozlovskya, Inessa M.D. ( Institute of Biomedical Problems Russian Academy of Sciences )  |                                       |                   |
| <b>Grant/Contract No.:</b>                        | Directed Research   |                                       |                   |
| <b>Performance Goal No.:</b>                      |   |                                       |                   |
| <b>Performance Goal Text:</b>                     |   |                                       |                   |

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| Task Description:                    | <p>The Field Test (FT) proposal represents a joint effort between the Neuroscience and Cardiovascular Laboratories at the Johnson Space Center and the Institute of Biomedical Problems Sensorimotor Laboratory and Cardiovascular Laboratory, Moscow, Russia. The primary goal of this proposal is to determine functional performance in long duration space flight crews beginning as soon after landing as possible (&lt; 2 hr) with one to three immediate follow-up measurements on the day of landing. This goal has both sensorimotor and cardiovascular elements with an evaluation of NASA's new compression garment with the Russian traditional Kentavr garment. In addition to the immediate post-landing collection of data, post-flight data will be acquired beginning approximately 24 hr following landing and continue until full functional sensorimotor and cardiovascular responses have returned to preflight normative values. It is recognized that the level of functional deficit will be most profound during the acquisition of gravity loads and immediately after landing when the demands for crew intervention for emergency operations will be greatest. Clearly measureable performance parameters such as ability to perform a seat egress, recover from a fall, or the ability to see clearly when walking, and related physiological data (orthostatic responses) are required to provide an evidence base for characterizing programmatic risks and variability among crewmembers. Overall, these early functional and related physiological measurements will allow for the establishment of a sensorimotor and cardiovascular recovery time constant that has not been previously captured in over 50 years of space flight.</p> <p>Specific Aims:</p> <ol style="list-style-type: none"> <li>1. Quantify functional performance from measurements on long duration crewmembers taken as close in time to landing as possible.</li> <li>2. Develop a recovery timeline of functional performance on long duration crewmembers.</li> <li>3. Determine the efficacy of U.S. and Russian compression garments as countermeasures for alleviating orthostatic intolerance.</li> </ol>   |
| Rationale for HRP Directed Research: | <p>This research is directed because it contains highly constrained research, which requires focused and constrained data gathering and analysis that is more appropriately obtained through a non-competitive proposal.</p>   |
| Research Impact/Earth Benefits:      | <p>This task requires that functional measures of performance be made initially at the landing site of the Soyuz spacecraft. This requirement has resulted in the development of tasks and recording instrumentation that are compatible with relatively harsh environments. Our team has been successful in developing a set of instrumentation that makes measurement of the required tasks possible, ensuring that performance measurements can be accomplished accurately and in a timely fashion.</p> <p>To ensure that data could be collected on both astronauts and cosmonauts immediately after landing the research has been divided into two investigative efforts: (1) a Pilot Field Test and (2) the full Field Test. The full Field Test will begin with the first U.S. International Space Station (ISS) one year mission (42S).</p>  |
| Task Progress:                       | <p>Pilot Studies: A total of 10 crewmembers (6 United States On-orbit Segment [USOS] and 4 cosmonauts) from four Expeditions have completed the Pilot Field Test (PFT) study, which consists of performing three simple tasks as soon after landing as possible: Sit-to-Stand, Recovery from Fall, and Tandem Heel to Toe Walk. Tests were conducted in either the medical tent at the Soyuz landing site, or at the Karaganda/Kustanai airport in Kazakhstan. After demonstrating successful data collections at the landing site, two additional PFT sessions were added to the R+0 postflight schedule: one at the refueling airport in Scotland and the other at the Johnson Space Center (JSC) Astronaut Crew Quarters. Three of the six USOS astronauts have been tested at all three locations on landing day. Additionally, data were collected on all three returning crewmembers for two separate Expeditions, demonstrating that multiple subjects can be tested on the same mission.</p> <p>Four USOS crewmembers and three cosmonauts have consented to participate in the PFT for future Expeditions.</p> <p>Field Test: The JSC Institutional Review Board (IRB) approved the Field Test protocol on December 5, 2013. Shortly after JSC IRB approval, the Field Test obtained international approvals from the Human Research Multilateral Review Board, JAXA (Japanese Exploration Space Agency), and ESA (European Space Agency). A Test Readiness Review was conducted and approved without actions on July 31, 2014.</p> <p>The first Field Test data collection/familiarization session was completed in August. Because this crewmember is participating in both the FT and Functional Task Test (FTT) experiments, which have many overlapping tasks, great effort was put into developing an integrated FTT/FT protocol to save crew time. This integrated protocol was tested end-to-end with multiple dry runs conducted to improve efficiency and optimize test flow. The integrated FTT/FT protocol will be implemented for each test session that the FTT and FT experiments have in common: L-180, L-90, L-60, R+1, R+6, and R+30.</p> <p>The Field Test (FT), being a joint US/Russian study, has been faced with many challenges. While developing hardware, software, and protocols, FT operators were also required to travel to support the PFT, to support multiple trips to Russia to attend Multilateral Human Research Panel for Exploration meetings, and to meet with our Russian investigators to finalize the hardware, protocol, and testing schedule for the FT. Once the hardware was finalized, multiple sets of hardware were purchased to support testing at the three locations on landing day and to support the testing in Russia.</p> <p>Because the crewmembers will be wearing either the gradient compression garment (GCG) or the Kentavr on landing day, a case study was initiated to investigate whether or not the GCG and Kentavr affect crewmember performance on tasks requiring locomotion and balance control.</p> |
| Bibliography Type:                   | Description: (Last Updated: 06/28/2023)  |

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