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| <b>Fiscal Year:</b>                               | FY 2017   | <b>Task Last Updated:</b>             | FY 07/26/2016     |
| <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   |                                       |                   |
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| <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>                          | 1   | <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>                | 2   | <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>                            | PostFlight  |                                       |                   |
| <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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| <b>Task Description:</b>                      | <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>  |
| <b>Rationale for HRP Directed Research:</b>   | <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>   |
| <b>Research Impact/Earth Benefits:</b>        | <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 one year mission (42S).</p>  |
| <b>Task Progress:</b>                         | <p>6/6/16 Task Progress for Field Test:</p> <p>Pilot Studies: A total of 18 crewmembers (11 United States Orbital Segment [USOS] and 7 cosmonauts) from eight Expeditions completed the dataset for the Pilot Field Test (PFT) study, which consisted 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 (KZ). 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. Eight of the 11 USOS astronauts were tested at all three locations on landing day. Additionally, data were collected in the medical tent on all three returning crewmembers for two separate Expeditions, demonstrating that multiple crewmembers can be tested on the same mission at the Soyuz landing site.</p> <p>Field Test: The Field Test (FT), being a joint US/Russian study, has been faced with many challenges. Newly implemented NASA Information Technology (IT) security regulations caused significant delays in the shipment of the FT hardware to the Gagarin Cosmonaut Training Center (GCTC) in Star City, Russia. To prevent loss of data, preflight data were collected on two cosmonauts during their trips to JSC. After considerable effort to comply with IT regulations, the decision was made to obtain temporary IT waivers that would permit the use of NASA computers to collect the postflight data for one cosmonaut only, then bring the NASA computers back and have the Russians purchase the needed computers. All postflight testing was successfully completed on the first cosmonaut, after which, JSC FT personnel helped the Russian FT team purchase compatible computers and set them up at the GCTC in time to support the preflight data collections for the next cosmonaut.</p> <p>Because the crewmembers are wearing either the gradient compression garment (GCG) or the Kentavr on landing day, there was a concern that these garments might affect crewmember performance on tasks requiring locomotion and balance control. Therefore, a case study was conducted and concluded that neither garment impacts crewmember performance.</p> <p>To date, a total of three crewmembers (one United States Orbital Segment [USOS] and two cosmonauts) have completed the FT. In addition, two One-Year mission crewmembers (one USOS and one cosmonaut) have also completed the FT. The FT team demonstrated that it was possible to conduct the entire test (9 tasks) in the tent/airport in KZ and at the refueling station where time is greatly constrained, including: 1) Gaze Nystagmus, 2) Sit-to-Stand, 3) Recovery from Fall, 4) Dysmetria, 5) Eye/Hand Coordination, 6) Force Discrimination, 7) Seat Egress Obstacle, 8) Tandem Heel to Toe Walk, 9) Push Test, and 10) Dynamic Visual Acuity.</p> |
| <b>Bibliography Type:</b>                     | Description: (Last Updated: 06/03/2025)  |
| <b>Abstracts for Journals and Proceedings</b> | <p>Reschke MF, Kozlovskaya IB. "Sensorimotor results from a Joint NASA and Russian Pilot Field Test." Presented at the 29th Barany Society Meeting 2016, Seoul, Korea, June 5-8, 2016.</p> <p>29th Barany Society Meeting 2016, Seoul, Korea, June 5-8, 2016. , Jun-2016</p>   |