

Fiscal Year:	FY 2019	Task Last Updated:	FY 08/16/2018
PI Name:	Reschke, Millard F Ph.D.		
Project Title:	Recovery of Functional Performance Following Long Duration Space Flight (Field Test)		
Division Name:	Human Research		
Program/Discipline:	HUMAN RESEARCH		
Program/Discipline-- Element/Subdiscipline:	HUMAN RESEARCH--Biomedical countermeasures		
Joint Agency Name:	TechPort:	No	
Human Research Program Elements:	(1) HHC: Human Health Countermeasures		
Human Research Program Risks:	(1) Cardiovascular: Risk of Cardiovascular Adaptations Contributing to Adverse Mission Performance and Health Outcomes (2) Sensorimotor: Risk of Altered Sensorimotor/Vestibular Function Impacting Critical Mission Tasks		
Space Biology Element:	None		
Space Biology Cross-Element Discipline:	None		
Space Biology Special Category:	None		
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City:	Houston	State:	TX
Zip Code:	77058-3607	Congressional District:	36
Comments:			
Project Type:	FLIGHT,GROUND	Solicitation / Funding Source:	Directed Research
Start Date:	10/22/2013	End Date:	10/31/2021
No. of Post Docs:	0	No. of PhD Degrees:	0
No. of PhD Candidates:	0	No. of Master' Degrees:	0
No. of Master's Candidates:	0	No. of Bachelor's Degrees:	0
No. of Bachelor's Candidates:	2	Monitoring Center:	NASA JSC
Contact Monitor:	Norsk, Peter	Contact Phone:	
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Flight Program:	PostFlight		
Flight Assignment:	ISS Postflight studies		
Key Personnel Changes/Previous PI:	None		
COI Name (Institution):	Kozlovskya, Inessa M.D. (Institute of Biomedical Problems Russian Academy of Sciences)		
Grant/Contract No.:	Directed Research		
Performance Goal No.:			
Performance Goal Text:			

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 (< 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"> 1. Quantify functional performance from measurements on long duration crewmembers taken as close in time to landing as possible. 2. Develop a recovery timeline of functional performance on long duration crewmembers. 3. Determine the efficacy of U.S. and Russian compression garments as countermeasures for alleviating orthostatic intolerance.
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 one year mission (42S).</p>
Task Progress:	<p>08/15/2018 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 either in 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 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:</p> <p>The Field Test (FT), being a joint US/Russian study, has faced many logistical challenges. Therefore, a second US FT operator was dispatched to KZ and introduced to all of the stakeholders involved in crew return activities in KZ (in the medical tent) and Norway/Scotland (at the refueling airport), and was trained as a back-up operator to conduct these high profile tasks. Also, the US FT team continued to conduct demonstrations and training sessions for the assigned flight surgeons before each landing so they could assist in the field and other remote locations as needed. Single operator data collection for two USOS crewmembers was completed successfully for the first time in the field and at Prestwick, Scotland, UK.</p> <p>To date, a total of 17 six-month crewmembers (7 USOS and 10 cosmonauts) have completed the FT. In addition, two One-Year mission crewmembers (one USOS and one cosmonaut) and one 9.5-month crewmember (USOS) have also completed the FT. The FT team continued to consistently demonstrate that it is 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 (DVA is not collected in KZ).</p>
Bibliography Type:	Description: (Last Updated: 06/28/2023)
Abstracts for Journals and Proceedings	<p>Fisher EA, Reschke MF, Kofman IS, Rosenberg MJ, Gadd NE, Kreutzberg GA, Ribeiro LC, Lee SMC, Bloomberg JJ, Kozlovskaya I, Tomilovskaya E. "Dysmetria: The effect of space flight on hand movements following long duration flights." Presented at the 2018 NASA Human Research Program Investigators' Workshop, Galveston, TX, January 22-25, 2018.</p> <p>2018 NASA Human Research Program Investigators' Workshop, Galveston, TX, January 22-25, 2018. , Jan-2018</p>

Abstracts for Journals and Proceedings	Reschke MF, Kozlovskaya IB, Kofman IS, Tomilovskaya ES, Rosenberg JF, Bloomberg JJ, Stenger MB, Lee SMC, Laurie SS, Rukavishnikov IV, Fomina EV, Wood SJ, Mulavara AP, Feiveson AH, Fisher EA, Kitov VV, Lysova NYu, Clement G. "Applying results of the field test to risks associated with unassisted emergency egress." Presented at the 2018 NASA Human Research Program Investigators' Workshop, Galveston, TX, January 22-25, 2018. 2018 NASA Human Research Program Investigators' Workshop, Galveston, TX, January 22-25, 2018. , Jan-2018
Abstracts for Journals and Proceedings	Rosenberg MJF, Reschke MF, Kofman IS, Fisher EA, Gadd NE, Lee SMC, Laurie SS, Stenger MB, Bloomberg JJ, Mulavara A, Kozlovskaya I, Tomilovskaya. "Field test: Results of quiet stance following long duration spaceflight." Presented at the 2018 NASA Human Research Program Investigators' Workshop, Galveston, TX, January 22-25, 2018. 2018 NASA Human Research Program Investigators' Workshop, Galveston, TX, January 22-25, 2018. , Jan-2018