Fiscal Year:	FY 2016	**Task Last Updated:**	FY 10/19/2016
PI Name:	Duda, Kevin R Ph.D.		
Project Title:	Real-Time Estimation of the Effects of a Simulated Long-Duration Exploration Mission on Flight Performance, Workload, and Situation Awareness		
Division Name:	Human Research		
Program/Discipline:			
Program/Discipline--Element/Subdiscipline:	HUMAN RESEARCH--Behavior and performance		
Joint Agency Name:		**TechPort:**	No
Human Research Program Elements:	(1) **HFBP**:Human Factors & Behavioral Performance (IRP Rev H)		
Human Research Program Risks:	(1) **BMed**:Risk of Adverse Cognitive or Behavioral Conditions and Psychiatric Disorders (2) **Sleep**:Risk of Performance Decrements and Adverse Health Outcomes Resulting from Sleep Loss, Circadian Desynchronization, and Work Overload		
Space Biology Element:	None		
Space Biology Cross-Element Discipline:	None		
Space Biology Special Category:	None		
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City:	Cambridge	**State:**	MA
Zip Code:	02139-3539	**Congressional District:**	7
Comments:			
Project Type:	GROUND	**Solicitation / Funding Source:**	2015-16 HERO NNJ15ZSA001N-ILSRA. Appendix F: International Life Sciences Research Announcement
Start Date:	07/19/2016	**End Date:**	10/18/2018
No. of Post Docs:		**No. of PhD Degrees:**	
No. of PhD Candidates:		**No. of Master' Degrees:**	
No. of Master's Candidates:		**No. of Bachelor's Degrees:**	
No. of Bachelor's Candidates:		**Monitoring Center:**	NASA JSC
Contact Monitor:		**Contact Phone:**	
Contact Email:			
Flight Program:			
Flight Assignment:	NOTE: Change in period of performance to 7/19/2016-10/18/2018 (previously 7/22/16-10/21/18), per K. Ohnesorge and D. Risin/JSC (Ed., 3/29/17) NOTE: Element change to Human Factors & Behavioral Performance; previously Behavioral Health & Performance (Ed., 1/18/17)		
Key Personnel Changes/Previous PI:			
COI Name (Institution):	Handley, Patrick M.S. (Charles Stark Draper Laboratory) Stankovic, Aleksandra Ph.D. (Charles Stark Draper Laboratory)		
Grant/Contract No.:	NNX16AO29G		
Performance Goal No.:			
Performance Goal Text:			

Task Description:	Human spaceflight often requires long-term isolation of crewmembers in extreme environments. These environments introduce stressors to both crewmember physiology and psychology. Specific human-factors stressors include long-duration isolation, sleep loss, circadian desynchronization, and high workload. These stressors present a real risk of performance decrement during a spaceflight mission. Research done on spaceflight analogs such as Human Exploration Research Analog (HERA) provide a unique opportunity to study these effects and develop essential metrics to identify and prevent performance decrements in an operationally-relevant setting. In the field of human spaceflight, real-time performance metrics, and quantification of performance during operationally-relevant tasks and scenarios has the potential for making existing operations safer and more efficient, as well as for improving the design of future vehicles. The identification of critical performance decrements, either in measures of task performance, workload, or situational awareness, may be used to alter the human-automation task allocation or suggest changes to crew resource management. These metrics have been previously developed for the following operationally relevant tasks: • Piloted lunar landing using a generic lunar lander design. • Manual control of SAFER during an inspection of a solar panel by an EVA (extravehicular activity) crewmember. • Multi-purpose crew vehicle (MPCV)/Orion docking operations with the International Space Station (ISS). Future missions may be operating with delayed communication, or in extreme cases, without communication to Earth for ground-based support. In addition, all of the environmental parameters likely will not be known in advance (e.g., asteroid spin rate). A simulation capability that can be used to assess operational performance can be used to inform temporal function allocation (e.g., performance benefit/cost of human performing all the tasks vs. auto to start and then allow human to takeover at the end). This can help to inform mission design and crew resource management as a function of mission duration, sleep state, circadian synchronization, and workload. Real-time performance metrics are a valuable tool for quickly identifying performance decrements, and for determining the performance impact of delayed or sparse communication. We propose to integrate an existing configurable and portable simulation platform for use during HERA missions. This platform can simulate multiple operationally-relevant scenarios—a generic lunar landing task, EVA SAFER inspection of a solar array, and MPCV/Orion docking with the ISS. This simulation platform is will be used to characterize real-time performance metrics including flight performance, workload, and situation awareness as a function of time in HERA.
Rationale for HRP Directed Research:	
Research Impact/Earth Benefits:	
Task Progress:	New project for FY2016.
Bibliography Type:	Description: (Last Updated: 09/04/2023)