Fiscal Year:	FY 2019	**Task Last Updated:**	FY 06/25/2019
PI Name:	Schreckenghost, Debra M.E.E.		
Project Title:	HCAAM VNSCOR: Enhancing Situation Awareness of Automated Procedures Using Adaptive Multimodal Augmented Reality Displays		
Division Name:	Human Research		
Program/Discipline:			
Program/Discipline--Element/Subdiscipline:			
Joint Agency Name:		**TechPort:**	Yes
Human Research Program Elements:	(1) **HFBP**:Human Factors & Behavioral Performance (IRP Rev H)		
Human Research Program Risks:	(1) **HSIA**:Risk of Adverse Outcomes Due to Inadequate Human Systems Integration Architecture		
Space Biology Element:	None		
Space Biology Cross-Element Discipline:	None		
Space Biology Special Category:	None		
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Comments:			
Project Type:	GROUND	**Solicitation / Funding Source:**	2017-2018 HERO 80JSC017N0001-BPBA Topics in Biological, Physiological, and Behavioral Adaptations to Spaceflight. Appendix C
Start Date:	05/15/2019	**End Date:**	05/14/2023
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
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Flight Program:			
Flight Assignment:	NOTE: End date changed to 5/14/2023 per S. Huppman/HRP and NSSC information (Ed., 3/3/2020)		
Key Personnel Changes/Previous PI:			
COI Name (Institution):	Holden, Kritina Ph.D. (NASA Johnson Space Center) Dory, Jonathan B.S. (NASA Johnson Space Center)		
Grant/Contract No.:	80NSSC19K0667		
Performance Goal No.:			
Performance Goal Text:			

Task Description:	This task is part of the Human Capabilities Assessments for Autonomous Missions (HCAAM) Virtual NASA Specialized Center of Research (VNSCOR). Future deep space missions will present new challenges for crew, and increased risks to human performance due to the stress, fatigue, radiation exposure, and isolation that characterizes these missions. In addition, crew will no longer be able to depend on timely support from Mission Control due to distance from the Earth, but will have to work autonomously, while maintaining high performance. Mission Controllers may not be available to answer questions, check system status, assist with procedures, monitor for errors, or troubleshoot problems. Greater crew autonomy will increase dependence on automated systems, and design of these automated systems must be driven by sound human-system integration standards and guidelines in order to ensure mission success. Historically, crew have had very limited dependence on automated systems, thus crew will be faced with a new way of working that may put situation awareness (SA) at risk. We must develop methods for promoting good situation awareness in the automated systems that will most certainly be part of future deep space vehicles and habitats. Procedure automation is a promising technology for reducing crew workload. We define procedure automation as technology that automates the selection or execution of procedural tasks. Structuring the work of automation according to human procedures should improve the transparency of automation actions. This approach provides a means for establishing common ground about ongoing tasks to improve operator understanding of automation behavior. New technologies such as adaptive, multimodal, augmented reality displays can offer the benefits of information presentation tailored to meet the needs of each crewmember, taking into consideration the current state of that crewmember (e.g., sleep-deprived, high workload), as well as the current state of his/her environment and ongoing activities (e.g., emergency situation, time-critical operations). We propose to combine technology for procedure automation with technology for augmented reality multi-modal (ARMM) user interfaces using Microsoft Hololens head-mounted display to provide a virtual task assistant to assist crew in performing procedural work. This virtual task assistant will be capable of identifying which procedures should be performed, performing actions in crew procedures, and summarizing actions taken by the human-automation team to assist crew in preparing for tasks and taking over tasks from other team members. Four studies are planned to evaluate the effects of a virtual task assistant combining procedure automation with augmented reality multi-modal (AARM) user interfaces on human task performance. These studies will achieve the following aims: Aim 1. Determine best methods to improve situation awareness and improve crew autonomy when using a virtual task assistant to prepare for and perform manual maintenance. Aim 2. Determine best methods to improve situation awareness and reduce workload when a virtual task assistant is used to handover maintenance tasks between users. Aim 3. Determine best methods to improve situation awareness and reduce workload when using a virtual task assistant to help manage concurrent manual and automated tasks. The proposed work addresses a number of gaps in the Human Research Program Human Factors and Behavioral Performance risks. This project will provide guidelines for designing effective human-automation systems (Human and Automated/Robotic Interactions (HARI)-02) and evaluate human-automation performance for exemplar procedure automation systems (HARI-03). This project also will provide guidance for the application of multi-modal and adaptive displays and control to Human-Computer Interaction (HCI) design for long duration operations (HCI-04).
Rationale for HRP Directed Research:	
Research Impact/Earth Benefits:	
Task Progress:	New project for FY2019.
Bibliography Type:	Description: (Last Updated: 04/10/2024)