Fiscal Year:	FY 2023	**Task Last Updated:**	FY 03/28/2023
PI Name:	Clark, Torin K. Ph.D.		
Project Title:	Detecting Pilot Spatial Disorientation to Trigger Active Countermeasures During Lunar Landing		
Division Name:	Human Research		
Program/Discipline:			
Program/Discipline--Element/Subdiscipline:			
Joint Agency Name:		**TechPort:**	Yes
Human Research Program Elements:	(1) **HHC**:Human Health Countermeasures		
Human Research Program Risks:	None		
Space Biology Element:	None		
Space Biology Cross-Element Discipline:	None		
Space Biology Special Category:	None		
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Zip Code:	80303-7813	**Congressional District:**	2
Comments:	NOTE: PI moved to University of Colorado after NSBRI Postdoctoral Fellowship concluded in late 2015 (Ed., 9/1/17)		
Project Type:	GROUND	**Solicitation / Funding Source:**	2020-2021 HERO 80JSC020N0001-HHP, OMNIBUS3 Human Research Program: Human Health & Performance Appendix E; Omnibus3-Appendix F
Start Date:	12/23/2022	**End Date:**	12/22/2025
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:			
Key Personnel Changes/Previous PI:			
COI Name (Institution):	Holder, Sherrie Ph.D. (Charles Stark Draper Laboratory Inc) Endsley, Tristan Ph.D. (Charles Stark Draper Laboratory Inc) Vance, Eric Ph.D. (University of Colorado, Boulder)		
Grant/Contract No.:	80NSSC23K0449		
Performance Goal No.:			
Performance Goal Text:			

Task Description:	During transit in microgravity, astronauts will reinterpret neurovestibular stimuli, prior to initial exposure to partial gravity when landing on the Moon or Mars. This poses a risk of spatial disorientation and impaired manual control performance during piloted planetary landings. Here, we propose to develop, validate, and assess a system for detecting when astronauts may become disoriented in real-time, such that it can be used to trigger active countermeasures for piloted planetary landings. Our approach leverages a well-validated computational model for human spatial orientation, now applied to partial gravity planetary landings. Incorporating microgravity neurovestibular adaptation, the vehicle motions of each landing trajectory are processed in real-time by the computational model to detect pilot spatial disorientation. We will assess the system using a ground-based lunar landing analog, combining a gravity transition (3 Gx) with a motion-based planetary landing simulation. First, we will experimentally tune and re-validate the computational model for detecting spatial disorientation, accounting for the effects of the recent gravity transition. Then, using the high-fidelity Disorientation Research Device, we will assess the benefit of the active countermeasure triggering system. Critically, this approach of triggering manual control countermeasures only when they are needed (i.e., when the pilot is about to be disoriented) avoids the added burden on the pilot to continuously process additional sensory information or otherwise have increased workload. We aim to deliver a validated performance support tool for triggering active countermeasures for pilot spatial disorientation during manually controlled lunar landings.
Rationale for HRP Directed Research:	
Research Impact/Earth Benefits:	
Task Progress:	New project for FY2023.
Bibliography Type:	Description: (Last Updated: 11/02/2022)