Fiscal Year:	FY 2019	**Task Last Updated:**	FY 08/27/2019
PI Name:	Barshi, Immanuel Ph.D.		
Project Title:	Effects of Long-Duration Spaceflight on Training Retention		
Division Name:	Human Research		
Program/Discipline:	HUMAN RESEARCH		
Program/Discipline--Element/Subdiscipline:	HUMAN RESEARCH--Space Human Factors Engineering		
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) **HSIA**:Risk of Adverse Outcomes Due to Inadequate Human Systems Integration Architecture (3) **Team**:Risk of Performance and Behavioral Health Decrements Due to Inadequate Cooperation, Coordination, Communication, and Psychosocial Adaptation within a Team		
Space Biology Element:	None		
Space Biology Cross-Element Discipline:	None		
Space Biology Special Category:	None		
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PI Organization Type:	NASA CENTER	**Phone:**	650.604.3921
Organization Name:	NASA Ames Research Center		
PI Address 1:	Mail Stop: 262-4		
PI Address 2:	Human Systems Integration Division		
PI Web Page:			
City:	Moffett Field	**State:**	CA
Zip Code:	94035-1000	**Congressional District:**	18
Comments:			
Project Type:	FLIGHT,GROUND	**Solicitation / Funding Source:**	Directed Research
Start Date:	10/01/2013	**End Date:**	09/30/2020
No. of Post Docs:	3	**No. of PhD Degrees:**	
No. of PhD Candidates:	1	**No. of Master' Degrees:**	
No. of Master's Candidates:	0	**No. of Bachelor's Degrees:**	1
No. of Bachelor's Candidates:	1	**Monitoring Center:**	NASA JSC
Contact Monitor:	Williams, Thomas	**Contact Phone:**	281-483-8773
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Flight Program:	ISS		
Flight Assignment:	ISS NOTE: End date changed to 9/30/2020 per PI (Ed., 7/18/19) NOTE: End date changed to 9/30/2019 per E. Connell/JSC HRP (previously 12/30/2016); title also changed to “Effects of Long-Duration Spaceflight on Training Retention” (previously "Effects of Long-Duration Spaceflight on Training Retention: 1 Yr ISS Investigation")--[Ed., 10/4/17 and 5/7/18, per info sent July 2017] NOTE: Element change to Human Factors & Behavioral Performance; previously Space Human Factors & Habitability (Ed., 1/19/17) NOTE: Risk/Gaps per E. Connell/HRP (Ed., 3/20/14) NOTE: Start date changed to 10/1/13 (from 5/22/13) per M. Whitmore/JSC (Ed., 2/24/14)		

Key Personnel Changes/Previous PI:	September 2018 report: Co-Investigators removed from the study are Dr. Kritina Holden (HRP HFBP), Dr. Brandon Vessey (HRP HFBP), Dr. Victor Hurst IV (HRP ExMC), and Vicky Byrne. Co-Investigators added to the study are Dr. Lauren Landon (HRP HFBP) and Dr. Kerry McGuire (HRP ExMC). September 2019 report: Co-Investigator added to the study is Dr. James Kole (Univ. of Northern Colorado).
COI Name (Institution):	Dempsey, Donna Ph.D. (NASA Johnson Space Center /SF311) McGuire, Kerry Ph.D. (NASA Johnson Space Center /SF4) Landon, Lauren Ph.D. (Wyle Laboratories/ NASA Johnson Space Center) Healy, Alice Ph.D. (University of Colorado) Kole, James Ph.D. (University of Northern Colorado)
Grant/Contract No.:	Directed Research
Performance Goal No.:	
Performance Goal Text:	
Task Description:	This proposal focuses on the research opportunity afforded by the 2015 year-long mission of two crewmembers aboard the International Space Station (ISS). Given that only two crewmembers will be spending the full year in space, the research proposed here is more of a case study than a typical research project. However, using repeated measures within-subject design, important insights can be gained concerning the retention and transferability or generalizability of material learned, as well as the effectiveness of Earth-based pre-launch training. In addition, information obtained in this research could help in the design of proper intervals for onboard refresher training, and suggest domains best served by Just-In-Time training (JITT). This proposal will be led by the Space Human Factors Engineering (SHFE) Element within the Human Research Program (HRP). The outcomes from this study will address gaps within the SHFE Element, as well as within the Behavioral Health and Performance (BHP) and Exploration Medical Capability (ExMC) Elements, and will be a cooperative effort with those Elements. Products and tools developed by these Elements in their work under HRP will be leveraged to benefit the proposed research. The specific aims are as follows: Aim A. Test the retention and transfer of specific technical content learned pre-launch to assess the need for and possible schedule of onboard refresher and JIT training. Aim B. Compare the process of knowledge/skill decay on orbit with that of a closely-matched subject on Earth. Aim C. Collect naturalistic data from onboard crew and ground control personnel on training-related crew performance including: performance errors, requests for ground support, need to review material previously learned, and training success stories.
Rationale for HRP Directed Research:	This research is directed due to a time constraint. This proposal focuses on the research opportunity afforded by the 2015 year-long mission of two crewmembers aboard the International Space Station (ISS).
Research Impact/Earth Benefits:	To date, we have not been able to collect data in flight to document the effectiveness of preflight crew training. Crewmembers have been largely successful in their performance, but that success could have primarily been the result of excellent innate capabilities, extreme motivation, and “as needed” support from mission control. Many studies have documented the processes of skill decay and the forgetting of acquired knowledge. However, all these studies have been conducted on Earth. It is an understatement to say that space is a very different environment than the one people are accustomed to on Earth. Yet, almost all current crew training is done on Earth. Zero-G is only one aspect of the difference that cannot be properly simulated in Earth-based training, but it is a feature of space operations that may have significant impact on the effectiveness of Earth-based training and on the ability of crewmembers to retain their knowledge and to acquire new skills in space. In addition to zero-G, the phenomenon of space adaptation, the stresses of confinement, noise, reduced-quality sleep, and the ever-present threat to basic survival are all factors that affect people’s behavior and cognitive capabilities. Little to no data are available on how people learn in space or how retention and retrieval of Earth-based training are affected by being in space over a long period of time.
Task Progress:	In 2018, 14 subjects from the 2017 astronaut candidate (ASCANs) class and 10 “crew-like” subjects were enrolled in the study (Study 1), and data collection for these subjects began in January and February of 2018. In summer of 2019, 11 ASCANs and 8 “crew-like” subjects completed the study. Analysis of this data is ongoing to provide a comparison of the ASCAN data with the crew-like and university subject group. In 2019, data from the university subject group was published showing long retention as well as specificity and generalizability of both the perceptual and motoric tasks (Healy, Kole, Schnieder & Barshi, 2019; see Bibliography section).
Bibliography Type:	Description: (Last Updated: 01/11/2021)
Articles in Peer-reviewed Journals	Healy AF, Kole JA, Schneider VI, Barshi I. "Training, retention, and transfer of data entry perceptual and motor processes over short and long retention intervals." Mem Cognit. 2019 Nov;47(8):1606-18. First Online 18 June 2019. https://doi.org/10.3758/s13421-019-00955-z ; PubMed PMID: 31215009 , Nov-2019