Fiscal Year:	FY 2016	**Task Last Updated:**	FY 06/13/2016
PI Name:	Salas, Eduardo Ph.D.		
Project Title:	Evidence-based Metrics Toolkit for Measuring Safety and Efficiency in Human-Automation Systems--NNX15AR28G		
Division Name:	Human Research		
Program/Discipline:			
Program/Discipline--Element/Subdiscipline:	HUMAN RESEARCH--Space Human Factors Engineering		
Joint Agency Name:		**TechPort:**	Yes
Human Research Program Elements:	(1) **HFBP**:Human Factors & Behavioral Performance (IRP Rev H)		
Human Research Program Risks:	(1) **HARI**:Risk of Inadequate Design of Human and Automation/Robotic Integration		
Space Biology Element:	None		
Space Biology Cross-Element Discipline:	None		
Space Biology Special Category:	None		
PI Email:	eduardo.salas@rice.edu	**Fax:**	FY
PI Organization Type:	UNIVERSITY	**Phone:**	713-348-3917
Organization Name:	Rice University		
PI Address 1:	Department of Psychology		
PI Address 2:	6100 Main Street MS25		
PI Web Page:			
City:	Houston	**State:**	TX
Zip Code:	77005	**Congressional District:**	7
Comments:	NOTE: Previous affiliation was University of Central Florida, until mid-2015		
Project Type:	GROUND	**Solicitation / Funding Source:**	2012 Crew Health NNJ12ZSA002N
Start Date:	08/01/2015	**End Date:**	07/31/2017
No. of Post Docs:	1	**No. of PhD Degrees:**	1
No. of PhD Candidates:	3	**No. of Master' Degrees:**	0
No. of Master's Candidates:		**No. of Bachelor's Degrees:**	0
No. of Bachelor's Candidates:	0	**Monitoring Center:**	NASA ARC
Contact Monitor:	Williams, Thomas	**Contact Phone:**	281-483-8773
Contact Email:	thomas.j.will1@nasa.gov		
Flight Program:			
Flight Assignment:	NOTE: Element change to Human Factors & Behavioral Performance; previously Space Human Factors & Habitability (Ed., 1/19/17)		
Key Personnel Changes/Previous PI:			
COI Name (Institution):			
Grant/Contract No.:	NNX15AR28G		
Performance Goal No.:			
Performance Goal Text:			

Task Description:	NOTE: Continuation of "Evidence-based Metrics Toolkit for Measuring Safety and Efficiency in Human-Automation Systems," grant #NNX13AO51G with Principal Investigator Eduardo Salas, Ph.D., due to PI move in mid-2015 to Rice University from University of Central Florida. Specific aims of this proposal are threefold: (1) develop a framework for human-systems integration requirements, (2) identify and develop a metrics criteria in which safety and efficiency can be characterized in human-automation teams, and (3) design, develop, and validate a theoretically-driven, empirically-based metrics toolkit that characterizes the safety and efficiency of human automation interactions. This proposal meets NASA goals and objectives by mitigating the risk of inadequate design of human and automation/robotic integration through the development of safety and efficiency metrics for human-automation systems. The proposal is divided into three primary phases. Phase 1 will consist of synthesizing and translating findings from the extant literature relevant to human automation/robotic integration. The result of this effort will be the development of objective metrics generalizable to individual and team levels that characterize the safety and efficiency of a human automation interaction. The final outcome of Phase 1 will be the development of a human automation interaction metrics (HAIM) toolkit. Phase 2 will involve in-depth preparation for scientifically sound experiments. Phase 2 ensures adequate time and methodology for meaningful outcomes for Phase 3. The central outcome of Phase 2 will be the final development of the experimental testbed and experimental protocol. Phase 3 will involve preparation for, and execution of, experiments. This will include the design and execution of a set of multi-level empirical studies aimed at validating the metrics toolkit. The validation studies will focus on testing different aspects of human automation interaction (e.g., levels of automation, task complexity, and the number and configuration of system operators). The outcome of the proposed effort will provide NASA a set of evidence-based, empirically-validated guidelines and a measurement toolkit for mitigating the risk of inadequate design of human and automation/robotic integration as it pertains to the development of safety and efficiency metrics for human automation systems.
Rationale for HRP Directed Research:	
Research Impact/Earth Benefits:	
Task Progress:	JUNE 2016 PROGRESS REPORT The third year of the project focused on completion of the subject matter expert (SME) interviews in order to determine best practices for measurement of human-automation systems within the specific context of spaceflight. The information gained during these interviews served as a supplement to the data gained through the qualitative literature review and during the 2014 HFES (Human Factors and Ergonomics Society) Measurement Workshop by providing a greater understanding of the specific context of interest -- spaceflight. Additionally, during Year 3, greater focus was placed on actual development of the toolkit as a web-based decision tree tool for guiding users in selecting metrics and applying appropriate measurement techniques. Currently, work is continuing on the development of the metrics toolkit prototype and preparation for the usability studies have begun. Usability studies will be conducted through the summer and will be followed by completion of final revisions to the toolkit.
Bibliography Type:	Description: (Last Updated: 06/10/2021)
Abstracts for Journals and Proceedings	Iwig C, Oglesby J, Woods A, Dinh J, Salas E. "Development of an Evidence-Based Measurement Toolkit for Assessing Human-Automation System Safety and Performance." Presented at the 2016 NASA Human Research Program Investigators' Workshop, Galveston, TX, February 8-11, 2016. 2016 NASA Human Research Program Investigators' Workshop, Galveston, TX, February 8-11, 2016. , Feb-2016
Abstracts for Journals and Proceedings	Woods A, Iwig C, Salas E. "Informing the Development of a Safety and Performance Metric Selection Toolkit: Subject Matter Experts Weigh In." Poster to be Presented at the 2016 International Meeting of the Human Factors and Ergonomics Society, Washington, D.C., September 19-23, 2016. To be published in the 2016 Human Factors and Ergonomics Society Conference Proceedings. In press as of June 2016. , Jun-2016
Articles in Peer-reviewed Journals	Iwig C, Oglesby J, Shimono M, Stowers K, Leyva K, Salas E. "Space flight task contexts for long distance and duration exploration missions: applications to measurement of human-automation interaction." Proceedings of the Human Factors and Ergonomics Society Annual Meeting. 2015 Sep;59(1):941-5. (59th Annual Meeting of the Human Factors and Ergonomics Society, Los Angeles, CA, October 26–30, 2015.) http://dx.doi.org/ , Sep-2015