Fiscal Year:	FY 2022	Task Last Undated:	FY 07/18/2022	
PI Name:	Burke, Shawn Ph.D.	Puncou		
Project Title	Facilitating the Synergistic Side of	Cultural Differences in L	DSE: Identification of Challenges and Development of	
Troject Thie.	Cultural Training			
Division Name:	Human Research			
Program/Discipline:				
Program/Discipline Element/Subdiscipline:	HUMAN RESEARCHBehavior a	and performance		
Joint Agency Name:	]	FechPort:	No	
Human Research Program Elements:	(1) HFBP:Human Factors & Behav	vioral Performance (IRP I	Rev H)	
Human Research Program Risks:	<ol> <li>(1) HSIA:Risk of Adverse Outcom</li> <li>(2) Team:Risk of Performance and Communication, and Psychosocial</li> </ol>	es Due to Inadequate Hu Behavioral Health Decre Adaptation within a Tear	man Systems Integration Architecture ements Due to Inadequate Cooperation, Coordination, n	
Space Biology Element:	None			
Space Biology Cross-Element Discipline:	None			
Space Biology Special Category:	None			
PI Email:	sburke@ist.ucf.edu	Fax:	FY	
PI Organization Type:	UNIVERSITY	Phone:	407-882-1326	
Organization Name:	University of Central Florida			
PI Address 1:	Institute for Simulation and Training			
PI Address 2:	3100 Technology Pkwy			
PI Web Page:				
City:	Orlando	State:	FL	
Zip Code:	32826-3281	Congressional District:	7	
Comments:				
Project Type:	Ground	Solicitation / Funding Source:	2014-15 HERO NNJ14ZSA001N-MIXEDTOPICS. Appendix E: Behavioral Health & Human Health Countermeasures Topics	
Start Date:	08/22/2016	End Date:	08/21/2023	
No. of Post Docs:	0	No. of PhD Degrees:	0	
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No. of Master's Candidates:	2	No. of Bachelor's Degrees:	0	
No. of Bachelor's Candidates:	0	Monitoring Center:	NASA JSC	
Contact Monitor:	Whitmire, Alexandra	<b>Contact Phone:</b>		
Contact Email:	alexandra.m.whitmire@nasa.gov			
Flight Program:				
Flight Assignment:	NOTE: End date changed to 8/21/2023 per NSSC information (Ed., 7/22/22)			
	NOTE: End date changed to 8/21/2022 per NSSC information (Ed., 8/24/21) NOTE: End date changed to 8/21/2021 per NSSC information (Ed., 7/27/20)			
Key Personnel Changes/Previous PI:	July 2022 report: No key personnel changes			
COI Name (Institution):	Salas, Eduardo Ph.D. ( Rice University )			
Grant/Contract No.:	NNX16AP96G			
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Task Description:	Culture has been a factor for space exploration since the mid 1970s when the U.S. first partnered with Russia. Work has indicated that culturally-based differences in values, beliefs, and preferences for cognition and action can have an impact on interdependent action. Cultural differences can pose challenges for a number of transition, action, and interpersonal processes and emergent states in teams. However, almost all of this work has been conducted outside the context of spaceflight. The little work that has been conducted within spaceflight has been conducted outside the context of utams may be different in long-duration space exploration (LDSE). This drives the question as to whether cultural differences within spaceflight crews has the same impact on team performance as that reported within the wider literature on cross-cultural teams and what can be done to create synergy. We leverage prior work on cultural differences in LDSE and use this information to create and test cultural training tools that can be used pre- and in-flight. Specifically, we take a multi-pronged approach to answer the following questions: (1) what are the critical issues surround culture and team performance in LDSE, (2) from a compositional standpoint is there an 'ideal' team profile in terms of cultural orientations to facilitate team performance and adaptability in LDSE, (3) what types of cultural training can be developed for use pre-flight and (4) what tools can be developed to facilitate practitioners in maximizing the potential synergy in culturally diverse teams operating in LDSE (e.g., pillars, guidelines, practices, tips).
Rationale for HRP Directed Researc	h:
Research Impact/Earth Benefits:	Within this project, we seek to answer the following questions: (1) what are the critical issues surrounding culture and team performance in long duration spaceflight, (2) is there a team cultural profile that facilitates team performance and adaptation in long duration spaceflight, and (3) what tools can be developed to facilitate synergy/mitigate decrements in teamwork and team performance within culturally diverse teams operating in the context of spaceflight. The proposed project will impact numerous areas. First, this research will address current theoretical gaps surrounding the critical challenge of cultural differences in long duration spaceflight (both on the ground and in orbit). This information is then used to build a series of complementary, modular training tools to facilitate the crew's ability to turn cultural differences into a synergistic force. The existent literature on cross-cultural training does little to focus on cultural differences in crews operating in isolated, confined environments. Additionally, the focus of most cross-cultural training programs is to prepare expatriates to go abroad; therefore, teaching cross-cultural competence with regard to teamwork skills is rarely seen. In building our training we seek to validate the effectiveness of such programs within analog environments using sound scientific methods and training evaluation techniques. Finally, as an important part of training development is the assessment of the skills gained during training we will also deliver a set of assessment tools that can be used to diagnose cross-cultural competence levels with regard to team interaction.
	<ul> <li>Efforts within the current reporting period have primarily focused on the SIRIUS-21 mission – specifically, survey implementation, data management, and coordination efforts. Additionally, a subset of preliminary analyses have been conducted for the initial 4 months of the 8-month mission. Note that the data presented herein is preliminary and action on any results should be viewed with caution due to the low sample size (1 crew, 6 individuals). Due to the small sample size, the results reported below focus more on effect sizes than actual significance levels; therefore, they are referred to as 'trends'. Comparison to SIRIUS-19 results and forthcoming missions will serve to provide greater confidence in initial results and allow us to move towards team level analyses. Results also need to be viewed in light of the fact that results from the quantitative data suggest that, in terms of cultural differences, the SIRIUS 8-month crew was on the low to moderate end of the spectrum for those cultural values that were assessed. [Ed. Note: Missions through the Scientific International Research In a Unique terrestrial Station, or SIRIUS, represent an international, multicultural series of studies researching the effects of isolation and confinement on human psychology, physiology, and team dynamics to help prepare for long-duration space exploration.]</li> <li>Differences were noted, at times, to result in tension within the crew. Additionally, there is evidence for subgroup formation at various levels within the crew. The drivers of such subgroup formation are currently being investigated more thoroughly through examination of journal and interview data. There is also some evidence that tensions amongst the crew may have been amplified by relations between the crew and the (Mission Control Center) MCC at various times within the mission.</li> <li>Despite the low to moderate cultural differences within the crew, quantitative results begin to suggest how cultural values may impact crewmember perceptions of rust an</li></ul>
Task Progress:	relationship with cohesion. With regard to the relationship between cultural differences and trust, similar trends were seen. Specifically, results suggest a trend towards uncertainty avoidance and collectivism having a moderate to strong relationship with perceptions of trust. While there was some variability in both of the relationships, in general, individuals higher in uncertainty avoidance and collectivism perceived more trust within the team. The relationship between indirectness and team trust was variable over time. Overall, there was a moderate positive relationship with team trust; however, there were downward trends at two time points in the first four months. Similarly, power distance trended towards a moderate negative relationship with team trust, while at times during the middle of the fourth month trending towards a weak positive relationship. The final emergent state that we examined were crew member mental models regarding teamwork. Analyses were conducted using the Pathfinder program (Schvaneveldt, Durso, & Dearholt, 1989). In looking at crewmember mental models, we were primarily interested in the degree to which teamwork mental models varied by culture. In investigating this question, our analyses examined the degree to which crewmembers' mental models changed over time (individual-level focus) and the degree to which there was variation amongst the crew's mental models over time in terms of the density and interconnections, and (2) differences between the mental models of crewmembers at a single point in time (density, interconnections, and (2) differences between the mental models of crewmembers at a single point in the mental models of crewmembers at a single point in time (density, interconnections, and (2) differences between the mental models of crewmembers at a single point in time (density, interconnections, are capable). We are further unnacking these differences to examine the degree to which

	conducted to examine the relationship between cultural values, social intelligence, and cultural intelligence.
	Moving forward, we will continue to analyze the remaining information contained within the 8-month mission and look forward to the opportunities that will be afforded when we compare the 4- and 8-month missions, such that with both data sets we can begin to talk about cultural differences in more detail. We will also continue to utilize and integrate the information gained to this point into the products we are building. With respect to the SIRIUS mission, the project team has attended planning and update meetings. Finally, additional data collection/analysis opportunities will serve to refine our initial findings and facilitate the integration of this information into the products we are building.
<b>Bibliography Type:</b>	Description: (Last Updated: 07/31/2024)
Articles in Peer-reviewed Journals	Traylor AM, Tannenbaum SI, Thomas EJ, Salas E. "Helping healthcare teams save lives during COVID-19: Insights and countermeasures from team science." Am Psychol. 2021 Jan;76(1):1-13. <u>https://doi.org/10.1037/amp0000750</u> ; <u>PMID:</u> 33119329; <u>PMCID: PMC8543842</u> , Jan-2021
Articles in Peer-reviewed Journals	Santos M, Luna M, Reyes DL, Traylor A, Lacerenza CN, Salas E. "How to be an inclusive leader for gender-diverse teams." Organ Dyn. 2022 Jun 2;100914. Online ahead of print. <u>https://doi.org/10.1016/j.orgdyn.2022.100914</u> , Jun-2022
Articles in Peer-reviewed Journals	Kilcullen M, Bisbey TM, Rosen M, Salas E. "Does team orientation matter? A state-of-the-science review, meta-analysis, and multilevel framework." J Organ Behav. 2022 Mar 22. Review. <u>https://doi.org/10.1002/job.2622</u> , Mar-2022
Books/Book Chapters	Croitoru N, Bisbey TM, Salas E. "Team training for long-duration space exploration: A look ahead at the coming challenges." in "Psychology and Human Performance in Space Programs: Extreme Application. " Ed. L.B. Landon, K.J. Slack, E. Salas. <u>https://doi.org/10.1201/9780429440854</u> Boca Raton, FL: CRC Press, 2020. p. 81-99., Jan-2020