Fiscal Year:	FY 2023	**Task Last Updated:**	FY 05/16/2023
PI Name:	Contractor, Noshir Ph.D.		
Project Title:	Composing Teams with TEAMSTaR: Tool for Evaluating and Mitigating Space Team Risk		
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:	None		
Space Biology Element:	None		
Space Biology Cross-Element Discipline:	None		
Space Biology Special Category:	None		
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Zip Code:	60208-0834	**Congressional District:**	9
Comments:			
Project Type:	GROUND	**Solicitation / Funding Source:**	2020 HERO 80JSC019N0001-TEAM: Team Composition-Appendix G
Start Date:	04/15/2021	**End Date:**	04/14/2024
No. of Post Docs:	0	**No. of PhD Degrees:**	1
No. of PhD Candidates:	1	**No. of Master' Degrees:**	0
No. of Master's Candidates:	0	**No. of Bachelor's Degrees:**	0
No. of Bachelor's Candidates:	5	**Monitoring Center:**	NASA JSC
Contact Monitor:	Whitmire, Alexandra	**Contact Phone:**	
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Flight Program:			
Flight Assignment:	NOTE: End date changed to 4/14/2024 per NSSC info via L. Barnes-Moten/JSC (Ed., 7/16/21)		
Key Personnel Changes/Previous PI:			
COI Name (Institution):	Bell, Suzanne Ph.D. (NASA Johnson Space Center) DeChurch, Leslie Ph.D. (Northwestern University, Evanston) Lungeanu, Alina Ph.D. (Northwestern University, Evanston) Loerch, Linda M.S. (NASA Johnson Space Center)		
Grant/Contract No.:	80NSSC21K0925		
Performance Goal No.:			
Performance Goal Text:			

Task Description:	As NASA sets its sight on more Earth-independent missions, such as Artemis missions to the Moon and on to Mars, team composition becomes a critical leverage point for mitigating risks. NASA has successfully designed crews with "the Right Stuff" for more than fifty years beginning with the Mercury and Apollo programs, then into the Shuttle period, and throughout the Skylab and International Space Station missions requiring highly specialized crews to live and work in space for extended periods of time. The key point of departure for deep space exploration is the complexity of missions and the autonomy with which the crew will work. Communication delays with support teams on Earth will necessitate that a relatively small crew take on greater responsibility for making critical decisions. This increased autonomy will occur despite the additional challenges posed by prolonged isolation and confinement and increased radiation exposure. Whereas the "Right Stuff" (Wolfe, 1979) emphasized the requisite individual characteristics, deep space missions also require the "Right Combination" of team members. With that as a backdrop, this project develops and validates TEAMSTaR (Tool for Evaluating And Mitigating Space Team Risks), a team composition decision support system, that can be used by stakeholders (e.g., schedule decision-makers) to predict how a hypothetical team's social relations are likely to evolve and influence crew performance over the course of a mission. The TEAMSTaR will enable decision-makers to evaluate composition scenarios for an entire set of teams, for single-member replacements, and/or for subsets of teams. To do this, we first leverage insights and data from recent NASA-funded team composition studies and thoughtfully refine and extend our agent-based models to include relevant input characteristics and their ability to predict team outcomes including team performance. We next conduct virtual experiments and gather stakeholder input to inform the development of TEAMSTaR, a team composition decision support system that utilizes insights from our updated agent-based models (ABMs) to enable real-time (or close to real-time) decision-making. Finally, we validate TEAMSTaR as a decision-making tool in short and long-term isolated, confined, and controlled environments. This project accomplishes five aims. Aim 1) Refine agent-based models looking at relevant input characteristics and their ability to predict team outcomes, including team performance. Aim 2) Identify and elaborate the scientific rationale for attributes used within the model, identifying factors known to affect crew functioning, crew member behavior, emergent characteristics that arise during team task completion. Aim 3) Develop and validate a Team Composition decision support system and user interface. Aim 4) Validate the refined model using a software prototype in at least one extended duration, isolated, and confined analog. Aim 5) Provide modeling and software prototypes that meet NASA Standard 7009a. With an eye toward the future of deep space exploration, this project leverages, and indeed advances, state of the art computational techniques to predict crew performance and to identify points of leverage in terms of team composition and task scheduling to optimize individual and team performance. Reference: Wolfe, T. (1979). The Right Stuff. New York: Farrar, Straus and Giroux.
Rationale for HRP Directed Research:	
Research Impact/Earth Benefits:	With an eye toward the future of deep space exploration, this project leverages and advances state of the art computational techniques to predict crew performance and to identify points of leverage in terms of team composition and task scheduling to optimize individual and team performance. Even though TEAMSTaR decision support system will be tested in space analog missions, it can be applied to teams operating on Earth in isolated and confined environments (ICE), such as expedition and science teams in the Arctic and Antarctic. The general framework of team composition and the analytic strategies developed in this project can be applied to Earth teams more generally.
Task Progress:	We have completed the second year of the project. During this past year, we have begun preparation for data collection. Specifically, (1) we have finalized the list of factors to be included in our team composition agent-based model (Aim 1 and 2); (2) we have started developing the TEAMSTaR Dashboard and we have created a prototype (Aim 3); and (3) we have created surveys and team activities to be implemented in Human Exploration Research Analog (HERA) C7 (Aim 4).
Bibliography Type:	Description: (Last Updated: 03/29/2024)
Abstracts for Journals and Proceedings	Chan M, Izadinia N, DeChurch L, Waechter A, Contractor N. "A quantitative approach to stratify and measure performance of multiteam systems." 2022 INFORMS Annual Meeting, Indianapolis, Indiana, October 16-19, 2022. Abstracts. 2022 INFORMS Annual Meeting, Indianapolis, Indiana, October 16-19, 2022. , Oct-2022
Abstracts for Journals and Proceedings	Chan M, Izadinia N, DeChurch L, Waechter A, Contractor N. "Measuring multiteam system performance with multi-objective optimization." 2023 SIOP Annual Conference, Boston, Massachusetts, April, 19-22, 2023. Abstracts. 2023 SIOP Annual Conference, Boston, Massachusetts, April, 19-22, 2023. , Apr-2023
Articles in Peer-reviewed Journals	Gómez-Zará D, Das A, Pawlow B, Contractor N. "In search of diverse and connected teams: A computational approach to assemble diverse teams based on members' social networks." PLoS One. 2022 Nov 9;17(11):e0276061. https://doi.org/10.1371/journal.pone.0276061 ; PubMed PMID: 36350821; PubMed Central PMCID: PMC9645621 , Nov-2022