

Fiscal Year:	FY 2019	Task Last Updated:	FY 07/21/2019
PI Name:	Binsted, Kim Ph.D.		
Project Title:	Using Analog Missions to Develop Effective Team Composition Strategies for Long Duration Space Exploration		
Division Name:	Human Research		
Program/Discipline:			
Program/Discipline--Element/Subdiscipline:	HUMAN RESEARCH--Behavior and performance		
Joint Agency Name:	TechPort:	No	
Human Research Program Elements:	(1) HFBP: Human Factors & Behavioral Performance (IRP Rev H)		
Human Research Program Risks:	(1) 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		
PI Email:	binsted@hawaii.edu	Fax:	FY
PI Organization Type:	UNIVERSITY	Phone:	808-398-1300
Organization Name:	University of Hawaii		
PI Address 1:	Hawaii Hall 202, 2500 Campus Rd		
PI Address 2:			
PI Web Page:			
City:	Honolulu	State:	HI
Zip Code:	96822-2217	Congressional District:	1
Comments:			
Project Type:	GROUND	Solicitation / Funding Source:	2014-15 HERO NNJ14ZSA001N-Crew Health (FLAGSHIP & NSBRI)
Start Date:	07/01/2015	End Date:	07/01/2020
No. of Post Docs:		No. of PhD Degrees:	
No. of PhD Candidates:	2	No. of Master' Degrees:	
No. of Master's Candidates:		No. of Bachelor's Degrees:	
No. of Bachelor's Candidates:		Monitoring Center:	NASA JSC
Contact Monitor:	Williams, Thomas	Contact Phone:	281-483-8773
Contact Email:	thomas.j.will1@nasa.gov		
Flight Program:			
Flight Assignment:	<p>NOTE: Extended to 7/01/2020 per NSSC information (Ed., 1/29/2020)</p> <p>NOTE: Extended to 12/31/2019 per NSSC information (Ed., 7/23/19)</p> <p>NOTE: Extended to 7/31/2019 per J. Garrett/JSC (Ed., 12/21/18)</p> <p>NOTE: Extended to 12/31/2018 per NSSC information (Ed., 8/24/17)</p> <p>NOTE: Element change to Human Factors & Behavioral Performance; previously Behavioral Health & Performance (Ed., 1/17/17)</p>		
Key Personnel Changes/Previous PI:			

COI Name (Institution):	Bedwell, Wendy Ph.D. (University of South Florida, Tampa) Bishop, Sheryl Ph.D. (University of Texas, Galveston) Hunter, Jean Ph.D. (Cornell University) Kozlowski, Steve Ph.D. (Michigan State University) Miller, Christopher Ph.D. (Smart Information Flow Technologies, LLC) Roma, Peter Ph.D. (Institutes for Behavior Resources, Inc) Wu, Peggy B.S. (Smart Information Flow Technologies, LLC) Schmer-Galunder, Sonja M.S. (Smart Information Flow Technologies, Inc.)
Grant/Contract No.:	NNX15AN05G
Performance Goal No.:	
Performance Goal Text:	
Task Description:	<p>Astronaut crews for long-duration multi-national missions will endure many physical challenges and psychological stressors, some largely predictable in type and timing and others unpredictable. Crews are likely to be diverse with respect to educational background, skill set, ethnicity, gender, leadership/followership styles, etc., yet they must form a cohesive team, and continue to function together at a high level of objective performance and remain responsive to mission support over the duration of the mission. Crew cohesion will be more fragile at times of high stress and fatigue, yet those are the times when performance must be unimpaired if the crew is to succeed. Adding to the challenge, the pool from which crews must be selected may be significantly constrained by other factors, such as past radiation exposure.</p> <p>For these reasons, it is essential that we understand how best to compose and support crews for long-duration space missions, and that we develop a set of validated tools to this end.</p> <p>In order to enable and advance long duration human space exploration, we are investigating individual and crew characteristics that may affect crew function and performance, by measuring both characteristics and performance on a range of simulated missions in analog environments. Based on the correlations found, we will develop a predictive model of the relationship between crew composition and performance. We will validate and enhance this model via data collected on two 8-month Hawai'i Space Exploration Analog and Simulation (HI-SEAS) missions, and use the results to provide NASA with a set of tools to optimize its crew composition strategies.</p> <p>Ed. note December 2018: Project has been rescoped and the specific aims of the re-scoped study are:</p> <ul style="list-style-type: none"> * Aim 1: Collect, develop, and verify a set of individual, dyad, and crew characteristics that are expected (based on past investigations) to be relevant to crew composition. * Aim 2: Identify correlations, if any, between those characteristics and crew function/performance, using data from a series of simulated missions of various lengths at analog sites. * Aim 3: Build a predictive model based on these correlations. * Aim 4: Validate that model over two eight-month simulated missions at the HI-SEAS analog. * Aim 5: Develop a set of tools (e.g., rubric, implemented model, best practices) NASA can use to optimize crew composition.
Rationale for HRP Directed Research:	
Research Impact/Earth Benefits:	<p>The objective of this investigation is to provide data and recommendations to inform crew composition for long-duration space missions, and to enable the implementation of countermeasures for problems related to crew behavioral health and performance.</p>
Task Progress:	<p>Due to an accident at the habitat in February 2018 that halted work, the program review by both University of Hawaii and NASA Institutional Review Boards, and the subsequent rescoping of the grant, no progress has been made in the research over the past year. We believe that all the issues have been resolved, and that we should be able to restart work soon. We did present at meetings and publish papers; see Bibliography section below.</p>
Bibliography Type:	Description: (Last Updated: 09/09/2022)
Abstracts for Journals and Proceedings	<p>Bleacher JE, Shiro B, McAdam A, Young K, Garry WB, Whelley P, Richardson JA, Rowland SK, Binsted K, Caldwell B, Glotch TD. "Studies of Young Hawaiian Lava Tubes to Develop Techniques for Interpreting Lava Emplacement and Inferring Past Environment on the Moon and Mars." Presented at the AGU (American Geophysical Meeting) Fall Meeting, Washington, DC, December 10-14, 2018.</p> <p>AGU (American Geophysical Meeting) Fall Meeting, Washington, DC, December 10-14, 2018. Fall Meeting Abstracts. Abstract #P31H-3800. , Dec-2018</p>
Articles in Peer-reviewed Journals	<p>Engler ST, Binsted K, Leung H. "HI-SEAS habitat energy requirements and forecasting." Acta Astronautica. 2019 Sep;162:50-5. Available online 2019 May 31. https://doi.org/10.1016/j.actaastro.2019.05.049 , Sep-2019</p>
Articles in Peer-reviewed Journals	<p>Goemaere S, Brenning K, Beyers W, Vermeulen ACJ, Binsted K, Vansteenkiste M. "Do astronauts benefit from autonomy? Investigating perceived autonomy-supportive communication by Mission Support, crew motivation and collaboration during HI-SEAS 1." Acta Astronautica. 2019 Apr;157:9-16.</p> <p>https://doi.org/10.1016/j.actaastro.2018.11.048 , Apr-2019</p>
Articles in Peer-reviewed Journals	<p>Goemaere S, Van Caelenberg T, Beyers W, Binsted K, Vansteenkiste M. "Life on Mars from a Self-Determination Theory perspective: How astronauts' needs for autonomy, competence and relatedness go hand in hand with crew health and mission success - Results from HI-SEAS IV. " Acta Astronautica. 2019 Jun;159:273-85.</p> <p>https://doi.org/10.1016/j.actaastro.2019.03.059 , Jun-2019</p>

Articles in Peer-reviewed Journals	Frick SE, Fletcher KA, Ramsay PS, Bedwell WL. "Understanding team maladaptation through the lens of the four R's of adaptation." Hum Resour Manage Rev. 2018 Dec;28(4):411-22. Epub 2017 Aug 31. https://doi.org/10.1016/j.hrmr.2017.08.005 , Dec-2018
Papers from Meeting Proceedings	Engler S, Hunter J, Binsted K, Leung H. "Robotic Companions for Long Term Isolation Space Missions." Presented at the 2018 15th International Conference on Ubiquitous Robots (UR), Honolulu, HI, June 26-30, 2018. In: 2018 15th International Conference on Ubiquitous Robots (UR) Proceedings, Honolulu, HI, June 26-30, 2018. p. 424-430. https://doi.org/10.1109/URAL.2018.8441838 , Jun-2018
Papers from Meeting Proceedings	Idota T, Biagioni E, Binsted K. "Swarm Exploration of Extraterrestrial Lava Tubes with Ad-Hoc Communications." Presented at the 2018 6th IEEE International Conference on Wireless for Space and Extreme Environments (WiSEE), Huntsville, AL, December 11-13, 2018. In: Proceedings, 2018 6th IEEE International Conference on Wireless for Space and Extreme Environments (WiSEE), Huntsville, AL, December 11-13, 2018. p. 163-168. https://doi.org/10.1109/WiSEE.2018.8637325 , Dec-2018