

<b>Fiscal Year:</b>	FY 2017	<b>Task Last Updated:</b>	FY 12/05/2017
<b>PI Name:</b>	Binsted, Kim Ph.D.		
<b>Project Title:</b>	Key Contributors to the Maintenance and Regulation of Team Function and Performance on Long Duration Exploration Missions		
<b>Division Name:</b>	Human Research		
<b>Program/Discipline:</b>	HUMAN RESEARCH		
<b>Program/Discipline--Element/Subdiscipline:</b>	HUMAN RESEARCH--Behavior and performance		
<b>Joint Agency Name:</b>	<b>TechPort:</b>	No	
<b>Human Research Program Elements:</b>	(1) <b>HFBP:</b> Human Factors & Behavioral Performance (IRP Rev H)		
<b>Human Research Program Risks:</b>	(1) <b>Team:</b> Risk of Performance and Behavioral Health Decrements Due to Inadequate Cooperation, Coordination, Communication, and Psychosocial Adaptation within a Team		
<b>Space Biology Element:</b>	None		
<b>Space Biology Cross-Element Discipline:</b>	None		
<b>Space Biology Special Category:</b>	None		
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<b>Comments:</b>			
<b>Project Type:</b>	GROUND	<b>Solicitation / Funding Source:</b>	2012 Crew Health NNJ12ZSA002N
<b>Start Date:</b>	08/01/2013	<b>End Date:</b>	09/01/2017
<b>No. of Post Docs:</b>	0	<b>No. of PhD Degrees:</b>	0
<b>No. of PhD Candidates:</b>	2	<b>No. of Master' Degrees:</b>	1
<b>No. of Master's Candidates:</b>	0	<b>No. of Bachelor's Degrees:</b>	1
<b>No. of Bachelor's Candidates:</b>	0	<b>Monitoring Center:</b>	NASA JSC
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<b>Flight Program:</b>			
<b>Flight Assignment:</b>	NOTE: Extended to 9/01/2017 per NSSC information (Ed., 8/24/17) NOTE: Element change to Human Factors & Behavioral Performance; previously Behavioral Health & Performance (Ed., 1/17/17) NOTE: Extended to 7/31/2017 per NSSC information (Ed., 5/5/16)		
<b>Key Personnel Changes/Previous PI:</b>	June 2014 report--Added collaborator: Mathias Basner. June 2016 report--Added collaborators: Jay Buckey, Abigail Fellows, Raphael Rose. Added project manager: Bryan Caldwell.		
<b>COI Name (Institution):</b>	Hunter, Jean ( Cornell University )		
<b>Grant/Contract No.:</b>	NNX13AM78G		
<b>Performance Goal No.:</b>			
<b>Performance Goal Text:</b>			

<b>Task Description:</b>	<p>HI-SEAS (Hawaii Space Exploration Analog and Simulation) is a habitat on an isolated Mars-like site on the Mauna Loa side of the saddle area on the Big Island of Hawaii at approximately 8200 feet above sea level. HI-SEAS is unique, in addition to its setting in a distinctive analog environment, as: - we select the crew to meet our research needs (in serendipitous analogs, such as Antarctic stations, crew selection criteria are not controlled by researchers); - the conditions (habitat, mission, communications, etc.) are explicitly designed to be similar to those of a planetary exploration mission; - the site is accessible year round, allowing longer duration isolated and confined environment studies than at other locations; - the Mars-like environment offers the potential for analog tasks, such as geological field work by human explorers and/or robots. The ability to select crew members to meet research needs and isolate them in a managed simulation performing under specific mission profiles makes HI-SEAS ideal for detailed studies in space-flight crew dynamics, behaviors, roles, and performance, especially for long-duration missions. To take advantage of this capability, the research in this proposal addresses the Integrated Research Plan (IRP) Gap Team1: "We need to understand the key threats, indicators, and life cycle of the team for autonomous, long duration and/or distance exploration missions." In particular, we will conduct a ground-based investigation to measure and track the factors expected to have significant impacts on team function and performance, and assess that impact, over three high-autonomy missions of differing durations (four, eight, and twelve months). During crew selection for each mission we will measure participants' cognitive capacities, communication skills, preferred communication strategies, interpersonal strategies, coping strategies, mission and crew role specific knowledge, and planning and collaborative problem solving ability. During the missions we will monitor crew communication, communication strategies, crew coping strategies, crew work load and job sharing, and conflict resolution and conflict management, as well as taking several measures of crew performance. Finally, we will examine how each of the factors affects crew performance during the missions. Our goals are: 1. To measure key factors that may contribute to crew function and performance over three high-autonomy missions of varying length. 2. To assess the impact of these factors on crew function and performance. 3. To assess the relative impact of these factors for different duration missions. 4. To suggest potential countermeasures (e.g., crew selection strategies) and interventions (e.g., responses to deteriorating crew cohesion) to maximize crew function and performance.</p>
<b>Rationale for HRP Directed Research:</b>	
<b>Research Impact/Earth Benefits:</b>	<p>The ability to track team cohesion, process, and performance could benefit other teams in long-duration isolated and confined environments (e.g., military deployments, Antarctic winter-over crews).</p>
<b>Task Progress:</b>	<p>We have conducted five long-duration analog missions at HI-SEAS (two 4-months, two 8-months, and one 12-months in length), three under this grant. The third of the missions covered by this grant was twelve months in duration and finished in August 2016.</p> <p>Nine sub-studies were completed:</p> <ul style="list-style-type: none"> <li>- Development of an Objective Behavioral Assay of Cohesion to Enhance Composition, Task Performance, and Psychosocial Adaptation in Long-Term Work Groups (Roma)</li> <li>- Consideration of Conflict Management Approach Behaviors as Possible Indicators of Cohesion Decrements in Teams Operating in Isolated, Confined Extreme Environments over Long Duration (Bedwell)</li> <li>- Measuring, Monitoring, and Regulating Teamwork for Long Duration Missions (Kozlowski)</li> <li>- AD-ASTRA (Automated Detection of Attitudes and States through Transaction Recordings Analysis) at HI-SEAS (Wu)</li> <li>- ANSIBLE (A Network of Social Interactions for Bilateral Life Enhancement) at HI-SEAS (Wu and Schmer-Galunder)</li> <li>- HI-SEAS Geology Tasks Crew Performance Analysis (Shiro)</li> <li>- Autonomous Stress Management and Resilience Training for Optimal Performance (SMART-OP): HI-SEAS Implementation (Rose)</li> <li>- Autonomous Behavior Health Countermeasures for Spaceflight: Evaluation at HI-SEAS (Buckey)</li> <li>- Cognitive Performance in Long-Duration Mars Simulations at HI-SEAS (Bassner)</li> </ul> <p>The three missions covered by this grant added up to 24 months of analog mission operations, collecting data under the above nine core sub-studies (as well as additional opportunistic research not reported here). We are still in the process of analyzing data within sub-studies, and integrating results across them.</p>
<b>Bibliography Type:</b>	Description: (Last Updated: 09/09/2022)
<b>Abstracts for Journals and Proceedings</b>	<p>Roma PG, Waggoner LB, Hienz RD, Binsted K, Hursh SR. "Cooperation, Cohesion, and 'Social Personality' in Isolated, Confined, and Extreme Environments." Presentation at 2017 NASA Human Research Program Investigators' Workshop, Galveston, TX, January 23-26, 2017.</p> <p>2017 NASA Human Research Program Investigators' Workshop, Galveston, TX, January 23-26, 2017. , Jan-2017</p>
<b>Abstracts for Journals and Proceedings</b>	<p>Shiro B. "HI-SEAS as a Testbed for Living and Working on Other Worlds." International Moonbase Summit, Waikoloa, HI, October 1-5, 2017.</p> <p>International Moonbase Summit, Waikoloa, HI, October 1-5, 2017. , Oct-2017</p>
<b>Abstracts for Journals and Proceedings</b>	<p>Shiro B, Rowland S, Bleacher J, Garry WB, Whelley P, Schmerr N. "Geophysical mapping of a lava tube cave on Mauna Loa volcano, Hawai'i." GSA Cordilleran Section Meeting, Honolulu, HI, May 23-25, 2017.</p> <p>GSA Cordilleran Section Meeting, Honolulu, HI, May 23-25, 2017. , May-2017</p>
<b>Abstracts for Journals and Proceedings</b>	<p>Anderson A, Cowan D, Fellows A, Binsted K, Hegel M, Buckey J. "Autonomous Behavioral Health Countermeasures: Virtual Space Station." 2017 NASA Human Research Program Investigators' Workshop, Galveston, TX, January 23-26, 2017.</p> <p>2017 NASA Human Research Program Investigators' Workshop, Galveston, TX, January 23-26, 2017. , Jan-2017</p>

Abstracts for Journals and Proceedings	Bedwell WL, Roma PG, Fletcher KA. "Long Duration Space Exploration: Does Cohesion Matter?" Presentation at the 32nd Annual Conference of the Society for Industrial and Organizational Psychology, Orlando, FL, April 27-29, 2017. 32nd Annual Conference of the Society for Industrial and Organizational Psychology, Orlando, FL, April 27-29, 2017. , Apr-2017
Abstracts for Journals and Proceedings	Binsted K, Basner M, Bedwell WL, Bishop S, Caldwell B, Chang D, Hunter J, Kozlowski SWJ, Roma PG, Shiro B, Wu P. "Investigations at HI-SEAS Into Team Function and Performance On, and Crew Composition For, Long Duration Exploration Missions." Poster session at 2017 NASA Human Research Program Investigators' Workshop, Galveston, TX, January 23-26, 2017. 2017 NASA Human Research Program Investigators' Workshop, Galveston, TX, January 23-26, 2017. , Jan-2017
Abstracts for Journals and Proceedings	Bleacher J, Shiro BR, Young KE, Rowland SK, Wilson EL, DiGregorio J, Caldwell BJ, Binsted K, Glotch T. "EVA Science at the HI-SEAS Planetary Analog Site in Hawai'i: Balancing Field Objectives during Long Duration Missions." NASA Exploration Science Forum, Moffett Field, CA, July 18-20, 2017. NASA Exploration Science Forum, Moffett Field, CA, July 18-20, 2017. , Jul-2017
Abstracts for Journals and Proceedings	Bleacher J, Shiro BR, McAdam A, Young KE, Johnson S, Garry WB, Whelley P, Rowland SK, Schmerr N, Needham D, Knudson C, Andrejkovicova S, Binsted K, Caldwell BJ, Glotch T. "Studies of Young Hawaiian Lava Tubes: Linking Geophysics, Geochemistry, Mineralogy and Habitability in Basaltic Subsurface Environments on Mars." 48th Lunar and Planetary Science Conference, The Woodlands, TX, March 20-24, 2017. 48th Lunar and Planetary Science Conference, The Woodlands, TX, March 20-24, 2017. Abstract 2634. , Mar-2017
Abstracts for Journals and Proceedings	Cowan D, Anderson A, Buckley J, Fellows A, Binsted K, Love R. "Evaluation of Virtual Nature for Relaxation in Isolated, Confined Environments." 88th Aerospace Medical Association Annual Meeting, Denver, CO, April 30-May 4, 2017. 88th Aerospace Medical Association Annual Meeting, Denver, CO, April 30-May 4, 2017. , Apr-2017
Articles in Peer-reviewed Journals	Anderson AP, Fellows AM, Binsted KA, Hegel MT, Buckley JC. "Autonomous, computer-based behavioral health countermeasure evaluation at HI-SEAS Mars Analog." Aerospace Medicine and Human Performance. 2016 Nov;87(11):912-20. <a href="https://dx.doi.org/10.3357/AMHP.4676.2016">https://dx.doi.org/10.3357/AMHP.4676.2016</a> ; PubMed PMID: 27779949 , Nov-2016
Articles in Peer-reviewed Journals	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. <a href="https://doi.org/10.1016/j.actaastro.2019.05.049">https://doi.org/10.1016/j.actaastro.2019.05.049</a> , Sep-2019
Articles in Peer-reviewed Journals	Wu P, Morie J, Wall P, Ott T, Binsted K. "ANSIBLE: Virtual reality for behavioral health." Procedia Eng. 2016;159:108-11. Available online Sept 2016. <a href="https://doi.org/10.1016/j.proeng.2016.08.132">https://doi.org/10.1016/j.proeng.2016.08.132</a> , Sep-2016
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. <a href="https://doi.org/10.1016/j.hrmr.2017.08.005">https://doi.org/10.1016/j.hrmr.2017.08.005</a> , Dec-2018
Articles in Peer-reviewed Journals	Lyons KD, Slaughenaupt RM, Mupparaju SH, Lim JS, Anderson AA, Stankovic AS, Cowan DR, Fellows AM, Binsted KA, Buckley JC. "Autonomous psychological support for isolation and confinement." Aerosp Med Hum Perform. 2020 Nov;91(11):876-85. <a href="https://doi.org/10.3357/AMHP.5705.2020">https://doi.org/10.3357/AMHP.5705.2020</a> ; PMID: 33334408 , Nov-2020
Articles in Peer-reviewed Journals	Anderson A, Stankovic A, Cowan D, Fellows A, Buckley J Jr. "Natural scene virtual reality as a behavioral health countermeasure in isolated, confined, and extreme environments: Three isolated, confined, extreme analog case studies." Hum Factors. 2022 May 23;187208221100693. <a href="https://doi.org/10.1177/00187208221100693">https://doi.org/10.1177/00187208221100693</a> , May-2022
Books/Book Chapters	Roma PG, Bedwell WL. "Key factors and threats to team dynamics in long-duration extreme environments." in "Research on Managing Groups and Teams (Vol. 18), Team Dynamics Over Time: Advances in Theory, Methods, and Practice." Ed. E. Salas, W.B. Vessey, L.B. Landon. Bingley, UK: Emerald Publishing Limited, 2017. p. 155-187. <a href="https://doi.org/10.1108/S1534-085620160000018007">https://doi.org/10.1108/S1534-085620160000018007</a> , Jul-2017