

<b>Fiscal Year:</b>	FY 2014	<b>Task Last Updated:</b>	FY 06/08/2014
<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>	07/31/2016
<b>No. of Post Docs:</b>		<b>No. of PhD Degrees:</b>	0
<b>No. of PhD Candidates:</b>	1	<b>No. of Master' Degrees:</b>	0
<b>No. of Master's Candidates:</b>	0	<b>No. of Bachelor's Degrees:</b>	0
<b>No. of Bachelor's Candidates:</b>	1	<b>Monitoring Center:</b>	NASA JSC
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<b>Flight Program:</b>			
<b>Flight Assignment:</b>			
<b>Key Personnel Changes/Previous PI:</b>	June 2014 report--Added collaborator: Mathias Basner.		
<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>	<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</p>		

Task Description:	<p>crew dynamics, behaviors, roles, and performance, especially for long-duration missions. To take advantage of this capability, the research in this proposal addresses the 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>
Rationale for HRP Directed Research:	<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>
Research Impact/Earth Benefits:	<p>At the time of submission of this report (06/2014) we are halfway through the first of three HI-SEAS missions supported by this grant. Here we report progress on various aspects of the project.</p> <p>Habitat upgrades: The HI-SEAS habitat was upgraded (at no additional cost to the grant) to include a robust array of solar panels and an H2 fuel cell. Although there is also a small backup gasoline generator, it was only used in the first few weeks of the mission, before the fuel cell came online (and even then rarely). We have also added another 500 gallons of water-holding capacity, and replaced the regular toilets with high-capacity composting toilets. These measures have reduced the frequency of site servicing from 1-2 times per week to two times per month, which in turn helps maintain the isolation of the crew.</p> <p>Crew selection: In late 2013, we began recruiting crew members for the three upcoming missions. Approximately 150 applications were received. Of these, about 120 met the basic requirements for participation. Based on education, professional background, and experience, these were down-selected to about thirty interviewees for the first mission. Interviewees were asked to complete psychological screening tests. Based on the interviews (conducted remotely) and screening, nine applicants were selected. These nine were asked for Class 2 flight medicals, and were also asked to conduct pairwise mutual interviews, and provide feedback on their potential crew members. Based on all the material collected, six crewmembers were selected in December 2013, and the remaining three became reserves.</p> <p>Mission support: Mission support is divided into two tiers. First tier support (FTS) members work in four-hour shifts 8am-8pm HST. FTS responds as quickly as possible (given the 20 minute latency in communications) to requests from the crew, acknowledges crew reports, and provides the crew with information (e.g. news reports, weather forecasts, requested data). FTS is also able to approve some activities, such as EVAs in the vicinity of the habitat, and escalate all other requests for approval to second tier support (STS). STS is ‘on call’ 24hrs/day, seven days per week. STS approval is required for site servicing, longer EVAs, and any activities not clearly defined by the mission rules. All mission support communications, except for emergency operations, are via a project-management system, and are subject to the 20-minute delay.</p> <p>Mission A:</p> <p>In March 2014, the first crew flew to Hawaii for a week of baseline measurements, as well as training on habitat systems, geological fieldwork, and study protocols. On March 27, the crew entered the habitat for the four-month-long mission. During the mission, the crew are collecting data on: - Cognitive function, - Team processes, - Team cohesion, - Intra-crew relationships, - Team member interactions, - Team performance.</p> <p>The crew are also carrying out several opportunistic research projects. These are not part of the research funded by this grant, but do support NASA’s goals by raising the readiness level of technologies and protocols. The opportunistic research projects on this mission include: - Evaluating anti-microbial fabrics, - Growing plants using light of varying wavelength, - Evaluating 3-D printed surgical tools, - Tracking stress and exertion on extra-vehicular activities.</p> <p>We have also begun the selection process for the next mission, which will start in October 2014 and last eight months.</p> <p>Education and public outreach:</p> <p>The crew and mission support have been very active in education and public outreach efforts. Regular updates are posted on the <a href="http://www.hi-seas.org">http://www.hi-seas.org</a> site, Facebook, and Twitter. Also, crewmembers regularly post blogs and YouTube videos chronicling their mission. They respond directly to questions from students on a regular basis. The mission has also received a great deal of national and international media attention.</p> <p>Results:</p> <p>Because this is the first year of the grant, and we are still carrying out the first mission, we do not yet have even preliminary results to report. However, the data is coming in as expected, and crew compliance with study protocols is high.</p>
Bibliography Type:	Description: (Last Updated: 09/09/2022)