

ISSMP	ASSESSMENT OF INTERNATIONAL SPACE STATION VEHICLE HABITABILITY	NHV/HAB Assessment
Principal Investigator		
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Description		
<p>Habitability and human factors concerns become more critical for long-duration space missions with autonomous crew. Inadequate design leads to reduced crew safety, introduces inefficiencies, and lowers crew satisfaction, often resulting in detriments to crew performance and possibly health. In order to ensure adequate design in terms of layout and net habitable volume (NHV), operational microgravity data is needed to document baseline conditions on the International Space Station (ISS), which will inform the Space Human Factors Engineering (SHFE) research community and be instrumental in the development and validation of standardized cost effective tools that will aid in the design of future Exploration mission vehicles and habitats.</p> <p>The purpose of this proposed study is to assess habitability on the International Space Station (ISS) in order to better prepare for long-duration spaceflight missions of the future. The current state of ISS habitability will be characterized using near real-time observations from crewmembers, periodic habitability questionnaires, crew-collected video footage, and video footage of key areas of the ISS vehicle. The footage of key ISS areas will also be used to characterize the utilization of space on ISS. As feasible, space utilization characterization will also include inputs from technological solutions such as advanced camera systems (e.g., Microsoft Kinect) and Radio-Frequency Identification (RFID). The project deliverables will include information to help prioritize and reduce research gaps, operational inputs to the Human Performance Data Repository, and data for human modeling and simulation tool development and validation. This project will help address specific research needs identified as part of HRP's 2012 Habitable Volume Workshop and Standing Review Panel comments, and may potentially enhance the current ISS human factors crew debrief processes, resulting in higher quality data with minimal impact on crew time.</p> <p>This proposal will be led by the Space Human Factors Engineering (SHFE) portfolio under the Space Human Factors and Habitability (SHFH) Element, in collaboration with the Behavioral Health and Performance (BHP) Element.</p>		
Objectives		
<p>Objective 1: Characterize the current state of ISS habitability using tools to capture data near real-time, with particular emphasis placed on areas of interest defined based on knowledge gaps, known trouble areas, and volume-driving tasks. 1a: Document/quantify details about crew task performance in a long-duration microgravity environment, including influences from the habitable environment and relationship impacts to the behavioral state of crewmembers. 1b: Determine whether mission duration leads to changes in habitability/human factors reporting by crewmembers 1c: Assess the cost versus benefit of implementing near real-time tools compared to traditional post-mission debriefs.</p> <p>Objective 2: Document/characterize details about how crewmembers currently utilize the space on ISS, with particular emphasis placed on areas of interest defined based on knowledge gaps, known trouble areas, and volume-driving tasks. 2a: Quantify time spent by crewmembers at workstations/habitation areas 2b: Collect naturalistic data (i.e. observation of subjects in their natural environment) to document movement of crewmembers throughout ISS (e.g., frequency of translations between locations) 2c: Collect evidence to use toward validating estimates of required volume for performance of volume-driving tasks 2d: Capture changes in strategies for crew tasks such as translation, stowage handling, etc. throughout the course of the mission.</p>		
Relevance		
<p>The One Year ISS mission provides a unique opportunity for habitability and human factors researchers to collect ISS utilization data, observing and documenting impacts of long-duration spaceflight on how the crewmembers perform their activities in an operational microgravity environment. This type of operational field data will be critical in future habitability and human factors research and analyses, including a planned future solicitation to develop a computational model to determine habitable volume needs based on mission properties, and a current Phase 2 SBIR project to develop a computer-based video analysis tool.</p>		
BDC Summary		
No pre-flight baseline data are required for this study.		
In-flight Operations Summary		

Data collection will include: once weekly or bi-weekly scheduled crewmember use of iSHORT to document observations (e.g., software interface issues, team dynamics) with optional use as needed; once monthly or bi-monthly scheduled video recording of crewmembers to document task details (e.g., work flow, required volume) and/or habitat walk-throughs to document crewmember observations (e.g., layout concerns); early, middle, and late mission scheduled video recording of specific translation paths, work areas, or tasks to document space utilization details (e.g., translation strategies, work postures); and early, middle, and late mission scheduled on-orbit debriefs using habitability and human factors questionnaires to capture data similar to that currently collected during post-mission debriefs. All data will be collected using existing ISS hardware, including iPads that are currently aboard ISS, so no up mass is anticipated.

Subject Selection/Participation Criteria

No participation criteria. International crew participation is desired.