

IAF SPACE SYSTEMS SYMPOSIUM (D1)
Space Systems Engineering - Methods, Processes and Tools (2) (4B)

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IMPLEMENTATION OF HUMAN SYSTEM INTEGRATION WORKSHOP AT NASA FOR HUMAN
SPACEFLIGHT

Abstract

The human is a key element in the complex system-of-systems underlying space exploration missions. As a critical system, its operating bands and requirements need to be characterized and integrated with other systems. Optimal integration of the human system with hardware and software elements has an impact on multiple aspects of mission execution, including human health and performance, risk mitigation, effective design and functionality, enhanced safety, and reduced life cycle costs. The field of Human Systems Integration (HSI) represents an interdisciplinary and comprehensive cross-cutting approach encompassing technical and management processes for integrating human-as-a-system considerations and objectives within and across all other system components and multiple domains. In addition to human activities, HSI covers training, operations and support dimensions. Moreover, HSI is an essential enabler to systems engineering practice, emphasizing human system aspects toward optimizing fully integrated system-of-systems performance while systematically infusing the needs of all users into the earliest stages of development. Consistent with the National Space Exploration Campaign, NASA is developing the Gateway, a lunar orbiting platform that will serve as astronaut habitat, support transit to deep space, validate new technologies and systems, and function as science laboratory and communications hub, among other uses. It is an essential element of a phase that will extend human exploration into deep space through evolvable infrastructure and advanced technology, supporting assembly and logistics of other exploration architecture elements. In an effort to explore the current status and forward plan of

HSI implementation in the mission (system-of-systems) life cycle, the HSI Employee Resource Group is conducting a workshop using the Gateway as a case study. It will reveal how different organizations at the Johnson Space Center are incorporating HSI in their processes in preparation for development and operation of the Gateway. The workshop focuses on HSI methodology for the six NASA HSI domains (functional areas): Human Factors Engineering, Operations Resources, Habitability and Environment, Maintainability and Supportability, Safety, and Training. Results from the workshop are reported on this paper, which are provided as recommendations of methods to verify and validate HSI requirements for Gateway, and will be used to disseminate best practices for translational applications to other space exploration systems.