HSI&E HUMAN SYSTEMS INTEGRATION & ENGINEERING

National Aeronautics and Space Administration

The Human Systems Integration and Engineering (HSI&E) team supports the development of space flight and ground processing hardware at MSFC. The team is responsible for Human Factors Engineering and Integrated Logistical Supportability and Sustainability as a part of the Human Systems Integration Plan for MSFC programs and projects. The team has a large role in determining and levying appropriate HSI requirements on hardware fabricated and/or used by MSFC. Integrated Logistics Support Plans are also developed to ensure projects have a design that supports mission objectives and can be maintained throughout the mission lifecycle. Additionally, the HSI&E team is responsible for verifying that designs and operations of that hardware meet the established requirements set. These functions are all focused to influence design to save cost and schedule and ensure mission success.

This work includes:

- Human Systems Integration Plans
- Worksite analyses for the design and use of SLS Ground Support Equipment (GSE)
- Worksite analyses for SLS pre-launch integration activities
- Virtual Reality (VR) assessments of hardware designs to identify areas for potential improvement
- Support to projects developing new technology
- Verification of HFE requirements
- Evaluation of concepts introduced by the Advanced Concepts Office (ACO)
- Integrated Logistics Support Plans
- Maintainability Analyses

Human Factors Engineering Assessments



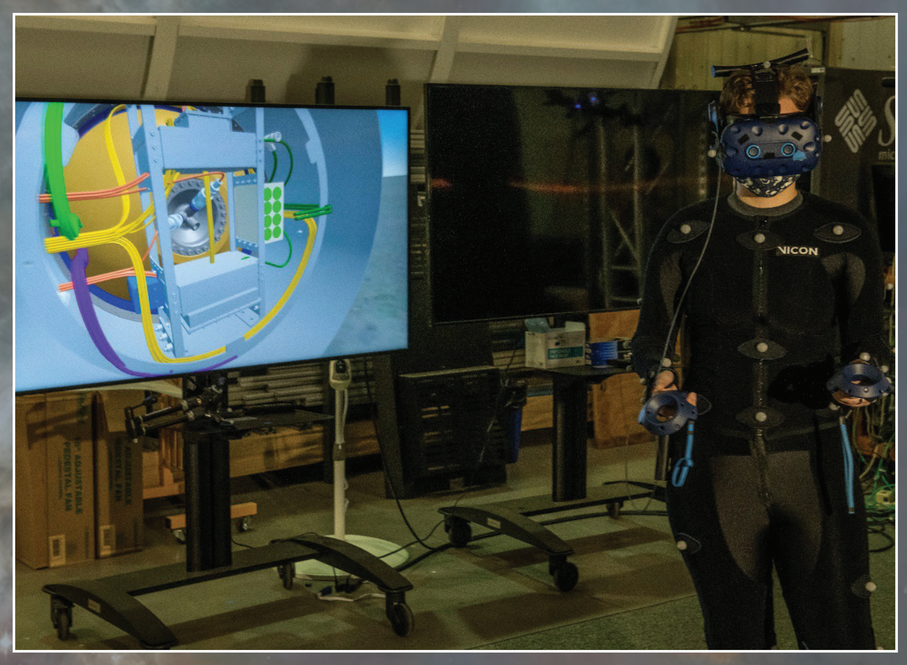
Full Mockup Fabrication

The fabrication shop and 3D printers are used to build physical mockups to aide in HFE assessments on a design. These range from smaller part-task mockups to full scale volumetric mockups.



Process Simulate Human (PSH)

PSH is a human modeling and simulation tool that provides the ability to quickly assess designs. It allows the simulation of a range of anthropometric human manikins, as well as assessing tool fit and function.



Virtual Environment Lab (VEL)

The VEL utilizes multiple extended reality devices such as virtual reality, augmented reality, motion capture, and haptic feedback gloves to aide in HF assessments.

Integrated Logistics

The Integrated Logistics team scope and capabilities include supportability and logistics requirements development, planning, design influence for sustainment, analysis, and assessment of flight and ground program and project systems for all life cycle phases, including Design Development Testing and Evaluation (DDT&E), launch site assembly and integration activities, sustainment operations, and disposal. It incudes the definition of logistics planning and implementation for the system and environment. Logistics support includes GSE and can include lunar surface, planetary and long duration space mission hardware.

Specific Capabilities for Logistics Planning Include:

- Development and Implementation of Logistics Solutions
- Logistics Process Design
- Supportability Design Influence
- Logistics Engineering
- Maintenance Concepts, Planning, Procedures, and Trend Analysis
- Logistics Support Assessments and Analysis
- Labeling and Part Marking Concepts
- Labeling and Part Making Requirements, implementation and maintenance
- Logistic Modeling and Analysis Tools
- Logistics Sustaining Engineering Requirements
- Program/Project Guidance, Insight and Oversight
- Integrated Assessment of all Integrated Logistics Support (ILS)

Capabilities for Integrated Logistics Support (ILS) Include:

- System/ Design Interface
- Maintenance Planning
- Manpower and Personnel
- Supply Support
- Support Equipment
- Technical Data
- Training and Training Support
- Computer Resources Support
- Facilities
- Packaging, Handling, Storage and Transportation (PHS&T)

Integrated Product Support (IPS) Tenants to Include:

- Design Interface
- Maintenance Planning
- Manpower and Personnel
- Supply Support
- Support Equipment
- Packaging, Handling, Storage and Transportation (PHS&T), and Disposal
- Training and Training Support
- Computer Resources Support
- Facilities
- Support Equipment
- Technical Data

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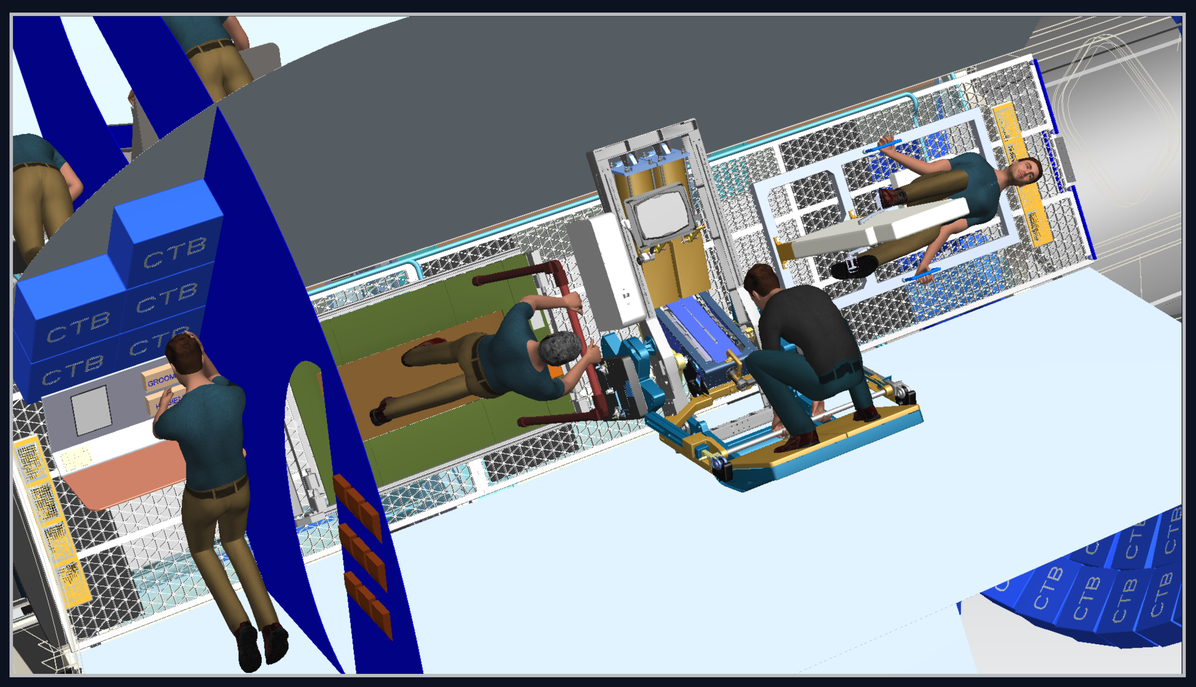
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HABITATS

EV74 HSI&E has been in the forefront of habitation development in collaboration with Habitation Systems Development Office (HP40) and the Advanced Concepts Office (ED04). The team has analyzed various habitation designs utilizing human factors engineering principles such as worksite design analysis.



















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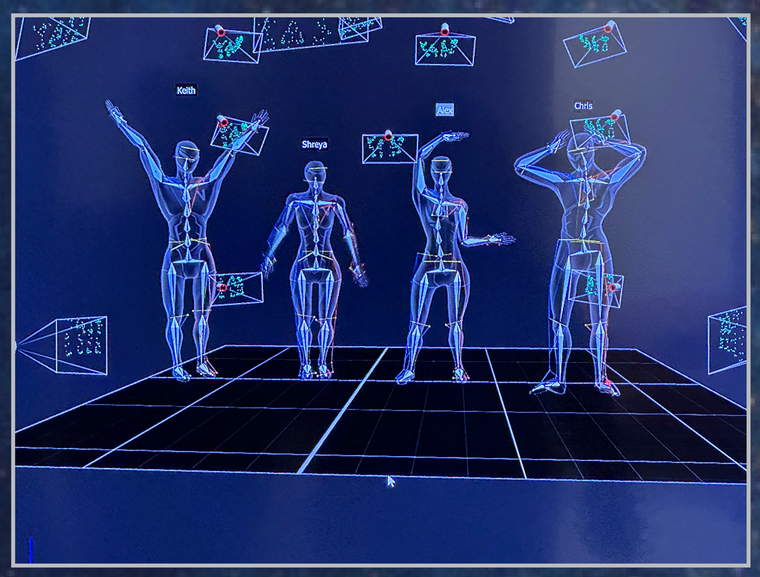
VIRTUAL ENVIRONMENTS LAB



The Virtual Environments Lab (VEL) plays an important role in developing cost effective human factors engineering (HFE) solutions. Virtual Simulation reduces physical mockup iterations, increases productivity through collaboration, and improves fidelity and quality of analyses. These findings provide early design influence, saving project cost and schedule.



Virtual Reality (VR) allows users to conduct analyses and interact with 3D models in a virtual environment. This can be combined with other tools like motion capture, physical mockups, and augmented reality to improve the fidelity of an assessment.



Human motions are tracked and recorded in real-time, generating a wireframe skeleton that is applied to a manikin within a virtual environment. This allows human participants to safely perform and evaluate a wide variety of operations tasks prior to fabrication.



Human motion capture used in conjunction with human factors analysis software is important for verifying worksite design such as reach access, visual access, and tool clearance for ground support personnel. The analysis is also integral to the design of special tools, aids and platforms, and optimizing safe ground operations.

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