Overview of Human Factors and Habitability at NASA

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Focus of Human Factors and Habitability

How can equipment, spacecraft design, tools, procedures, and even nutrition be used to improve the health, safety, and efficiency of crewmembers? Can variables such as work scheduling, sleep cycles, leisure time, and communication be modified to improve team performance in the space environment?

These are the kinds of questions addressed by researchers in the Human Factors and Habitability program. Taking into consideration the unique challenges posed by the space environment, HRP scientists and engineers, along with other experts, focus on refining every aspect of a crew member’s equipment, gear, food, and interior environments in order to improve safety and maximize performance.

As future missions take crewmembers deeper into space and require longer stays in the space environment, the HRP’s human factors and habitability research will move towards addressing the challenges of long-term space travel and habitation. Future space missions are likely to uncover many new issues and areas of study for HRP researchers and engineers.
The Constellation Program is comprised of 7 Projects

- Ares – Launch Vehicles
- Orion – Crew Exploration Vehicle
- Extravehicular Activities
- Mission Operations
- Ground Operations
- Altair
- Lunar Surface Systems
Transport 4 crew on Orion for crew rotation
Emergency lifeboat for ISS crew
Deliver pressurized cargo for ISS resupply
Orion Crew Module – Configuration and Development

Internal layout of crew functional areas
Seat layout
Acoustic/noise modeling
Displays and controls design
Usability of the environment
Hatch design development/dimension
Orion Translation and Hatch Development

Orion hatch and tunnel ingress/egress
The Lunar Lander - Altair

Cruise configuration to the Moon: Orion will orbit while lander descends to the surface.

Lander descent stage remains and ascent stage rejoins with Orion.
The Lunar Lander - Altair

Internal configuration concepts
Altair – Interior Configuration for 4 Crew

Internal configuration concepts
Altair Conceptual Development and Evaluation

Mark III Suit ladder test

Altair hatch ingress/egress
Overall EVA System architecture approach provides a modular, reconfigurable, component-based, lower mass architecture, that meets various mission objectives.
Lunar Electric Rover Design Development
LER Conceptual Design and Field Evaluations

Concept mockups and low-fidelity models
Concepts fabricated to take to field testing
Lunar Electric Rover Window Conceptual Design

Concept mockups and low-fidelity models
For visual capability determination and window design/placement
The Lunar Electric Rover
Lunar Surface System Infrastructure
Inflatable Technology Concepts
Family Portrait of Us......\textit{All of Us}

Kaguya Spacecraft 2008 – 1\textsuperscript{st} high definition TV camera
First Japanese lunar mission
“We leave as we came and, God willing, as we shall return, with peace and hope for all mankind.”

Eugene Cernan,
Commander of the last Apollo Mission