National Aeronautics and Space Administration

Johnson Space Center

HUMAN HEALTH AND PERFORMANCE

Exploring Space | Enhancing Life

Human Exploration Research Analog (HERA)

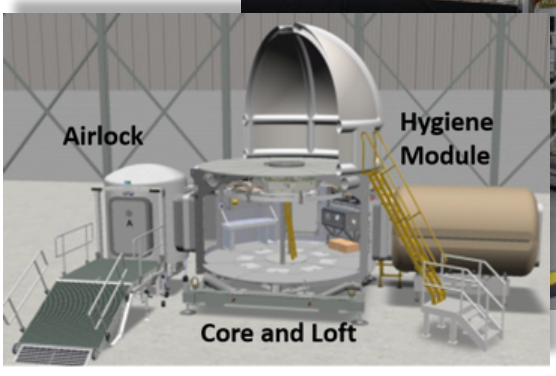
Human Exploration Research Analog (HERA) is a unique three-story habitat designed to serve as an analog for isolation, confinement, and remote conditions in exploration scenarios.

World Renowned Skills and Unique Capabilities

The HERA is an analog environment used to emulate an exploration-like habitat or spacecraft that provides the conditions of isolation, confinement and remote operations for up to four crewmembers. HERA currently supports the implementation of research selected by the Human Research Program (HRP); it is operated by the Flight Analogs (FA) team within the Research Operations and Integration (ROI) element. The FA team develops mission scenarios and conditions analogous to those anticipated for exploration missions, enabling a realistic and immersive flight-like environment. The use of high fidelity ground analogs enables the conservation of spaceflight resources while expeditiously and efficiently addressing research questions for future human exploration missions.

HERA implements research in campaigns; a campaign is defined as one integrated science protocol with one primary mission scenario consisting of multiple missions in order to meet study subject requirements. Studies designed to utilize the HERA capabilities are integrated with other investigations on a non-interference basis and run together as one integrated science complement.

Planned mission durations may range from 7 days up to 45 days. The HERA planning schedule currently anticipates four missions within a year (approximately one per quarter) of 45-day duration, each with 4 persons serving as crewmembers.



HERA Features

The HERA is a two-story, four-port habitat unit residing in Building 220 at NASA Johnson Space Center (JSC). It is cylindrical with a vertical axis, and connects to a simulated airlock and hygiene module (Figure 1). The total space comprises 148.6 m3 or 636 sq. ft., distributed as follows: core (56.0 m3) or 187 sq. ft., loft (69.9 m3) or 349 sq. ft., airlock (8.6 m3) or 42 sq. ft., and hygiene module (14.1 m3) or 58 sq. ft.

HERA facility capabilities include a network that allows electronic research data collection, storage, and distribution, and voice communications between the crew and mission control personnel located in Building 220. The research data can be securely accessed remotely by investigators in real-time or near real-time though a JSC-based data storage capability. HERA has a surveillance video system for monitoring crew safety and compliance, flight-like voice communication system, flight-like timeline and procedure viewer to provide a space mission experience.

The HERA represents an analog for simulation of isolation, confinement and remote conditions of exploration mission scenarios. Studies suitable for this analog may include, but are not limited to behavioral health and performance assessments, communication and autonomy studies, human factors evaluations, human health countermeasures, and exploration medical capabilities assessments and operations.

The ROI Flight Analogs team defines a set of conditions and capabilities that are the baseline for operations within HERA. Researchers may propose modifications to any of these parameters; such proposed modifications are evaluated for feasibility by the Flight Analogs team.

Selected Capabilities

- Mission Control Center (MCC) for real-time interaction with HERA crew members
  - 24/7 mission video surveillance with audio, recorded during mission
  - Communication delay, voice and/or text, up to 20 minutes each way
  - Simulation of Acquisition of Signal/Loss of Signal of varying duration
- Individual crew sleeping quarters for 4 crewmembers
- HERA-provided Windows-based laptops and iPADs for each crewmember for investigator data collection.
- Flight Simulators to support an exploration mission scenario
- Virtual reality simulation for simulated EVA tasks
- Biological sample collection pre, during and post mission
- Medical Workstation (Remote medical procedures and examinations)
- Adjustable LED lighting on L2
- Simulated stowage module (pass through for hardware, biological samples, and trash)
- Modifiable virtual window views
- Exercise equipment (aerobic and resistive) to simulate daily operational activities.
- Heart Rate Monitor to support exercise or research
- Actigraphy
- Simulated Environmental Control and Life Support System (ECLSS)
- 3D printer to support vehicle maintenance and operational tasks
- Flight-similar galley capabilities for preparing meals (plumbed water supply)
- Shower/sink with hot and cold running water for crew hygiene

For more information:
NASA HERA
www.nasa.gov/analogs/hera

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