National Aeronautics and
Space Administration

Space Analog Environments

Analogs are designed to solve the unique challenges of living and working in extreme environments. Johnson Space Center (JSC) provides advanced concepts to NASA and the external community using human factors as a design tool to develop products, systems, and architecture. The team assures successful human habitation and performance in space through the development of early and iterative conceptual designs, models and mockups of habitation systems, and hardware and architectural concepts. JSC provides realistic surface analog environments to evaluate major systems through integrated systems testing involving cargo and human lunar landers, lunar habitats, unpressurized and pressurized rovers, other robotic systems, Extravehicular Activity (EVA) test subjects, intravehicular activity and EVA tools and repair equipment, and scientific sample collection equipment. JSC also provides capability to simulate reduced gravity environments, such as lunar, Martian, or microgravity. Reduced gravity simulation can be utilized for testing, development, and training for both human and hardware applications.

Services Provided

- Design and development of low-to-medium fidelity full-scale mockups of space vehicles and habitats.
- Surface operation studies
- Space suit and vehicle requirements development
- Space suit and vehicle design evaluation
- Training with both space suited and shirtsleeved participants
- Offloading weight of humans, rovers, and robots

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Vehicles and Habitats

Mockup Development Facility

The facility provides for development of low-to-medium fidelity full-scale mockups of space vehicles and habitats. Mockups developed include a horizontal axis cylindrical habitat module, toroidal habitat module, lander translation tunnel test article, descent stage mockup, and a vertical axis cylindrical habitat demonstration test article. Testing of these mockups can be performed in place at JSC or can, in some cases, be performed at analog field test sites or in reduced-gravity aircraft.

20-Foot Chamber

The 20-Foot Chamber is a vacuum chamber with an airlock and a rapid decompression chamber. The volume is divided into three levels by non-pressure-bearing floors, which provide atmospheric isolation. Chamber configurations can support both long-duration human habitability and testing of life support equipment and systems.

Space Analog Environment

Desert Research and Technology Studies (Desert RATS)

Desert RATS is a NASA-led team of research partners working together to prepare for human-robotic exploration. The Desert RATS field test activity is the culmination of the year-long technology and operations development efforts of various individual science and advanced engineering discipline areas into a coordinated field test demonstration under representative (analog) planetary surface terrain conditions. The purpose of the RATS effort is to drive out preliminary exploration operational concepts for system requirements by providing hands-on experience with simulated planetary surface exploration hardware and procedures.

Planetary Analog Test Site

The Planetary Analog Test Site (a.k.a. Rock Yard) provides a large multi-acre test area that simulates general features of the lunar and Martian surface terrain environment consisting of various slopes, grades, simulated craters, and strewn rock field conditions.

Reduced Gravity Environment

Active Response Gravity Offload System (ARGOS)

ARGOS is designed to simulate reduced gravity environments, including lunar, Martian, and microgravity. A continuous vertical offload of a portion of a subject's weight is maintained by a motion control system that follows the subject's motion within the facility's operational volume. The facility is capable of offloading the weight of humans (both in shirtsleeves and space suits), rovers, and robots for testing in simulated reduced gravity environments.

Air Bearing Floor (ABF)

The ABF or "flat floor" is a 70' x 98' epoxy surface designed to support rendezvous and contact testing that requires low friction movement of test articles along a flat surface. Test articles are mounted on perforated pads that distribute a cushion of compressed air between the pads and the floor. The test articles "ride" on the air cushion and do not contact the floor.

We have developed customer-friendly agreements to streamline business relationships and are eager to share our unique facilities and expertise with new customers. We invite your inquiries regarding application or adaptation of our capabilities to satisfy your special requirements. Briefings on general or specific subjects of mutual interest can be arranged at JSC or at your business site.

Facility Testing Information
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