Lunar Surface Science Workshop
Integrating Science into Artemis

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National Aeronautics and Space Administration

Human Landing System Program

Overview & Update

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www.nasa.gov

HLS Uncrewed Demo

SpaceX Starship

2024

Artemis III

SpaceX Starship

2025

Artemis IV

SpaceX Starship

2028

HLS Uncrewed Demo

Blue Origin
Blue Moon

2028

Artemis V

Blue Origin
Blue Moon

2029

Human Landing System (HLS)

STARSHIP

NASA has awarded two contracts to SpaceX:

- Artemis III – develop its HLS Starship for use on Artemis III, the mission that will put the next two Americans on the surface of the Moon docking with Orion
  - SpaceX Uncrewed Lunar Demo
  - SpaceX Crewed Lunar Demo (Artemis III)
- Artemis IV – Further develop the HLS Starship to an extended set of requirements longer surface duration, docking with Gateway
  - SpaceX Crewed Lunar Demo-B (Artemis IV)

Image Credit: SpaceX


SPACEX


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BLUE MOON

Human Landing System (HLS)

NASA awarded Blue Origin a contract to develop a human landing system built to meet NASA's plans for regularly occurring, long-term access to the lunar surface.

The contract includes one uncrewed demonstration mission and one crewed demonstration mission (Artemis V).

The team's architecture consists of **Blue Origin's** Blue Moon lander and **Lockheed Martin's** Cislunar Transporter as well as:

- **Draper** - guidance software and analysis on the lunar lander; developing pilot simulator and training system
- **Boeing** - active docking adapter for the integrated lander; engineering design; mission support operations
- **Astrobotic** - cargo accommodation system; landing sensor maturation; mission operations
- **Honeybee Robotics** - motion control systems and robotics

Image Credit: Blue Origin

HLS Utilization Payload Team

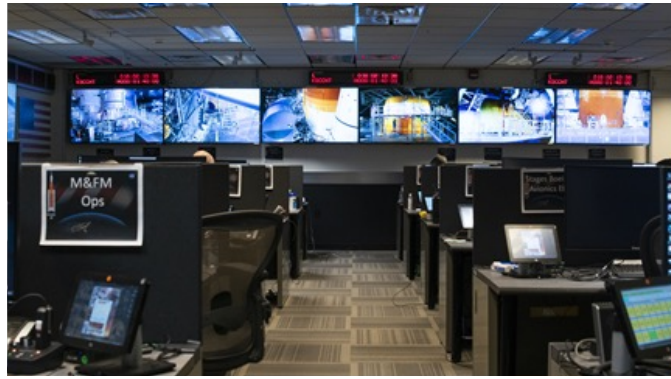
*"**Utilization**" encompasses **science**, **tech demos**, **human research**, and **ISRU***

HLS's Utilization Payload Team supports **all aspects of utilization payload integration** with lander providers.

- **Advocates for utilization payloads** to the HLS Program
- **Engages with the science and research community** on payload development
  - Interfaces with the Artemis Internal Science Team (SMD)
  - HLS will assign a POC to work directly with each payload
  - Provides support for payload feasibility assessments
- **Develops payload interface requirements**, both on the vehicle and payload sides of the interface
  - Works interoperable payload interface requirements with other Artemis programs via the Utilization Interoperability Working Group
  - Works with HLS providers on interpretation of requirements and development of interfaces
- **Supports Moon to Mars Office and cross-program activities** relating to utilization payloads
  - Development of payload interface requirements, integration agreements, and integration processes
- **Provides support for payload operations**
  - Science and mission planning, training, procedure development, ground operators

Huntsville Operations Support Center (HOSC)

- Serves as a 24/7/365, multi-mission, ground systems operations facility
- Provides user-oriented, highly reconfigurable services
- Provides secure and centralized gateway services and communications infrastructure to a globally dispersed user community
- Offers custom solutions to your mission requirements
- Can support dynamic operations through five Configurable Control Room
  - Lander Engineering Support Area (LESA)
  - Lunar Utilization Control Area (LUCA)



HOSC-supported programs with significant relevance to HLS:

- International Space Station — Payload Ops, Planning, Data & Communications
- Space Launch System — Mission Management Support, Engineering Support, Data & Communications
- Commercial Crew Program — Mission Management & Engineering Support
- Upcoming: Gateway — Payload Ops, Planning, Data & Communications

Follow the missions

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PMOD Artemis Team Representatives

HP21	HP22	HP23	HP25	HP26	HP27
Gateway	Cross- Program	Cross- Program	Cross- Program	Gateway	Cross- Program
Erek Allen	Josh Johnson	Johnnie Berry	Ben Harper	Kevin Hargrave	Edwin Smith
HLS		EHP	Gateway	HLS	Gateway
Jason Briggs		James Reynolds	Joseph Dempsey	Jessica Ende	Jennifer Jennings
EHP					
Spenser Kockler					

**Cross-Program supports Gateway, HLS, and EHP

HOSC Payload & Mission Operations Services

Science & Mission Planning Capabilities

- Expertise in mission and payload planning through all flight phases
- Provide payload logistics during all flight phases across various delivery schedules and vehicles
- Coordination with Payload Developers to customize and execute experiment plans based on specific needs
- Integrate requirements for many experiments into a cohesive schedule of crew and ground activities
- Expertise in development of safe and efficient crew and ground command procedures
- Quality control on payload crew procedures to ensure tools and hardware are gathered, used, and returned in order
- Expertise in payloads display development and NASA usability standards for real-time mission execution

Science & Mission Operations Training

- Science operations curriculum development and related instructional design
- Flight and ground controller training and certification for payload and mission operations
- Remote science user, ground systems interface training on NASA tools and displays
- Critical thinking, situational awareness, and anomaly response training
- Joint, multi-partner payload operations simulations

HOSC Payload & Mission Operations Services

Payload & Mission Operations Execution

- Flexible Operations — Turnkey operations areas, connectivity to offsite locations, and ability to host customers' systems onsite
- Extensive Connectivity — Existing connections to NASA spaceflight networks and capability to expand to commercial facilities
- Safety and Security — 24/7/365 monitoring capability from a secure, reliable facility, and mission execution by operators who specialize in science mission operations
- Expertise in modern data systems, cyber security, imagery, voice, protocols and standards, etc.