Human Landing System for Lunar Exploration

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International Planetary Probe Workshop
July 11, 2019
The NASA Charge to the Moon

In keeping with SPD-1, NASA is charged with landing the first American woman and next American man at the South Pole of the Moon by 2024, followed by a sustained presence on and around the Moon by 2028.

NASA will “use all means necessary” to ensure mission success in moving us forward to the Moon.

Vice President Mike Pence speaks about NASA’s mandate to return American astronauts to the Moon and on to Mars at the U.S. Space & Rocket Center in Huntsville, Alabama.
Artemis Phase 1: To the Lunar Surface by 2024

Artemis 1: First human spacecraft to the Moon in the 21st century

Artemis 2: First humans to the Moon in the 21st century

First high power Solar Electric Propulsion (SEP) system

First Pressurized Crew Module delivered to Gateway

Artemis 3: Crewed mission to Gateway and lunar surface

Commercial Lunar Payload Services
- CLPS delivered science and technology payloads

Early South Pole Crater Rim Mission(s)
- First robotic landing on eventual human lunar return and ISRU site
- First ground truth of polar crater volatiles

Large-Scale Cargo Lander
- Increased capabilities for science and technology payloads

Humans on the Moon - 21st Century
First crew leverages infrastructure left behind by previous missions

Lunar South Pole Target Site

2019

2024
Achieving 2024 – A Parallel Path to Success

Artemis will see government and commercial systems moving in parallel to complete the architecture and deliver crew.

**CREW**
- NASA Programs SLS and Orion

**Artemis 1**
- First flight test of SLS and Orion as an integrated system

**Artemis 2**
- First flight of crew to the Moon aboard SLS and Orion

**Artemis 3**
- First crew to the lunar surface; Logistics delivered for 2024 surface mission

Between now and 2024, U.S. industry delivers the launches and human landing system necessary for a faster return to the Moon and sustainability through Gateway.

**PPE**
- Power Propulsion Element arrives at NRHO via commercial rocket

**CARGO**
- Commerciaally Provided Elements

**Crew Module**
- Small pressurized crew module launches to Gateway on a commercial rocket

**Human Landing System**
- Transfer: Transfers lander from Gateway to low lunar orbit
- Descent: Descends from Transfer Vehicle to lunar surface
- Ascent: Ascends from lunar surface to Gateway

Up to three commercial rocket launches, depending on distribution of the Transfer, Descent, and Ascent functions.
Current Thoughts on Human Landing System

HLS Notional Transportation Elements

- Transfer
- Ascent
- Descent

= Aggregate at Gateway

NextSTEP Appendix E: Human Lander System
- Issued: Feb 7
- Proposals submitted: March 25
- Selections: May
- Awards: July
- Phase A Risk Reduction Studies and prototypes for
  - Descent Element
  - Transfer Element
  - Refueling

Studies expedited via Undefinitized Contract Awards

NextSTEP Appendix H: Human Lander System 2
- Synopsis Issued: April 8, for Ascent Element
- Synopsis updated: April 26, now for development, integration, and crewed demonstration of integrated landing system
- Final solicitation: NET July
2024

Develop essential hardware and systems required for a 2024 landing

- Crew: At least 2 on the South Pole
- Suits: Initial capability suit
- Expedition Duration: Hours-Days (open trade)
- Partners: Significant collaboration with U.S. industry
- Access: Potential opportunities for international partners
- Reusability: ?

2028

Establish a sustainable human lunar presence with robust, reusable systems

- Crew: Up to 4 on the Moon
- Suits: Sustained capability suit
- Expedition Duration: Days-Weeks (open trade)
- Partners: U.S. industry and international collaboration
- Access: ?
- Reusability: ✔️