HUMAN LANDING SYSTEM

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NASA's Human Landing System Program

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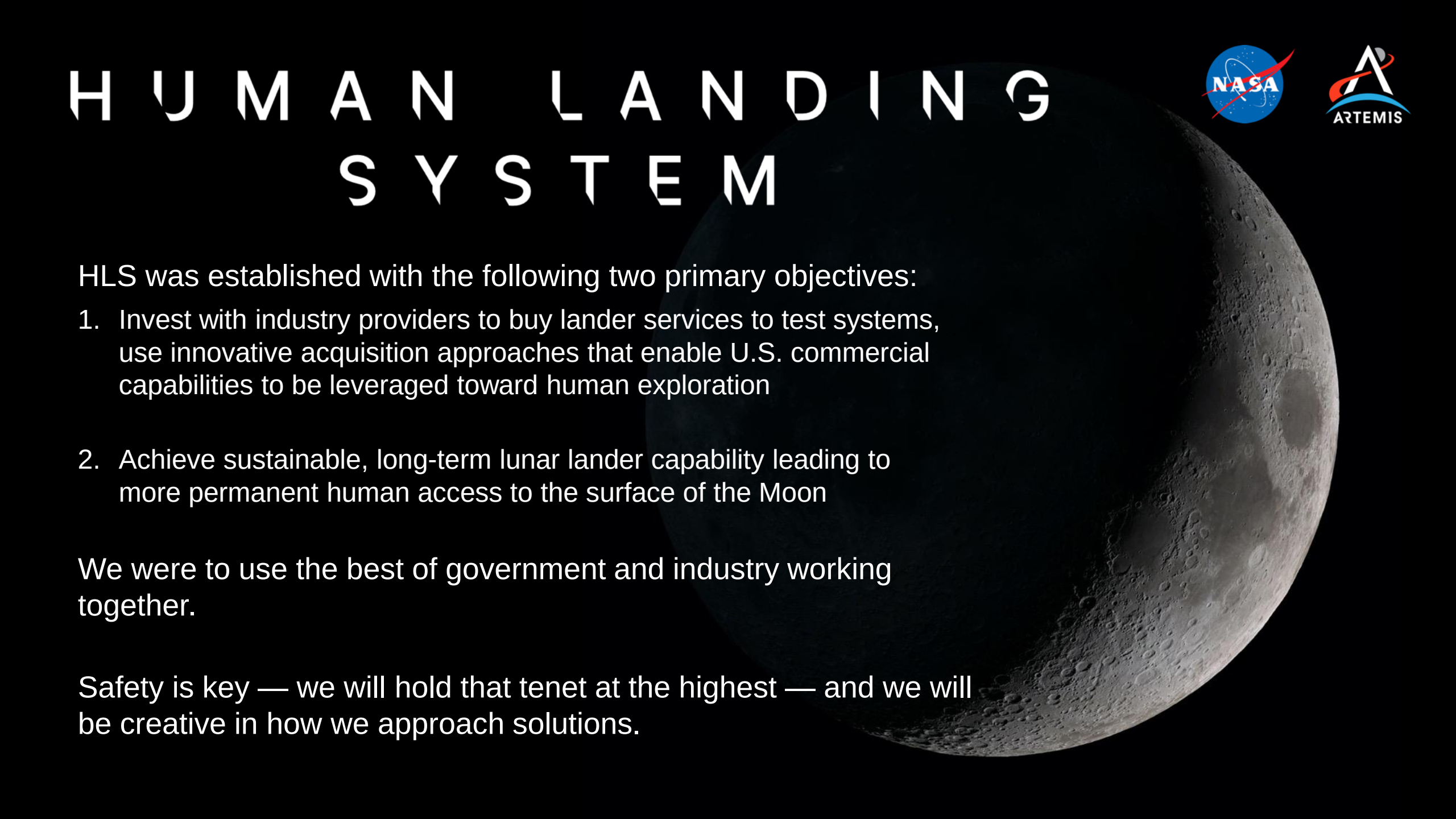


HLS was established with the following two primary objectives:

1. Invest with industry providers to buy lander services to test systems, use innovative acquisition approaches that enable U.S. commercial capabilities to be leveraged toward human exploration

2. Achieve sustainable, long-term lunar lander capability leading to more permanent human access to the surface of the Moon

We were to use the best of government and industry working together.

Safety is key — we will hold that tenet at the highest — and we will be creative in how we approach solutions.

NASA's Key Role in Lander Development

Insight

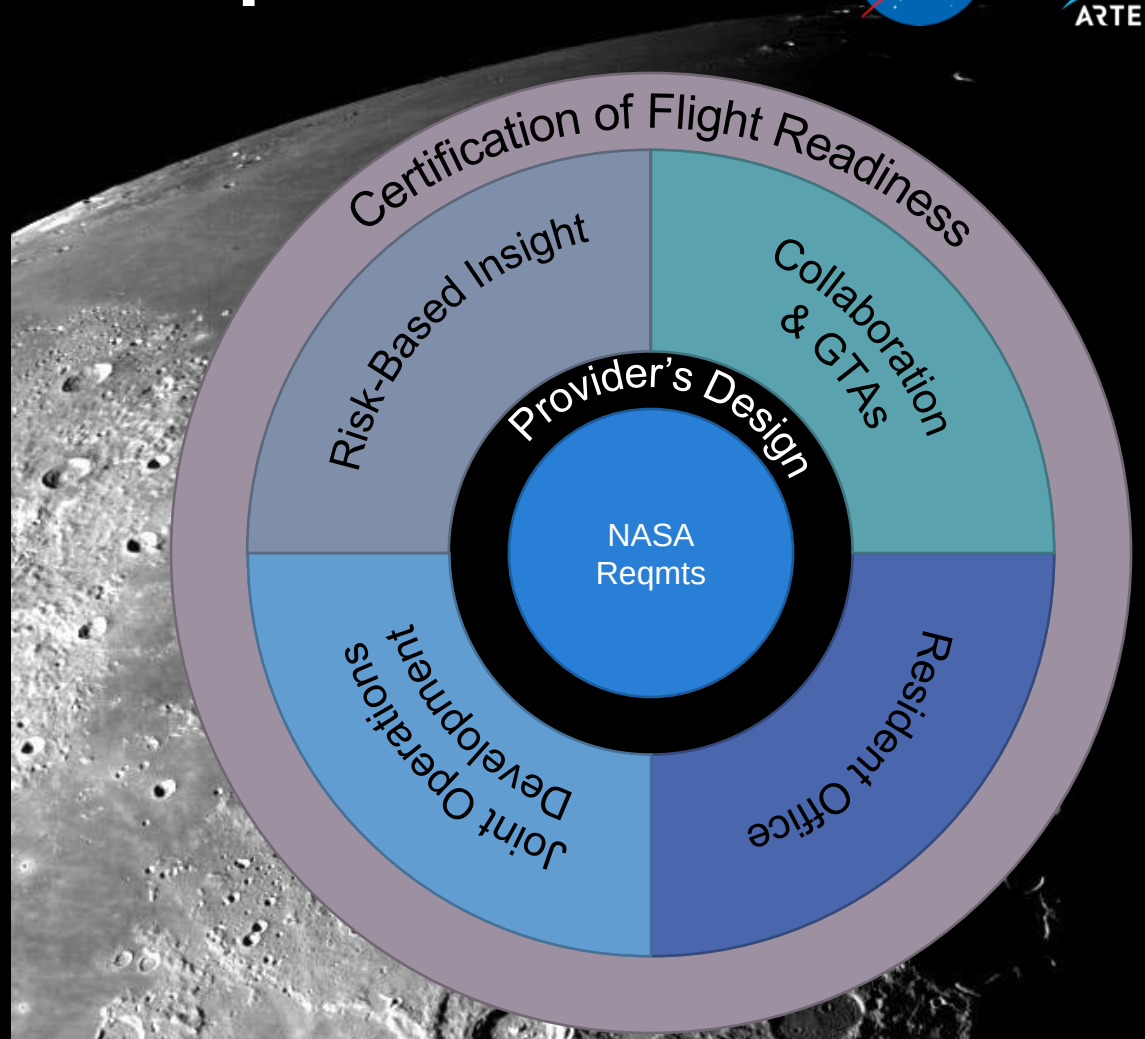
Risk based focusing on targeted areas of program concern

Ensures HLS resources are applied efficiently, and that providers are not overly burdened by excessive insight activity in low-risk areas

Collaboration

Personnel that are assigned to work with the provider and part of their team

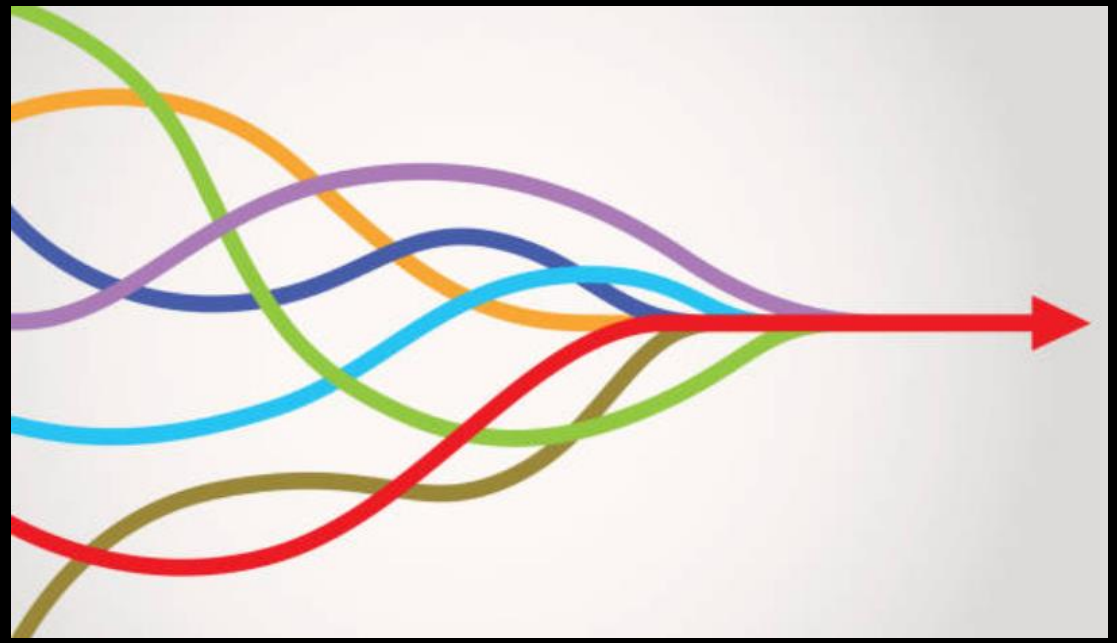
Accomplish tasks that are specified by the provider, and deliverable to the provider as in-line work



NASA-Industry Partnership: Collaboration is Crucial

HLS: the best of government & industry

- Speed & innovation from industry, expertise & safety posture from NASA
- At any given time, SpaceX & Blue Origin have access to up to 80 technical collaborations across seven NASA Centers providing expertise in areas such as:
  - Thermal engineering
  - Cryogenic fluid management
  - Plume-surface interaction
  - Cryogenic valve development



Artemis Path to Sustainable Lunar Architecture

✓ Artemis I
Uncrewed Flight Test

SLS, Orion, EGS

Artemis II
Crewed Flight Test

SLS, Orion, EGS, **Crew**

Artemis III
First Human Landing

SLS, Orion, EGS, Crew, **Starship HLS, EVA Suits**

Artemis IV
First Human Gateway Mission

SLS, Orion, EGS, Crew, Starship HLS, EVA Suits, **Gateway (PPE & HALO)**

Artemis V
Mobile Surface Assets for Crew

SLS, Orion, EGS, Crew, **Blue Moon HLS, Gateway (iHab), Lunar Terrain Vehicle**

New Artemis Assets

STARSHIP

Human Landing System (HLS)

NASA is working with SpaceX to develop the Starship Human Landing System for use on:

- Artemis III - the mission that will put the next two Americans on the surface of the Moon
- Artemis IV - meets an extended set of requirements such as docking with Gateway for crew transfer and more mass to the surface

SpaceX will perform an uncrewed demonstration mission prior to the crewed Artemis III mission.

Image Credit: SpaceX

BLUE MOON

Human Landing System (HLS)

NASA is working with Blue Origin to develop the Blue Moon MK2 human landing system for use on:

- Artemis V – meets an extended set of requirements such as docking with Gateway for crew transfer and more mass to the surface

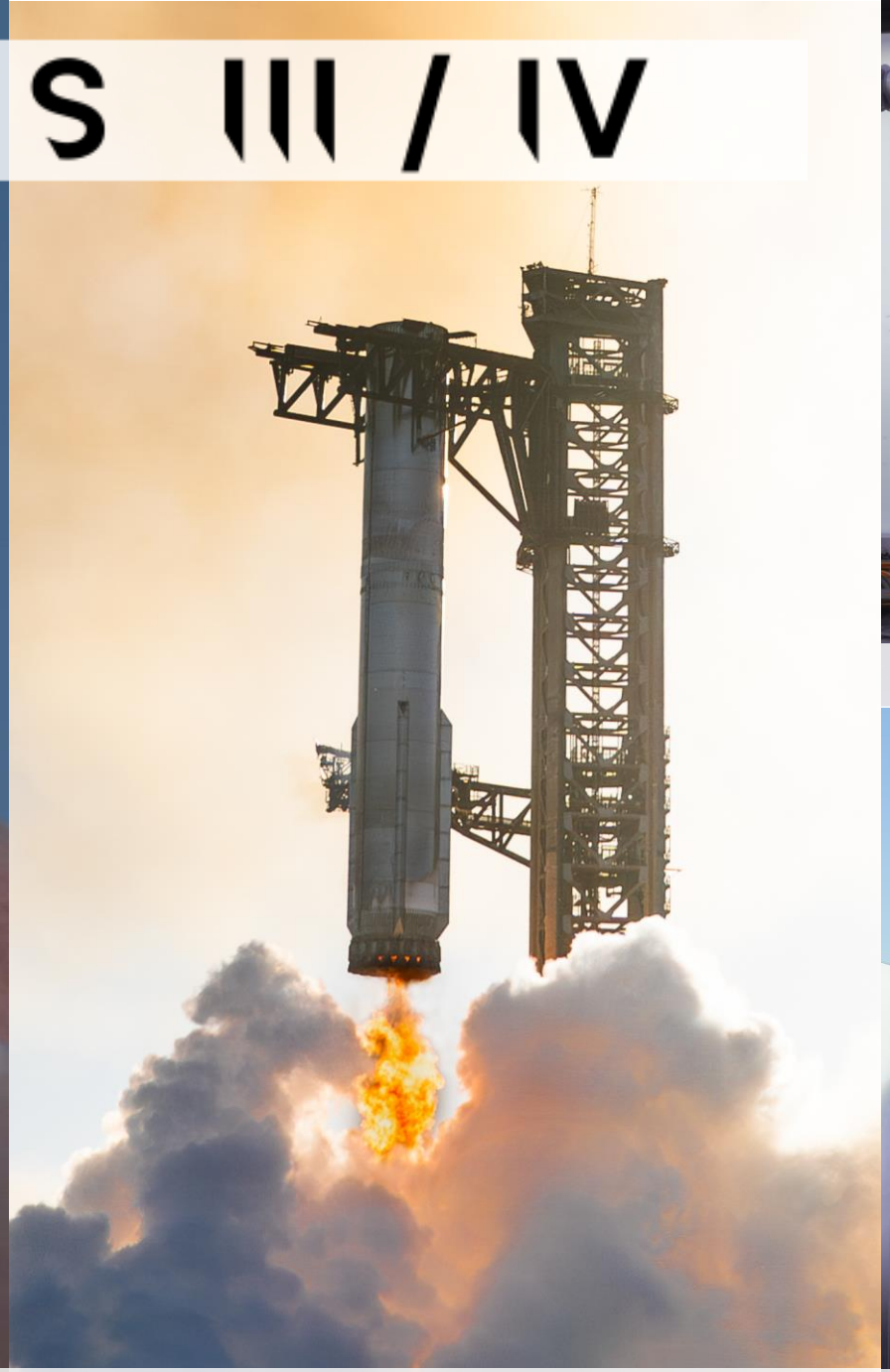
Blue Origin will perform an uncrewed demonstration mission prior to the crewed Artemis V mission.

Image Credit: Blue Origin

ARTEMIS III / IV

Photo credits: SpaceX

Super Heavy-Starship Flight 6



Super Heavy Return to Launch Site, Flight 7

Pressurized Suit-Elevator Operations Testing

Pressurized Suit-Airlock Testing

ARTEMIS V

Photo credits: Blue Origin

New Glenn Vertical for Flight at LC36

New Glenn’s First Flight on Jan. 16

Testing New Glenn First Stage Landing Legs

Hot-fire Testing of New Glenn Second Stage

CARGO LANDERS

The HLS program is working with SpaceX and Blue Origin to develop cargo variants of the companies' crewed landers to deliver large payloads – approximately 26,000-33,000 pounds (12-15 metric tons) – to the lunar surface for enhanced exploration no earlier than Artemis VII.

NASA intends to award SpaceX the mission to deliver a pressurized rover, currently in development by JAXA, to the lunar surface no earlier than 2032.

NASA intends to award Blue Origin the mission to deliver a lunar surface habitat to the Moon no earlier than 2033.

Image Credit: SpaceX

Image Credit: Blue Origin


ARTEMIS
Future Landing Services
Artist's Concept

Follow the missions

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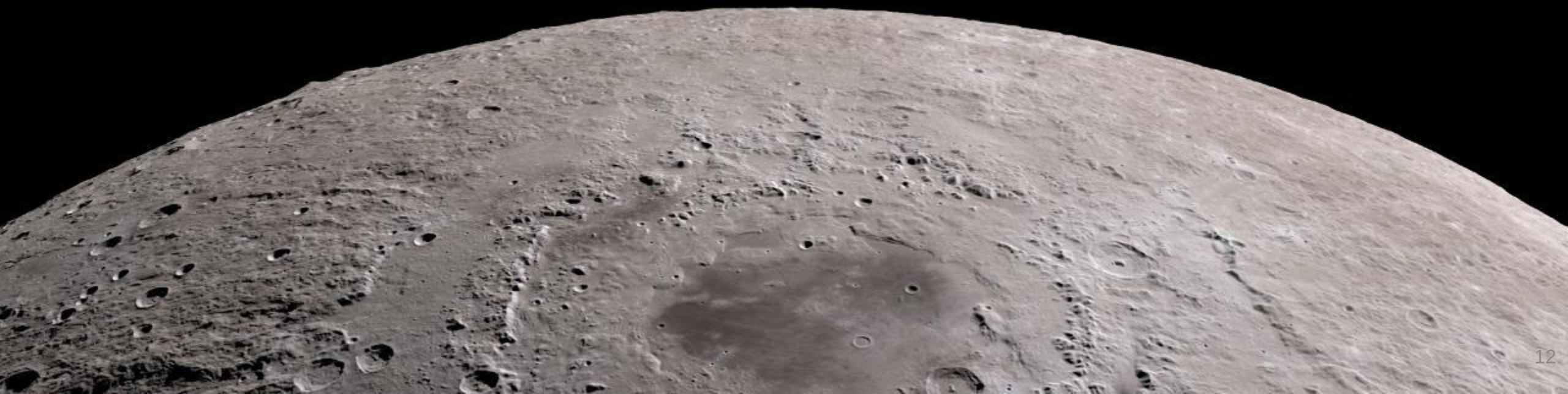

Buying a Service, Applying Rigor to the Process