



Tara Polsgrove

Lead Systems Engineer, Human Landing System Program

Marshall Space Flight Center, Huntsville, Alabama

In her current role, Tara is focused on the vehicle designs, system engineering, and programmatic assessments for the future human missions to the Moon and Mars, particularly the lander and ascent vehicle for human missions. She has been with NASA since 2000 and has a background in interplanetary trajectory optimization and mission analysis. Tara has a Bachelor of Science in Aerospace Engineering from the Georgia Institute of Technology and a Master of Science in Engineering with a Systems Engineering focus from the University of Alabama in Huntsville.

National Aeronautics and Space Administration



NASA's Initial and Sustained Artemis Human Landing Systems

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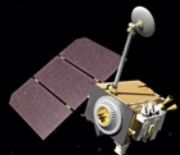
Co-authors:

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Dr. Greg Chavers
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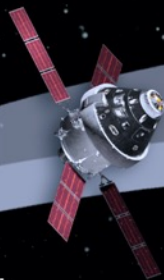
ARTEMIS : Landing Humans on the Moon in 2024



Lunar Reconnaissance Orbiter: Continued surface and landing site investigation



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



Artemis II: First humans to orbit the Moon and rendezvous in deep space in the 21st Century



Gateway begins science operations in lunar orbit with launch of Power and Propulsion Element and Habitation and Logistics Outpost



Initial human landing system delivered to lunar orbit



Artemis III: Orion and crew dock to human landing system for crew expedition to the surface

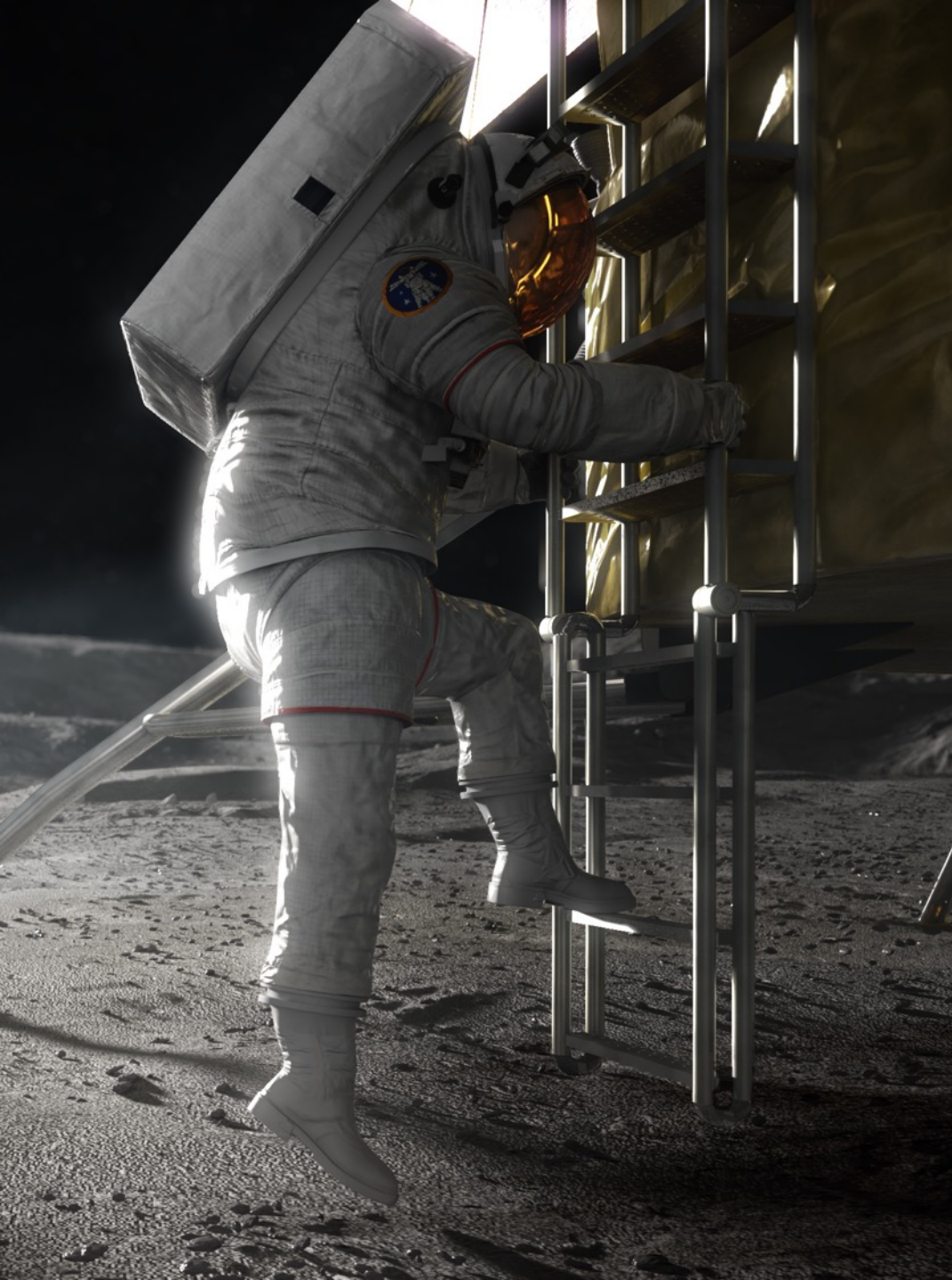


Early South Pole Robotic Landings
Science and technology payloads delivered by Commercial Lunar Payload Services providers

Volatiles Investigating Polar Exploration Rover
First mobility-enhanced lunar volatiles survey

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

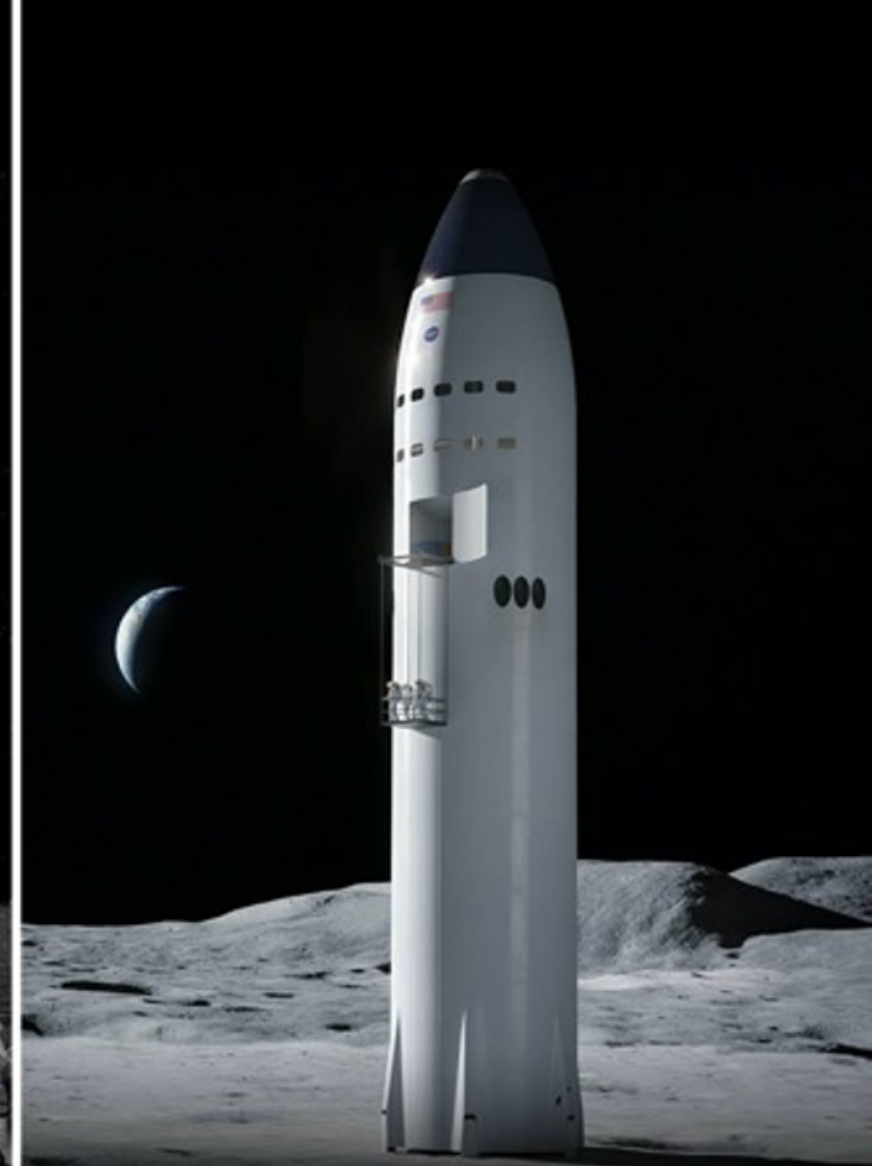
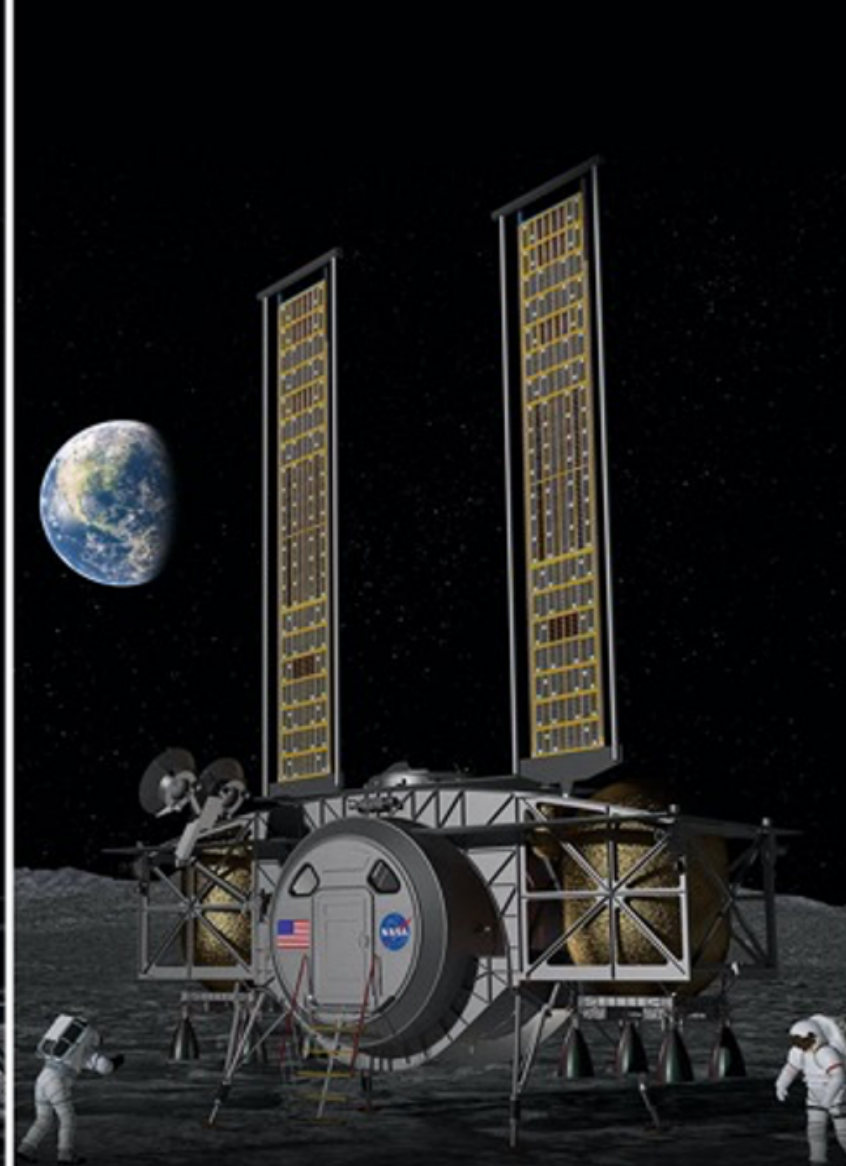
LUNAR SOUTH POLE TARGET SITE



Human Landing System

- Firm Fixed Price Broad Agency Announcement for rapid development and crewed demonstration to return humans to the lunar surface by 2024
- Leveraging commercial capabilities to the maximum extent possible; may tailor the traditional NASA program management and systems engineering processes to expedite the schedule
- NASA will not take ownership of the HLS hardware/software
- HLS will launch as commercial cargo; checkout and testing will occur on orbit prior to any crew launch and egress
- NASA provides certification and technical expertise

The HLS plan is to leverage the speed and operating models of the commercial space industry while applying NASA expertise to ensure safety and mission success



LOCKHEED MARTIN

BLUE ORIGIN

NORTHROP GRUMMAN

DRAPER

Dynetics
A Leidos Company

SPACEX

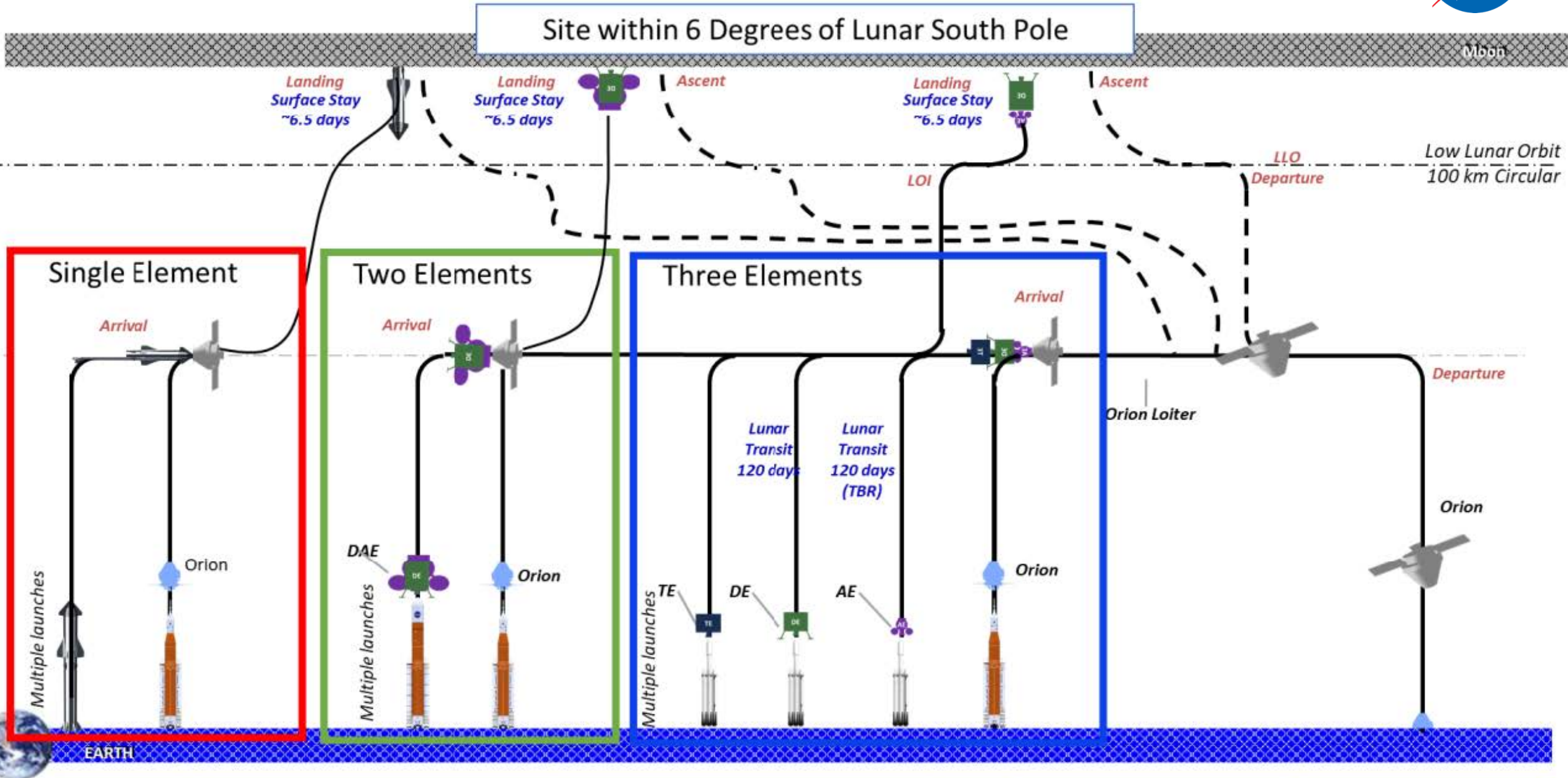
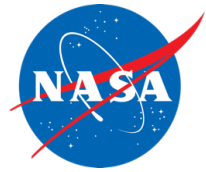
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NASA's Artemis Human Landing Systems

INITIAL PHASE

Initial Phase Concept of Operations



ARTEMIS III

CREW SURFACE OPERATIONS

Two crew live in the landing system cabin for 6.5 days on the lunar surface

Goal of up to four moonwalks, with reserves for a fifth contingency moonwalk

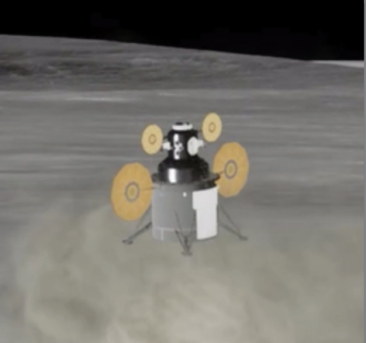
Collect a variety of samples to return to Earth for later research:

- Rock samples to help date the sequence of impact events on the Moon
- Core tube samples to capture ancient solar wind trapped in regolith layers
- Paired samples of material within and outside a permanently shadowed region



Initial Phase 6.5-Day Surface Sortie

Landing Day



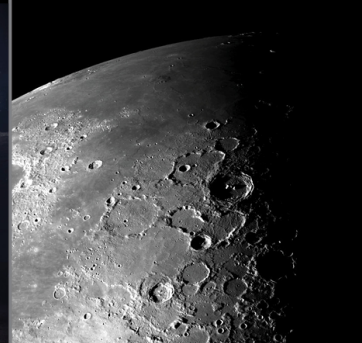
EVA Day 1



EVA Day 2



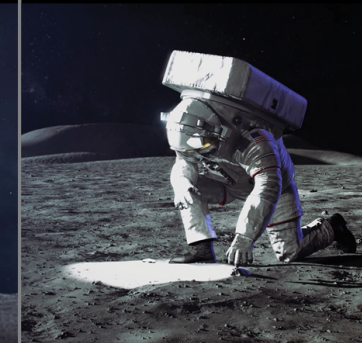
Rest Day



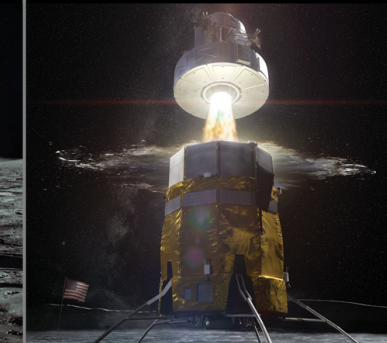
EVA Day 3



EVA Day 4



Ascent



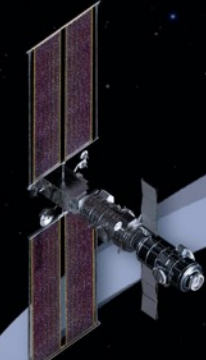
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NASA's Artemis Human Landing Systems

SUSTAINING PHASE

ARTEMIS : Living, Learning and Working on the Moon



International habitat delivered to Gateway, in-situ resource utilization (ISRU) demonstrations on the surface and LTV to expand exploration range



Artemis IV: First lunar surface expedition through Gateway. External robotic system added to Gateway



Sustainable operations with reusable landing system and enhanced lunar communications, refueling, and viewing capabilities on Gateway



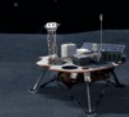
Airlock arrives at Gateway; surface habitat and pressurized rover delivered to expand exploration range and crew size



Enhanced habitation capability delivered to Gateway for Mars dress rehearsals



Lunar Terrain Vehicle (LTV)



Surface Habitat

Pressurized Rover



Fission Surface Power



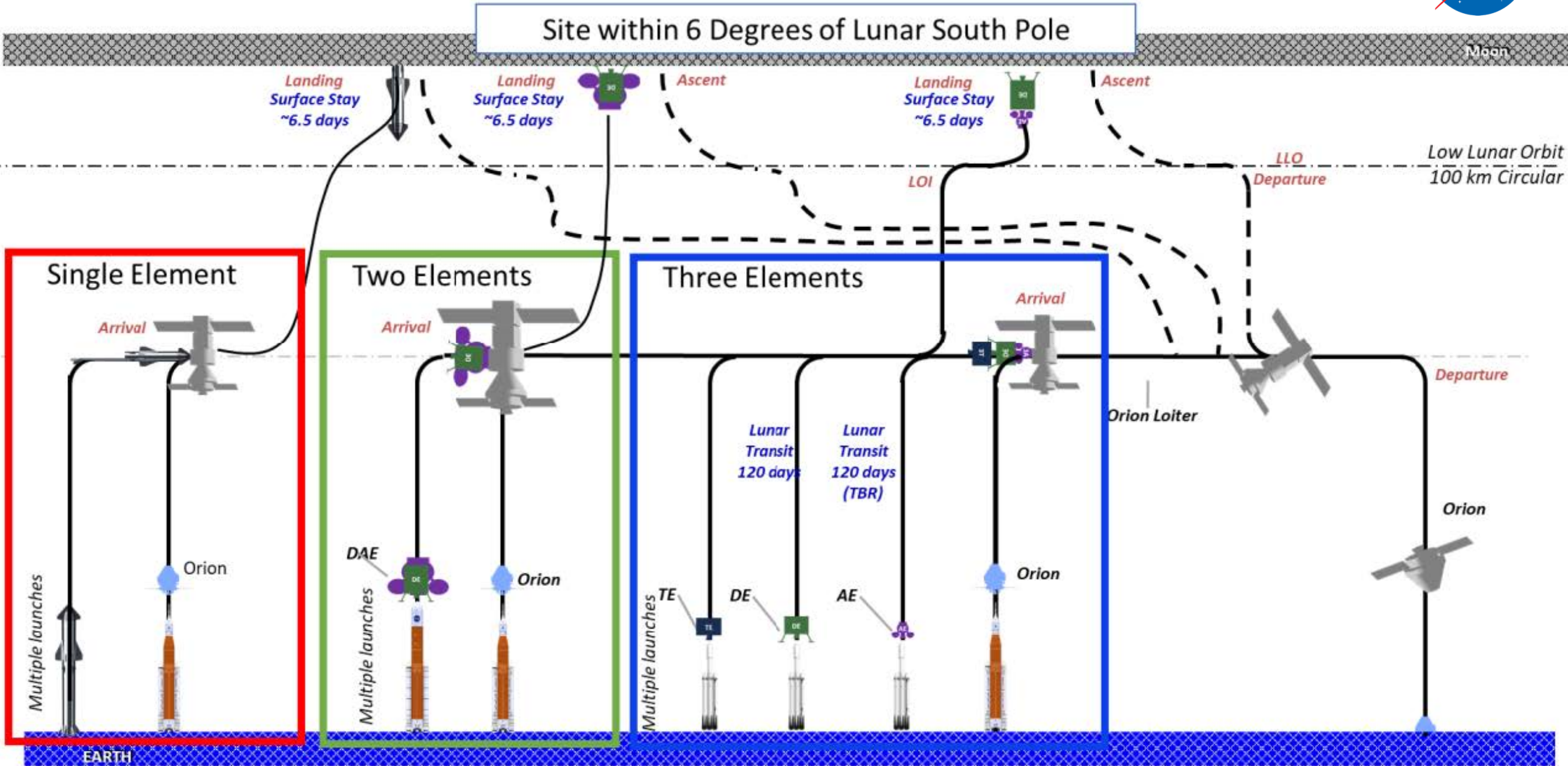
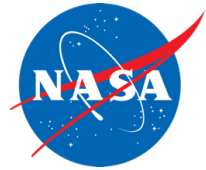
ISRU Pilot Plant

SUSTAINABLE LUNAR ORBIT STAGING CAPABILITY AND SURFACE EXPLORATION

MULTIPLE SCIENCE AND CARGO PAYLOADS | U.S. GOVERNMENT, INDUSTRY, AND INTERNATIONAL PARTNERSHIP OPPORTUNITIES | TECHNOLOGY AND OPERATIONS DEMONSTRATIONS FOR MARS

All contents represent notional planning and are for discussion purposes only

Sustaining Phase Concept of Operations



HLS Design Reference Mission Summary

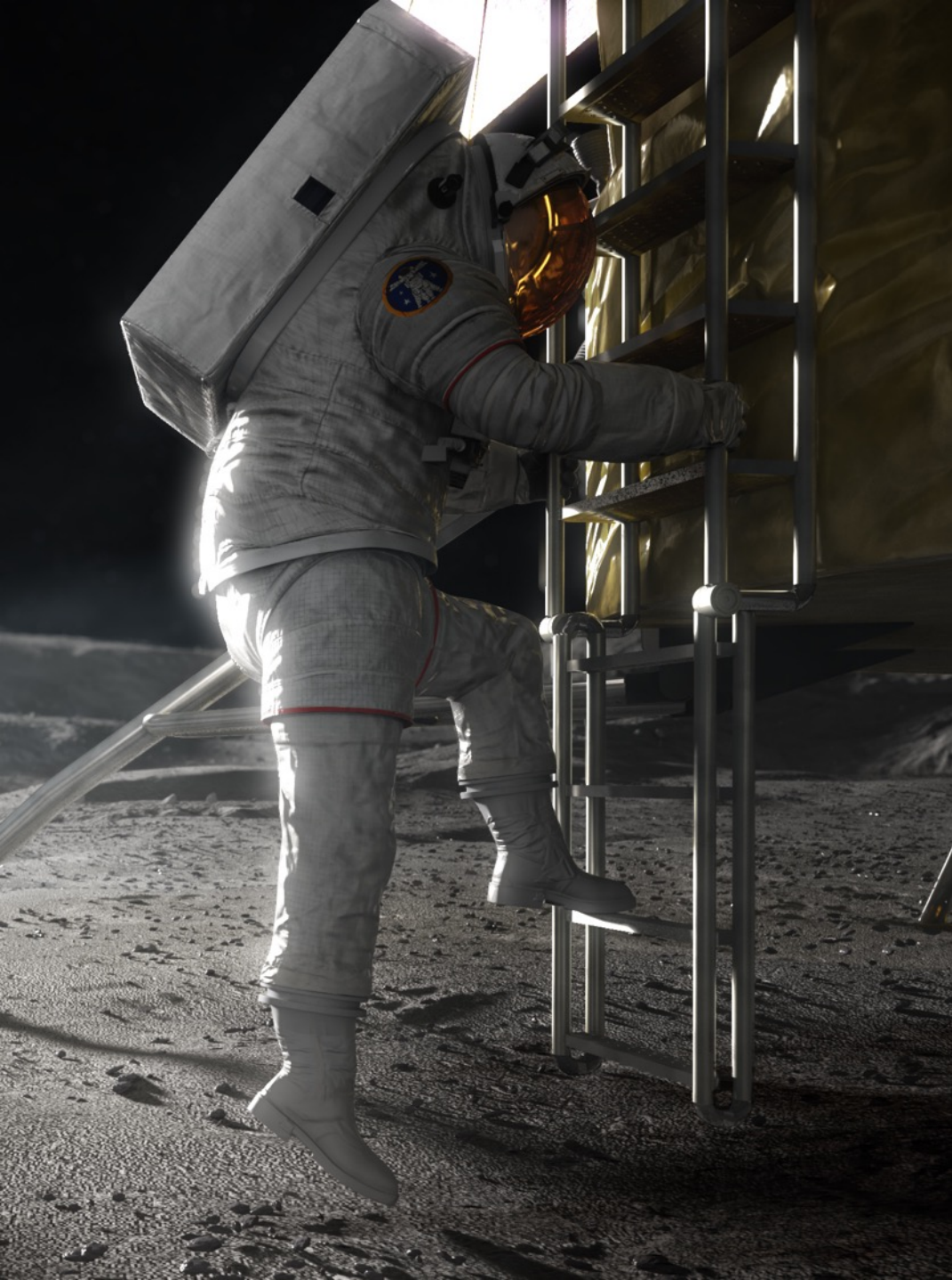


| | Initial Phase | Sustainable Phase: Surface Sortie | Sustainable Phase: Extended Stay | Sustainable Phase: Non-Polar Sortie |
|-------------------------------------|--|--|--|--|
| Staging Orbit | NRHO | NRHO | NRHO | NRHO |
| Crew size | 2 | 2 | 4 | 2 |
| Transit Profile | 0.5-day transit to LLO, followed by loiter and descent | 0.5-day transit to LLO, followed by loiter and descent | 0.5-day transit to LLO, followed by loiter and descent | |
| Landing Location | South Pole | South Pole | South Pole | Non-polar region |
| Total Surface Stay | 6-6.5 days | 6-6.5 days | 30+ days | <6 days |
| Total Inhabited Surface Stay | 6-6.5 days | 6-6.5 days | <6-6.5 days | <6 days |
| Down Mass | 870.50 kg | 1,595 kg | 1,595 kg | 870.50 kg |
| Up Mass | 530.5 kg | 1,070 kg | 1,070 kg | 530.5 kg |



NASA's Artemis Human Landing Systems

PARALLEL DEVELOPMENT



HLS Timeline & Milestones

- Aug 2019 MSFC named Program Office
- Sept 2019 Final App H solicitation issued
 - Drafts issued in July and August; +1,150 comments from industry
- Nov 2019 Proposals submitted
- Apr 2020 Selections announced for Base Period
- May 2020 Base Period contracts awarded
- Aug 2020 Certification Baseline Reviews
 - Requirements and Design/Construction, Safety & Human System Standards finalized
- Oct 2020 Option A solicitation issued
- Dec 2020 Continuation Reviews
 - Option A proposals due
- Spring 2021 Base Period contracts end and Option A contracts awarded

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Stay Connected



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