

RETURNING TO THE MOON

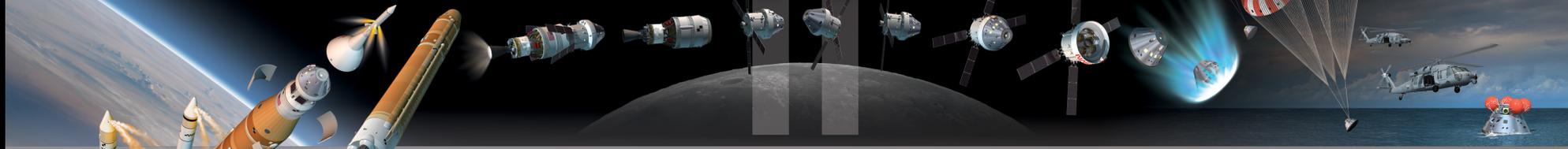
Dr. Lori Glaze

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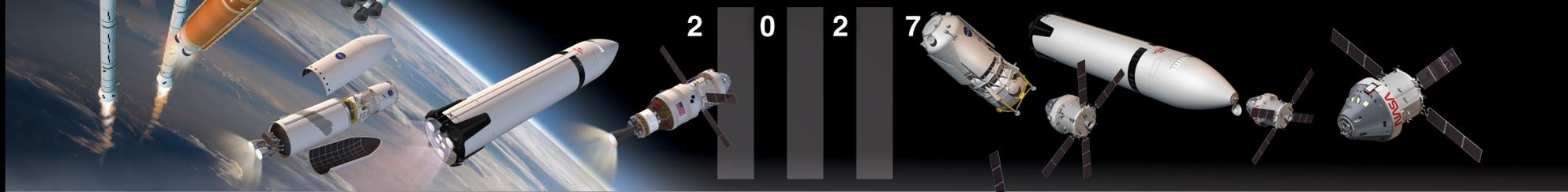


ARTEMIS

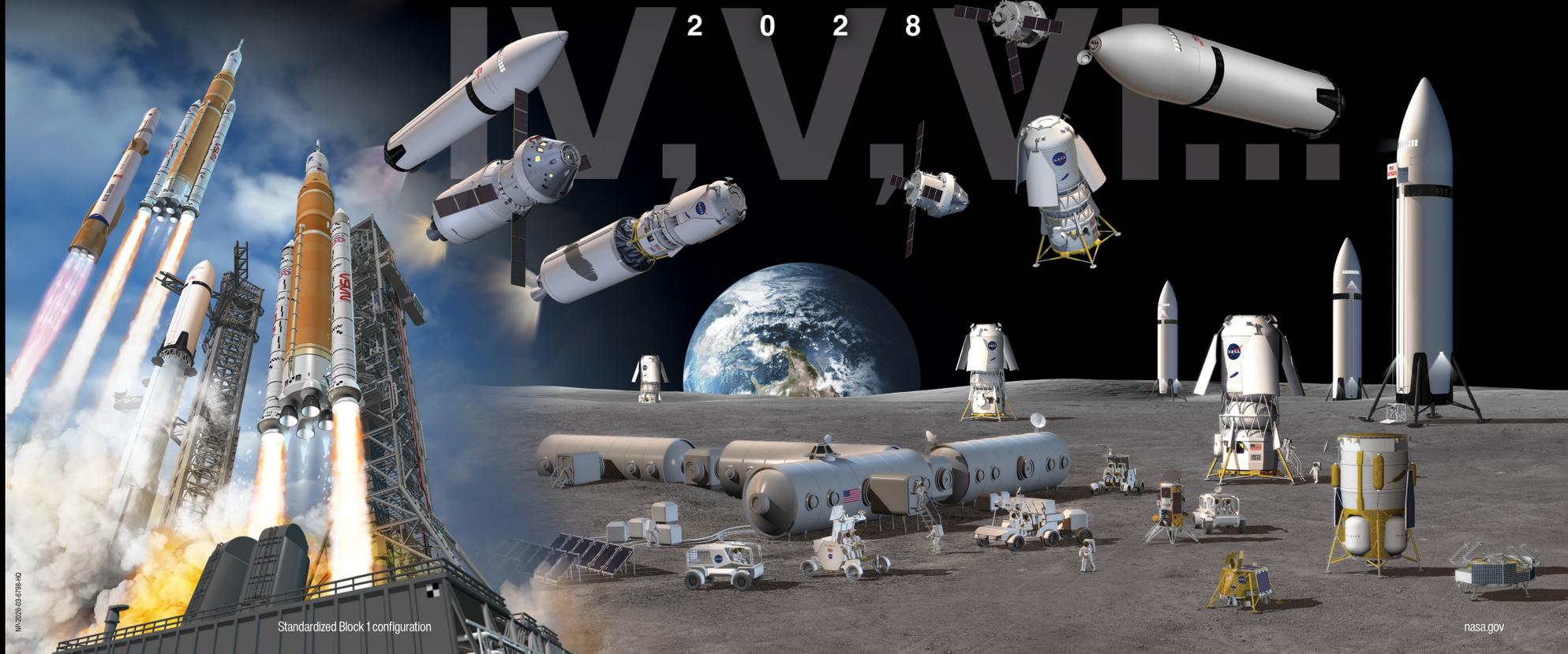
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Standardized Block 1 configuration

nasa.gov

Incremental Capability Development



- Framework used by Apollo to incrementally reduce risk and increase mission success

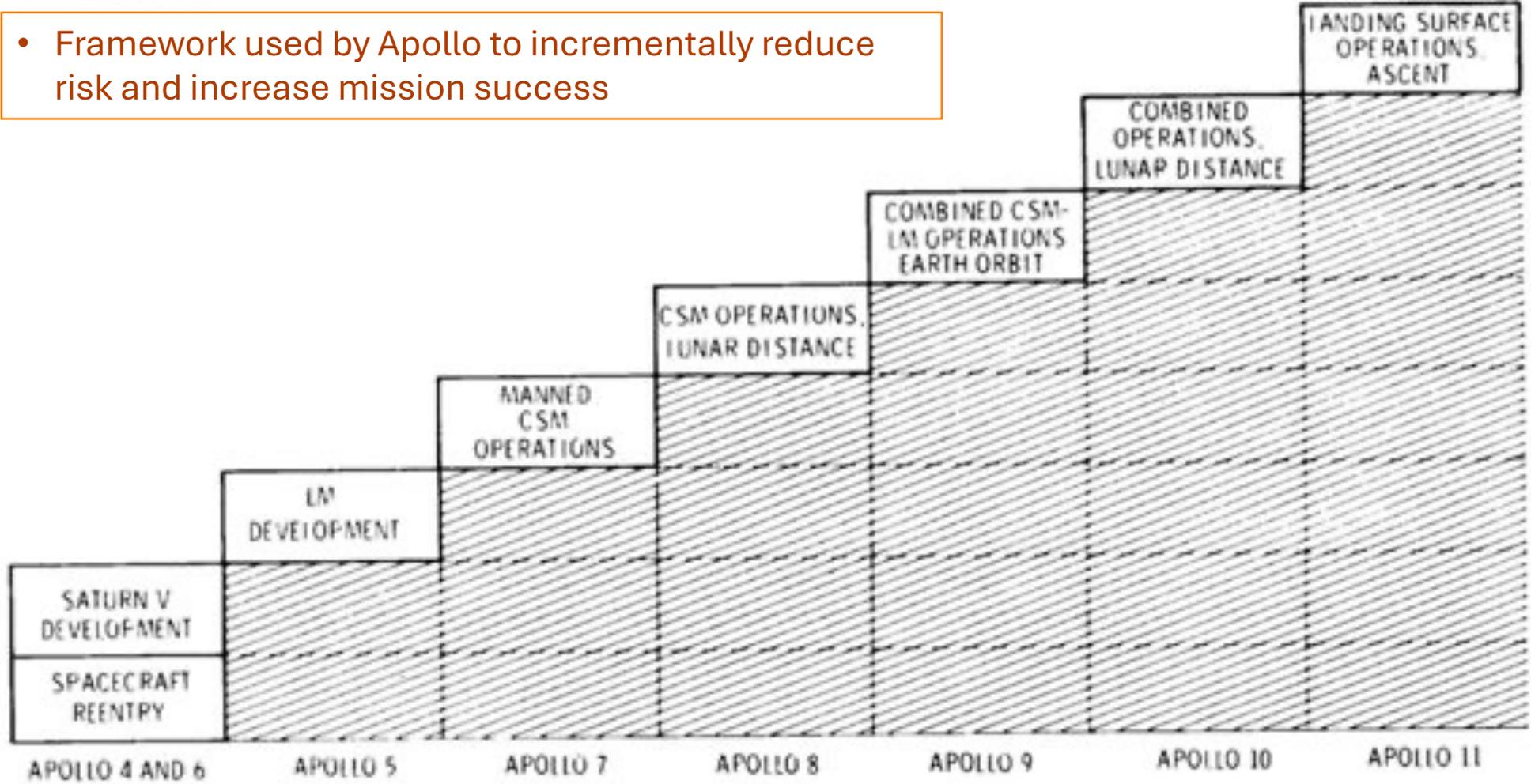
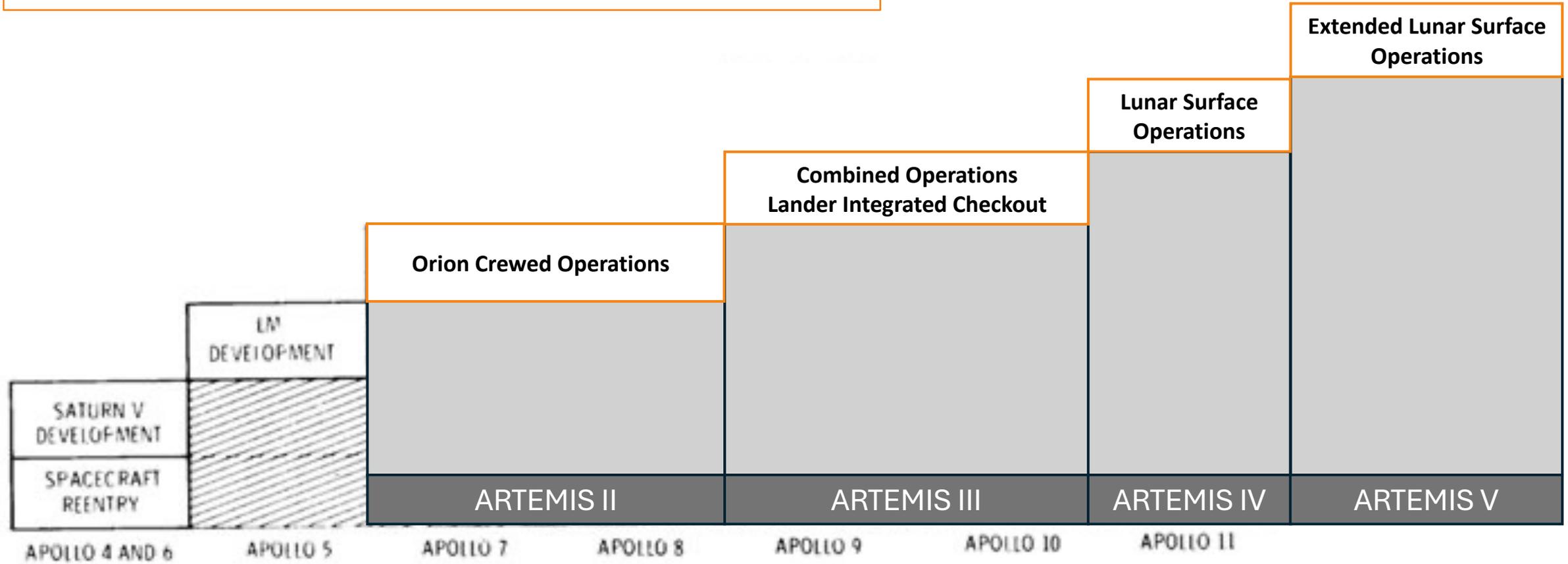


Figure 1-7. - Buildup of Apollo mission capability.



Incremental Capability Development

- Same philosophy is applied to the Artemis mission manifest to increase overall Artemis safety and mission success





Milestones & Progress - Artemis II



Artemis II Vehicle



NASA's Space Launch System (SLS) rocket and Orion spacecraft, secured to the mobile launcher, as it rolls out of the Vehicle Assembly Building to Launch Pad 39B



NASA's Artemis II and Backup Crews with the Space Launch System (SLS) rocket and Orion spacecraft as it makes the 4.2 mile journey from the Vehicle Assembly Building to Launch Pad 39B on the mobile launcher



NASA's Artemis II Space Launch System (SLS) rocket and Orion spacecraft on the mobile launcher at Launch Complex 39B



ARTEMIS II

First Crewed Test Flight to the Moon Since Apollo

- 1 LAUNCH**
Astronauts lift off from Launch Pad 39B at Kennedy Space Center.
- 2 JETTISON SOLID ROCKET BOOSTERS, FAIRINGS, AND LAUNCH ABORT SYSTEM**
- 3 CORE STAGE MAIN ENGINE CUT OFF**
With separation.
- 4 PERIGEE RAISE MANEUVER**
- 5 APOGEE RAISE BURN TO HIGH EARTH ORBIT**
Begin 23.5-hour checkout of spacecraft.
- 6 ORION SEPARATION FROM INTERIM CRYOGENIC PROPULSION STAGE (ICPS) FOLLOWED BY PROX OPS DEMO**
Plus manual handling qualities assessment for up to 2 hours.
- 7 ORION UPPER STAGE SEPARATION (USS) BURN**
Begins high Earth orbit checkout. Life support, exercise, and habitation equipment evaluations.
- 8 PERIGEE RAISE BURN**
- 9 TRANS-LUNAR INJECTION (TLI) BY ORION'S MAIN ENGINE**
Lunar free return trajectory initiated with European service module.
- 10 OUTBOUND TRANSIT TO MOON**
Outbound trajectory correction (OTC) burns as necessary for lunar free return trajectory; travel time approximately 4 days.
- 11 LUNAR FLYBY**
4,047 mi/6,513 km (mean) lunar far side flyby altitude.
- 12 TRANS-EARTH RETURN**
Return trajectory correction (RTC) burns as necessary to aim for Earth's atmosphere; travel time approximately 4 days.
- 13 CREW MODULE SEPARATION FROM SERVICE MODULE**
- 14 ENTRY INTERFACE (EI)**
Enter Earth's atmosphere.
- 15 SPLASHDOWN**
Ship recovers astronauts and capsule.

PROXIMITY OPERATIONS DEMONSTRATION SEQUENCE	9
1	10
2	11
3	12
4	13
5	14
6	15
7	16
8	17



Milestones & Progress - Artemis III (2027)



Artemis III Progress – Space Launch System



Interim cryogenic propulsion stage complete
final testing and checkout: September 2023

- ICPS ready (if required)
- Boosters ready - shipping in April
- Engine section in VAB
- RS-25 Engines ready - shipping in April
- Core Stage TFF - shipping April
- LVSA ready - in storage at MSFC



Artemis III forward skirt was lifted and set atop the intertank and liquid oxygen tank: December 2025



Artemis III RS-25 flight engine processing at NASA Stennis (now complete and in storage)



Artemis III launch vehicle stage adapter completed and ready to be moved to KSC: March 30, 2025



Teams from Kennedy integrated Artemis III core stage engine section with its boattail inside the Vehicle Assembly Building at NASA's Kennedy Space Center: August 13, 2025



Assembly check-out of forward assemblies is complete at NASA's Kennedy Space Center in Florida



The core stage "major join" was completed at NASA Michoud in January 2026

Artemis III Progress – Orion



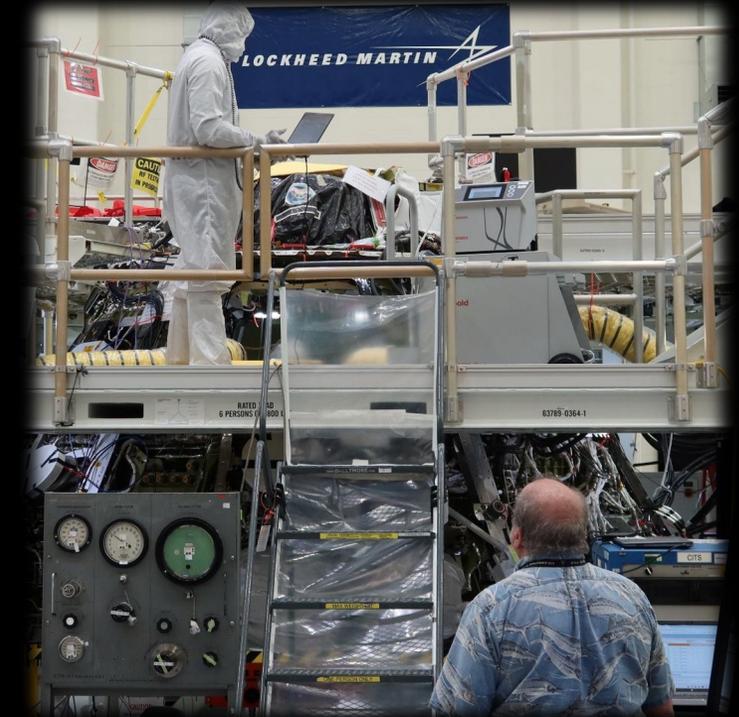
- Orion Service Module is at KSC in testing and checkout
- Orion heatshield is in final assembly
- Orion Crew Module is in outfitting and testing



Teams prepare for the installation of the engine nozzle onto the European Service Module for NASA's Artemis III mission: February 17, 2026



Orion heat shield inside the Operations and Checkout Building at NASA's Kennedy Space Center in Florida: February 18, 2026



Technicians work on the Artemis III Orion crew module inside the Operations and Checkout Building at NASA's Kennedy Space Center: March 5, 2026



Artemis III Progress – Human Landing Systems



A view of Earth from Starship's 11th test flight as it reenters the atmosphere prior to an ocean splashdown, gathering data to inform the design and continued development of the Starship HLS: October 2025

- SpaceX Starship Flight 12 (version 3) in April
- Blue Origin Mark 1 lander in 2026
- NASA has undertaken an effort to work with both HLS providers to accelerate lander development.
- Includes modifications to requirements, hardware, mission definition, and capabilities.
- The accelerated landers will be used for the Artemis III demonstration and initial lunar landings.



An artist's illustration of the SpaceX Starship HLS crew cabin interior. Engineers are fabricating the cabin at Starbase, Texas to demonstrate design maturity, support integrated hardware testing, and provide realistic training for Artemis astronauts.



SpaceX and NASA performed full-scale qualification testing of the docking system that will connect SpaceX's Starship HLS with Orion: 2023



Blue Origin recently completed soft capture system testing at NASA's Johnson Space Center confirming the performance of the Blue Moon MK2 crew lander's pressurized docking system: February 2026



Blue Origin Mark 1 lander

Notional Plan for 2027 Artemis III Earth Orbit Mission



GOALS

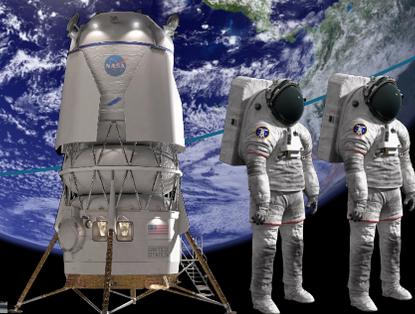
Buy down as much risk as possible prior to crewed lunar landing mission:

Demonstrate multi-launch campaign	Test xEVA hardware on orbit
Demonstrate Orion rendezvous, proximity operations, and docking with lander(s) in Earth orbit	Demonstrate critical Human Landing Systems and vehicle performance in Earth orbit
Demonstrate crewed docked operations in Earth orbit	Demonstrate Orion Permeable Heatshield
Demonstrate increasing mission cadence with prompt turnaround of pad and ground systems with incorporating lessons learned	

SUPPORTING MISSIONS

Supporting Demonstration Missions

Lander Propellant Transfer and Aggregation Demonstration in Earth Orbit



CREWED MISSION (Current State)

CREW INFO		ASSUMPTIONS	
TOTAL CREW	≤ 4 (TBD)	ORION – HLS RPOD	Earth orbit
ELEMENTS		CREW INGRESS	Crew ingress events
		DOCKING	Multiple docking/undocking events
SLS	Block 1 TBD: ICPS OR spacer	TOTAL MISSION DURATION	≤ 21 DAYS (Orion, mission extension with lander augmentation TBD)
ORION	Crewed, RPODU capable	ORION LANDING	San Diego FLETA HOT
HLS	Starship AND/OR Blue Moon		
xEVA	TBD: Axiom AxEMU		



Milestones & Progress - Artemis IV (2028)





Artemis IV Progress – Space Launch System and Orion

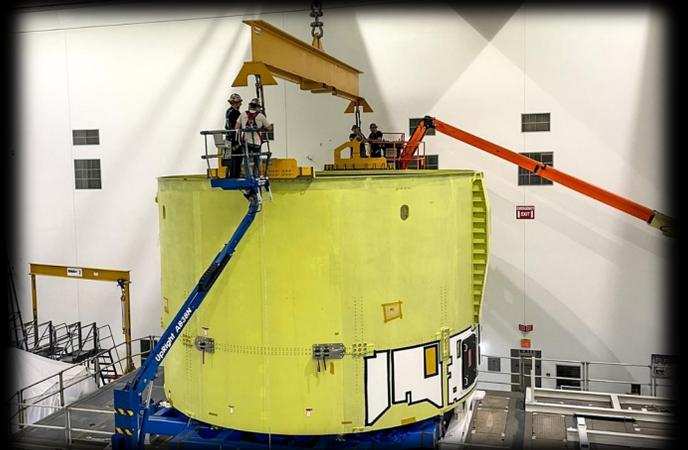


Artemis IV Orion crew module in the Operations and Checkout Building NASA's Kennedy Space Center in Florida: September 23, 2023

- Booster segments complete
 - Aft skirts in final production
- Core Stage engine section at KSC
- RS-25 Engines in storage
- Core Stage TFF in manufacturing
- Orion Crew Module in final assembly
- Orion Service Module at KSC



Artemis IV Liquid Hydrogen Tank for NASA's SLS rocket fully assembled: November 14, 2025



Technicians lift the engine section for NASA's Artemis IV SLS rocket ahead of further processing NASA's Kennedy Space Center in Florida: October 21, 2024



Teams at NASA's Michoud Assembly Facility in New Orleans lifting a forward skirt out of its vertical assembly center: January 31, 2025



European Service Module for NASA's Artemis IV mission in the Operations and Checkout Building at NASA's Kennedy Space Center in Florida: February 18, 2026

Artemis IV Progress – Space Launch System Upper Stage



- NASA is replacing the Exploration Upper Stage (EUS) with the Centaur V – a proven capability that enables mission repeatability
 - Limits major changes between missions
 - The first Centaur V mission may be Artemis IV or Artemis V
- SLS, EGS, Orion, and ULA are actively working the implementation of this new stage
 - A new Stage Adapter will be required, which NASA is preparing to manufacture.
 - Changes to Mobile Launcher 1 to relocate umbilicals is also under assessment.



Artemis Progress – Extravehicular Activity Suits



- Axiom suit checkout on A-III or ISS
- Suits to be delivered to HLS provider for integration
- NASA will provide direct support at Axiom facilities and suppliers to increase collaboration and accelerate hardware production
- NASA also providing test facilities and sub 1g aircraft test platforms and personnel



NASA crew members practice emergency rescue drills during simulated lunar surface operations at NASA's Neutral Buoyancy Laboratory, where teams evaluate how well crew perform tasks while wearing the Artemis IV lunar spacesuit: January 20, 2026



Axiom astronaut and NASA spacesuit engineers conducted spacesuit testing in NASA's Neutral Buoyancy Lab. This is the first time that the spacesuits were tested in conditions that simulated gravity at the lunar surface: July 9, 2025

Artemis IV Progress – Human Landing System



Simplifying mission profiles to accelerate initial landing and surface capability.



SpaceX Starship Launch



Blue Moon Lander



Starship Lander



Blue Origin New Glenn Launch

Notional Plan for 2028 Initial Crewed Landing Mission – SpaceX/Blue Origin



GOALS

Demonstrate crewed lunar landing near the lunar South Pole

Demonstrate multi-launch campaign

Collect lunar surface samples

Demonstrate xEVA suits on the lunar surface

CREWED MISSION (Current State)

CREW INFO

TOTAL CREW

4

LUNAR SURFACE CREW

2

ELEMENTS

SLS

Block 1 Crewed
(ICPS or Centaur V)

ORION

Crewed, RPODU Capable

HLS

Starship / Blue Moon

xEVA

Axiom xEMU

ASSUMPTIONS

LANDING REGION

SOUTH POLE (84-90 deg)

EVAs

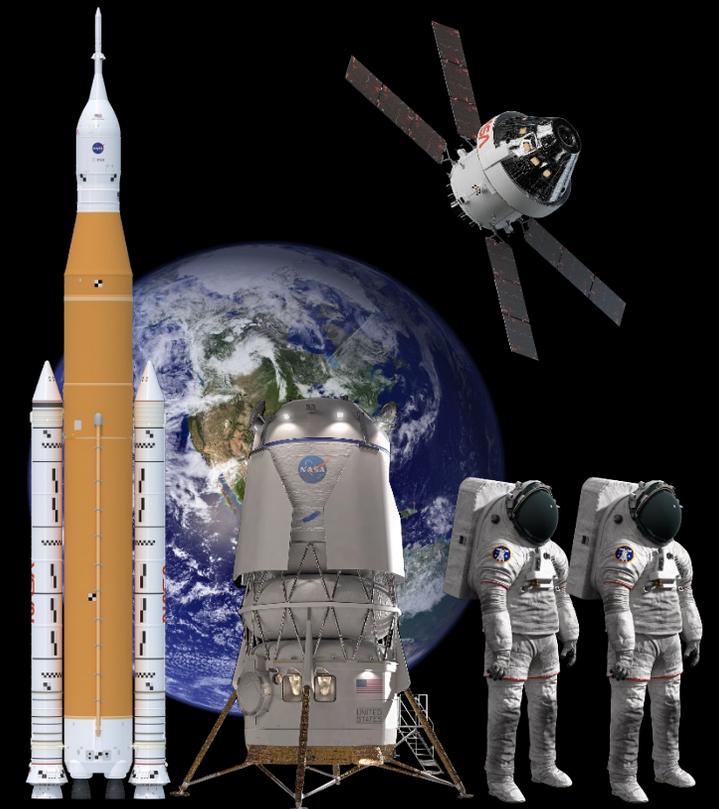
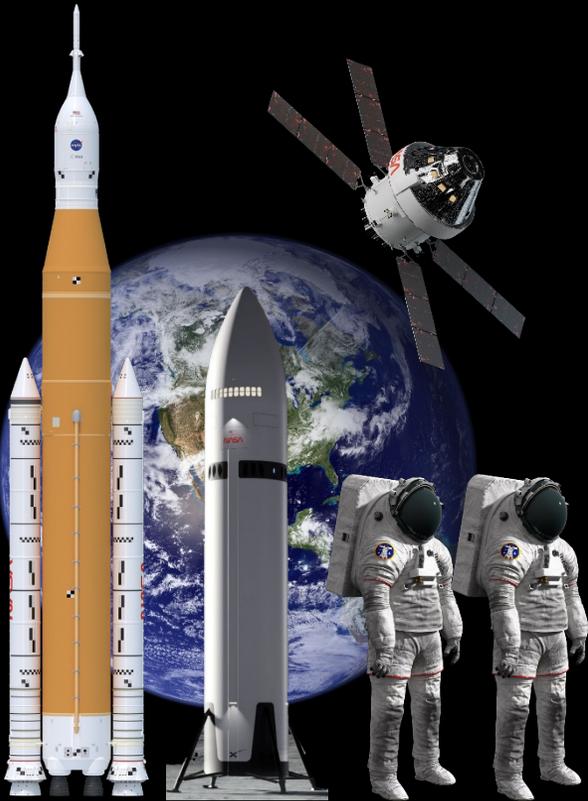
2 to 4 EVAs / 1 to 2 EVAs

TOTAL MISSION DURATION

≤ 21 DAYS

**LUNAR OPS (INCLUDES
SURFACE STAY)**

7 DAYS / 6 DAYS

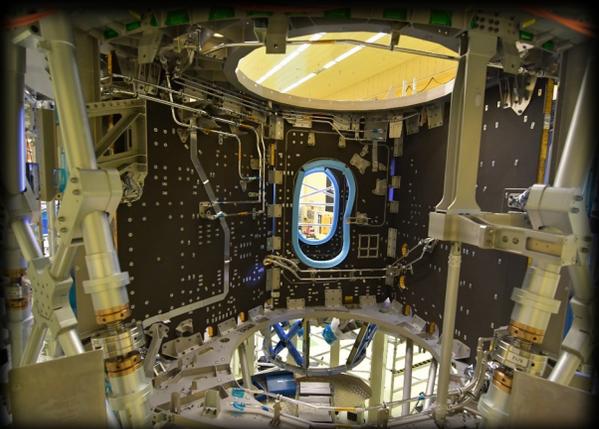




Milestones & Progress - Artemis V (2028)



Artemis V Progress and Testing



At the European Service Module integration halls in Bremen, Germany, stands the structure for the fifth spacecraft that will fly for Artemis to the Moon: July 2, 2023



Completed RL-10 engines for upper stage in storage



Core stage intertank panels awaiting production at NASA Michoud



Certification testing for production of new RS-25 Retrofit 3b engines to power the SLS rocket, beginning with Artemis V, completed early April 2024



RS-25 new production engine 20002 shown here at 70% completion in Canoga Park, CA



Artemis V liquid hydrogen tank barrel being removed from Vertical Weld Center at NASA's Michoud Assembly Facility: February 10, 2025



Artemis V SLS core stage first engine section barrel weld successfully completed at NASA's Michoud Assembly Facility: February 10, 2025



Artemis V crew module: February 18, 2026



Summary

- Artemis III standardizes the architecture and reduces risk
- We have the hardware, the skills, and capabilities to accelerate while this Administration is committed to removing all obstacles
- NASA is prepared to advocate for increased supply chain criticality and build components ourselves if necessary
- NASA personnel will be embedded as active, not passive, participants in the supply chain. We will help drive outcomes.
- We are building new tools that allow us insight and real time resolution across the Artemis enterprise.
- To support a common understanding and initiate solutions, each CEO/company leader will be briefing the NASA Administrator in next few weeks.
- We are signaling demand and dropping an RFI for two pathways for crewed missions to the moon beyond Artemis V

NASA and our partners are ready and prepared to meet the challenge