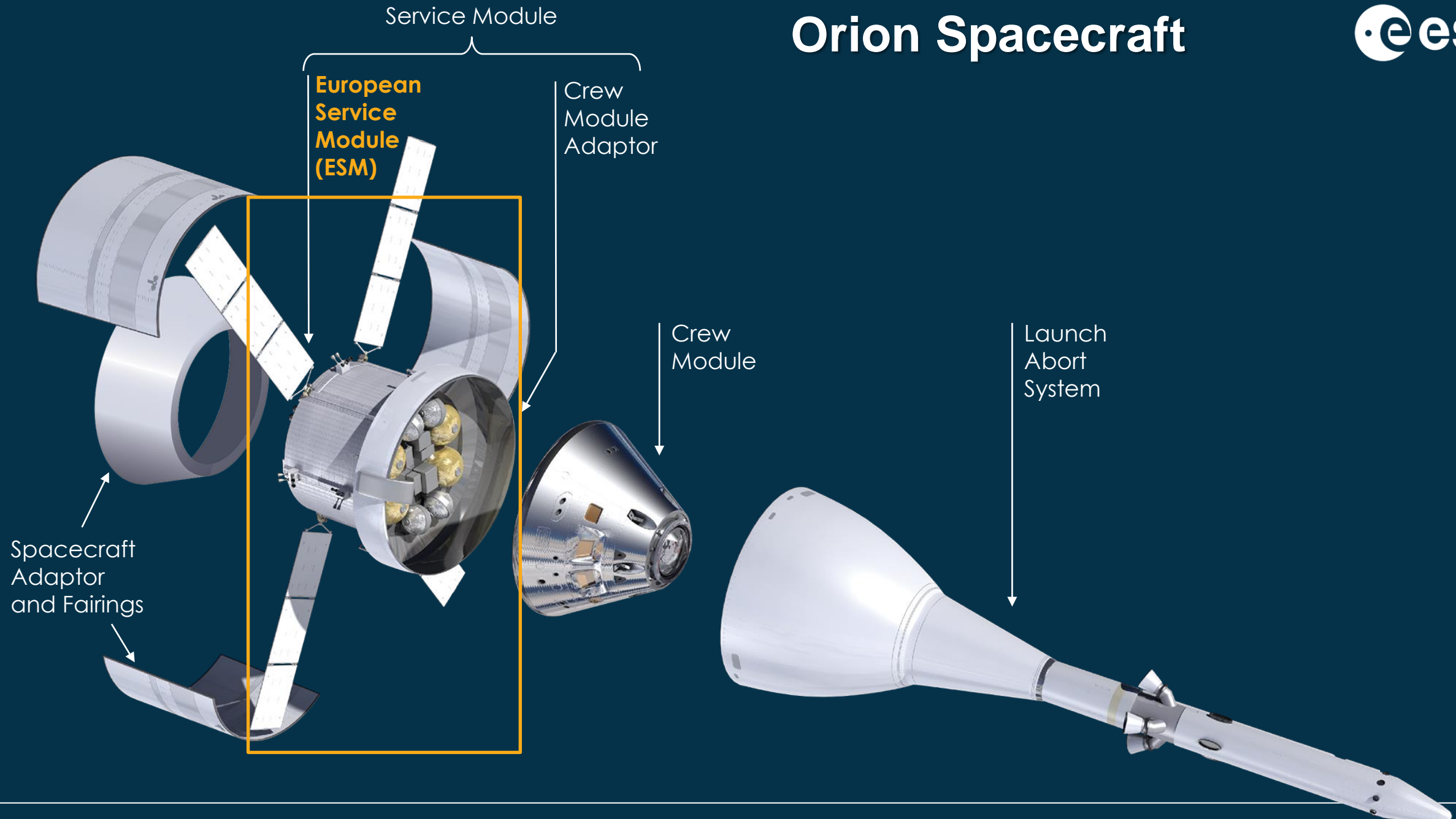


# Orion Spacecraft



# THE SPACECRAFT

## Orion



Apollo
3 crew members
~39 crew days consumable
Fuel Cell Powered (~14day max lifetime)



**Command Module**

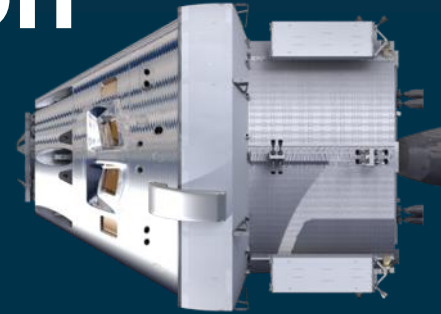
Height	10'7" (3.2m)
Diameter	12'10" (3.9 m)
Habitable Volume	210ft <sup>3</sup> (5.9m <sup>3</sup> )
Launch Weight	12,392 lbm (5,621 kg)
Landing Weight	10,977 lbm (4,979 kg)

**Service Module**

Height	22'7" (6.9 m)
Diameter	12'10" (3.9 m)
Launch Weight	51,258 lbm (23,250 kg)

**Performance**

Crew	3
Habitable Volume	70 ft <sup>3</sup> /person (2.0m <sup>3</sup> )
Mission Support	14 days/3 crew
Power Source	Fuel Cells



**Crew Module**

Height	10'10" (3.3 m)
Diameter	16'5" (5 m)
Habitable Volume	314ft <sup>3</sup> (8.9m <sup>3</sup> )
Launch Weight	22,900 lbm (10,387 kg)
Landing Weight	20,400 lbm (9,253 kg)

**Service Module**

Height	16' (4.9 m)
Diameter	13'5" (4.1 m)
Launch Weight	34,085 lbm (15,461 kg)

**Performance**

Crew	4
Habitable Volume	78.5 ft <sup>3</sup> /person (2.2m <sup>3</sup> )
Mission Support	21 days/4 crew
Power Source	Solar Arrays

Orion
4 crew members
~84 crew days consumables
Solar Array Powered

Transition from minimal mission durations to long-duration and flexibility in cislunar operations

# EUROPEAN Service Module



## Germany

- Prime Contractor
- European Service Module Assembly Integration & Verification
- Propulsion and Propulsion Drive Electronics
- Centralised Parts Procurement Agent
- On Board Data Network Harness for Qualification Module

## Italy

- Structure
- Thermal Control System
- Consumable Storage System
- Power Control and Distribution Unit
- Photovoltaic Assembly
- Meteoroid and Debris Protection System

## Switzerland

- Secondary Structure
- Solar Array Drive Assembly
- Solar Array Simulator
- Mechanical Ground Support Equipment

## USA

- Gas Tank
- Valves
- On Board Data Network Harness for Flight Module

## France

- System Tasks
- Avionics qualification
- Direct Current Harness
- Front End Electronics
- Helium Filters

## Belgium

- Tank Bulkhead
- Electrical Ground Support Equipment
- Pressure Regulation Units

## Sweden

- Propulsion Qualification Module Integration

## Denmark

- Front End Electronics
- Electrical Ground Support Equipment

## Norway

- Hydrophobic Filter

## Spain

- Thermal Control Unit

## The Netherlands

- Solar Array Wings



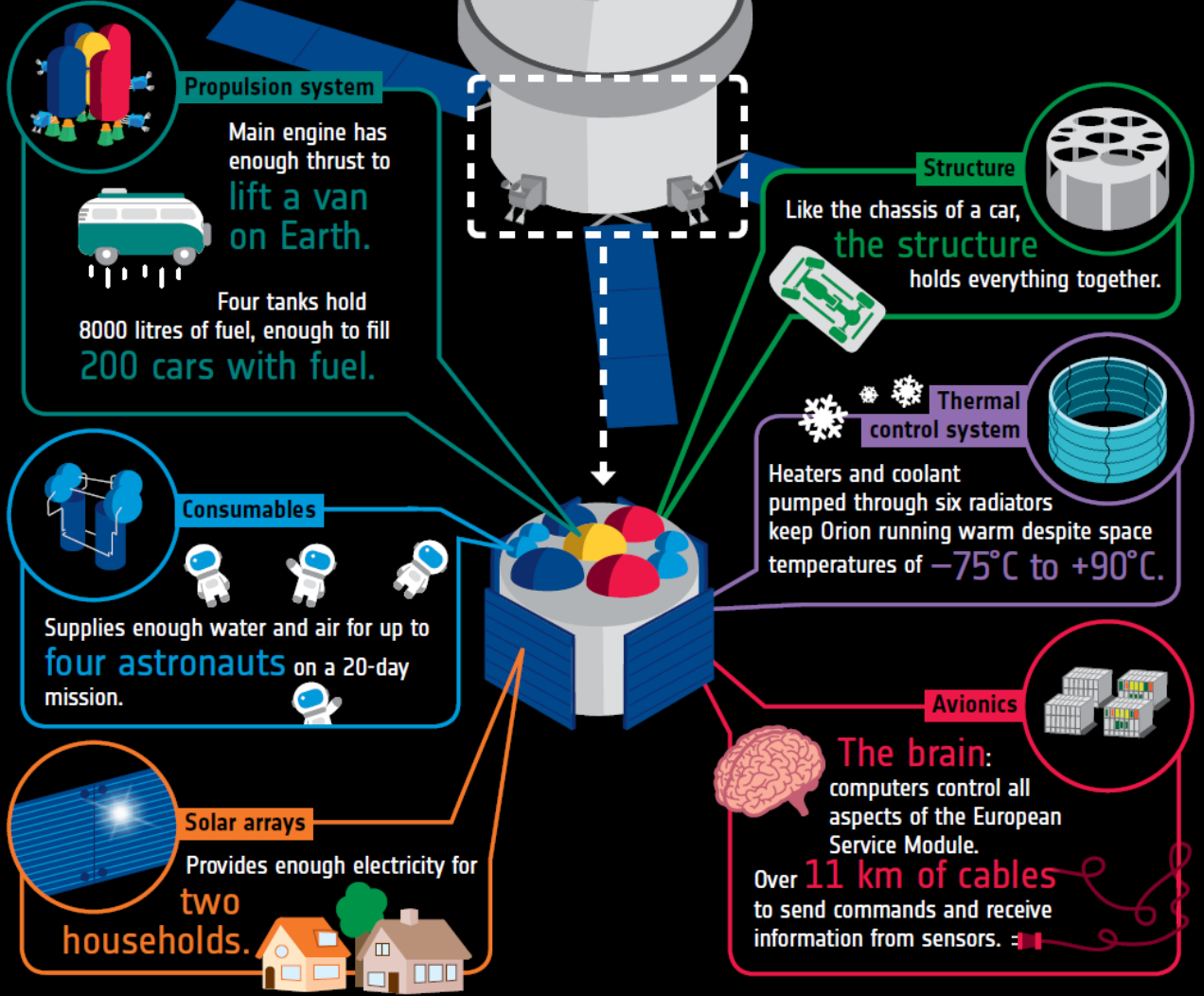
# The European Service Module

- Power: 4 x 7m long solar array wings (double the power than ATV)
- Propulsion:
  - 33 Engines: 1 main engine + 8 AUX + 24 RCS thrusters
  - Propellant tanks + Helium
- Air & Water: 3litre/day water + 1kg of air.
  - 4 water tanks provide 240 kg of potable water.
  - gas: 1 nitrogen tank (30 kg) + 3 oxygen tanks (90 kg)
- Thermal control: radiators
- Avionics: computers and electronics
- Structure: to hold propulsion and consumable tanks, and provide robustness to the spacecraft.



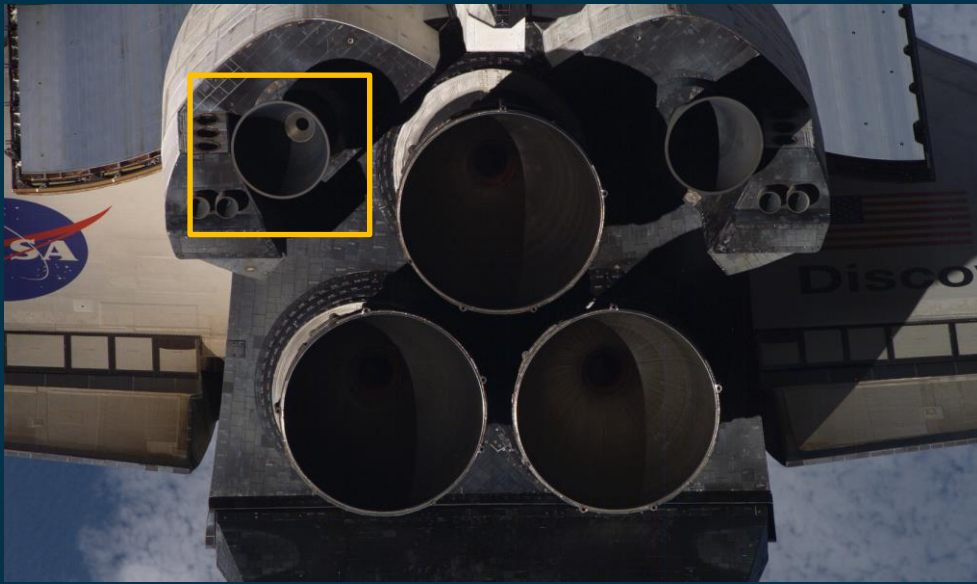
## → ORION

### The European powerhouse

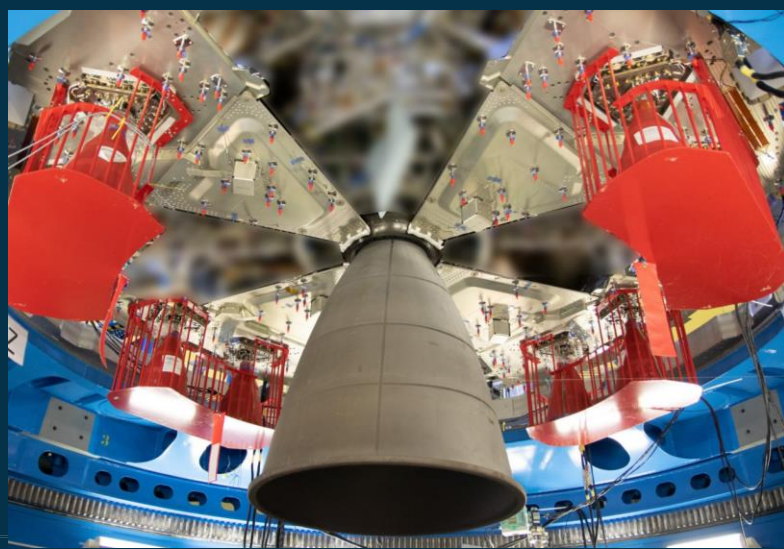
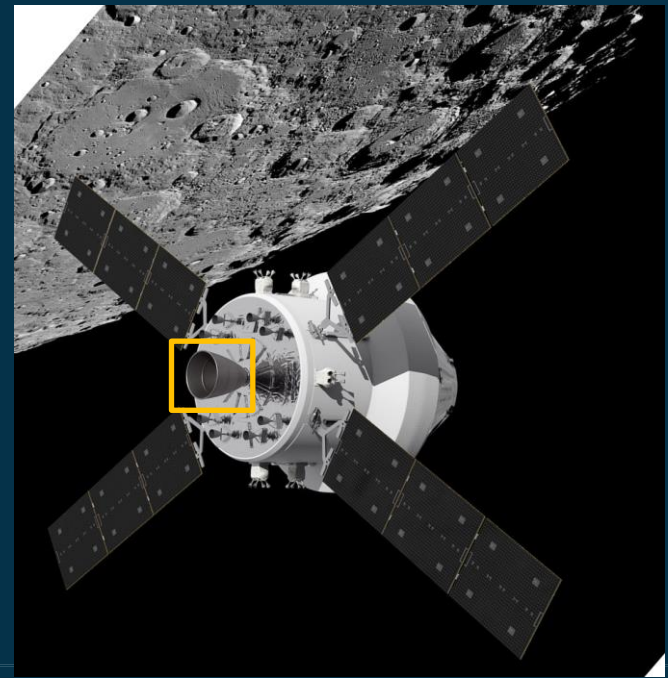


# The European Service Module

- OMS-E: Orbital Maneuvering System Engine (OMS-E) from the Space Shuttle
- 8 Auxiliary engines, same as used on ATV
  - Trajectory correction manoeuvres
  - Back-up to the main engine
- 24 RCS thrusters which are the same as used on ATV (220 N) provide the impulse necessary for translation and attitude control manoeuvres.



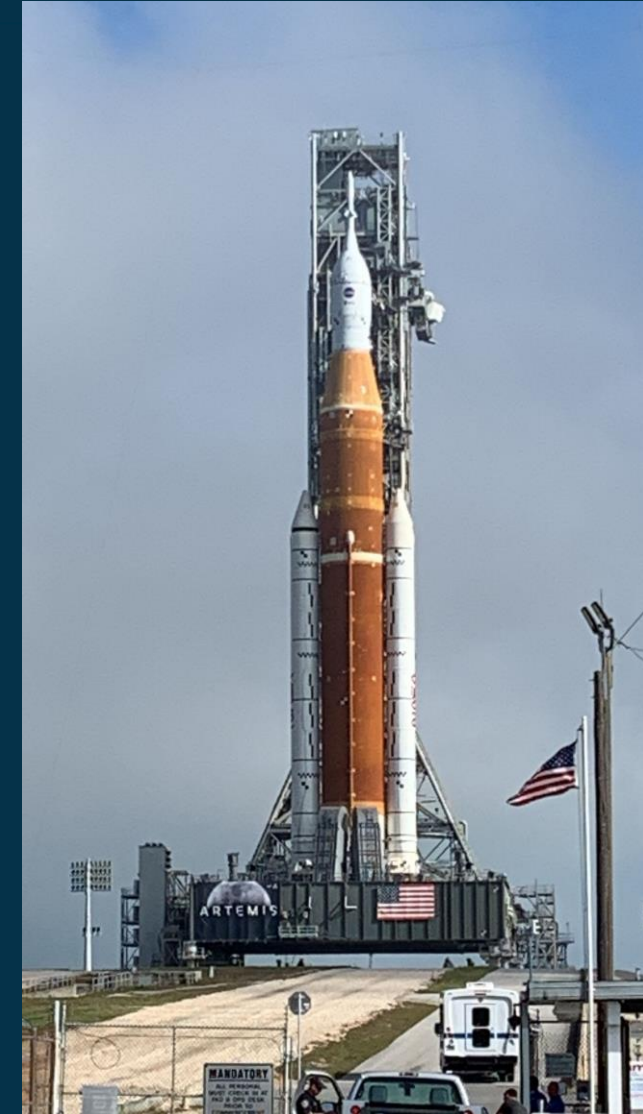
**OMS-E: Orbital Manoeuvring System Engine**

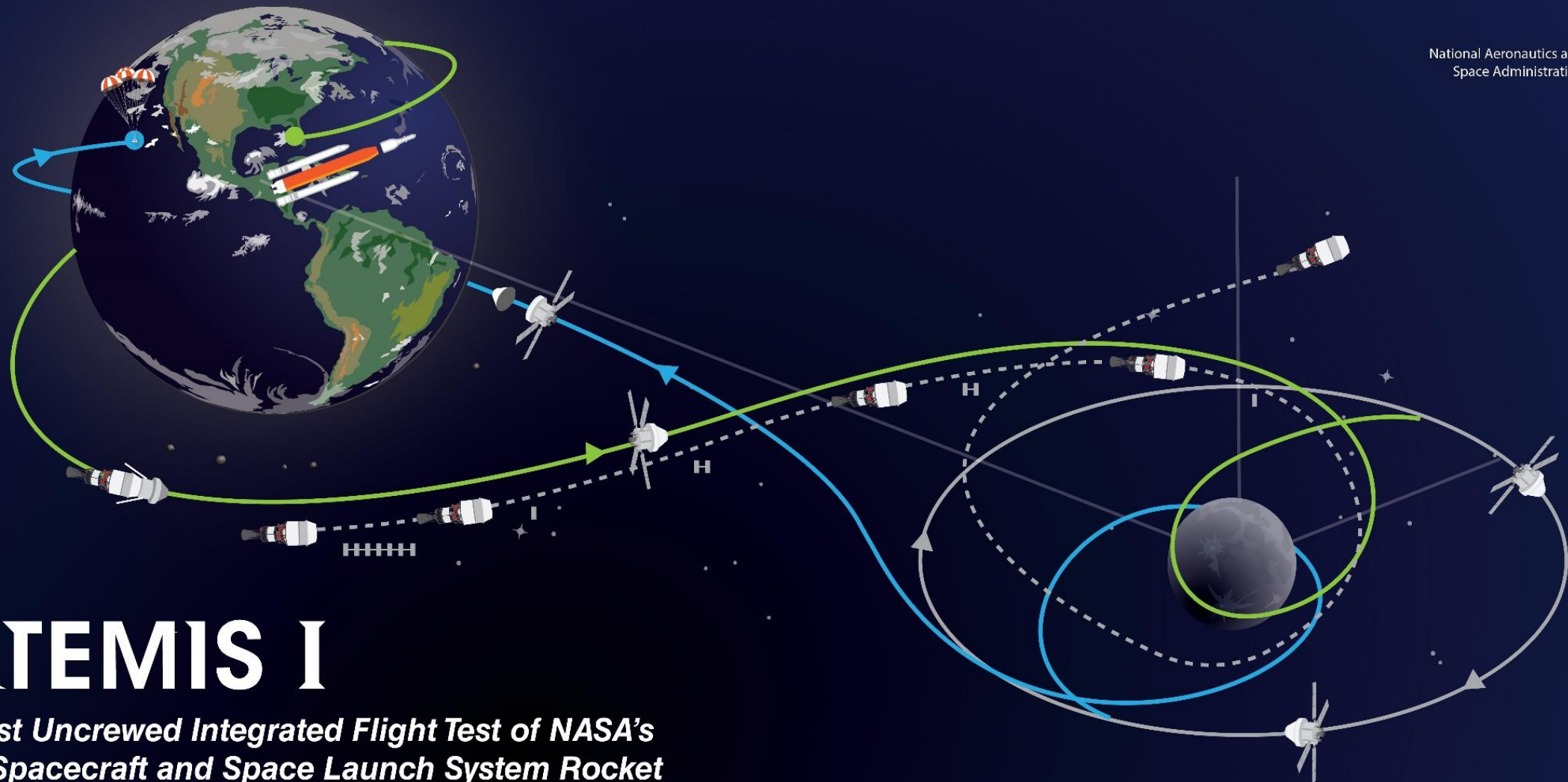


ESM1 OMS-E flew on the shuttle Challenger, Discovery and Atlantis. Its first launch was on the STS-41G mission in October 1984, and its last shuttle mission was STS-112 in October 2002.



# Preparing for launch



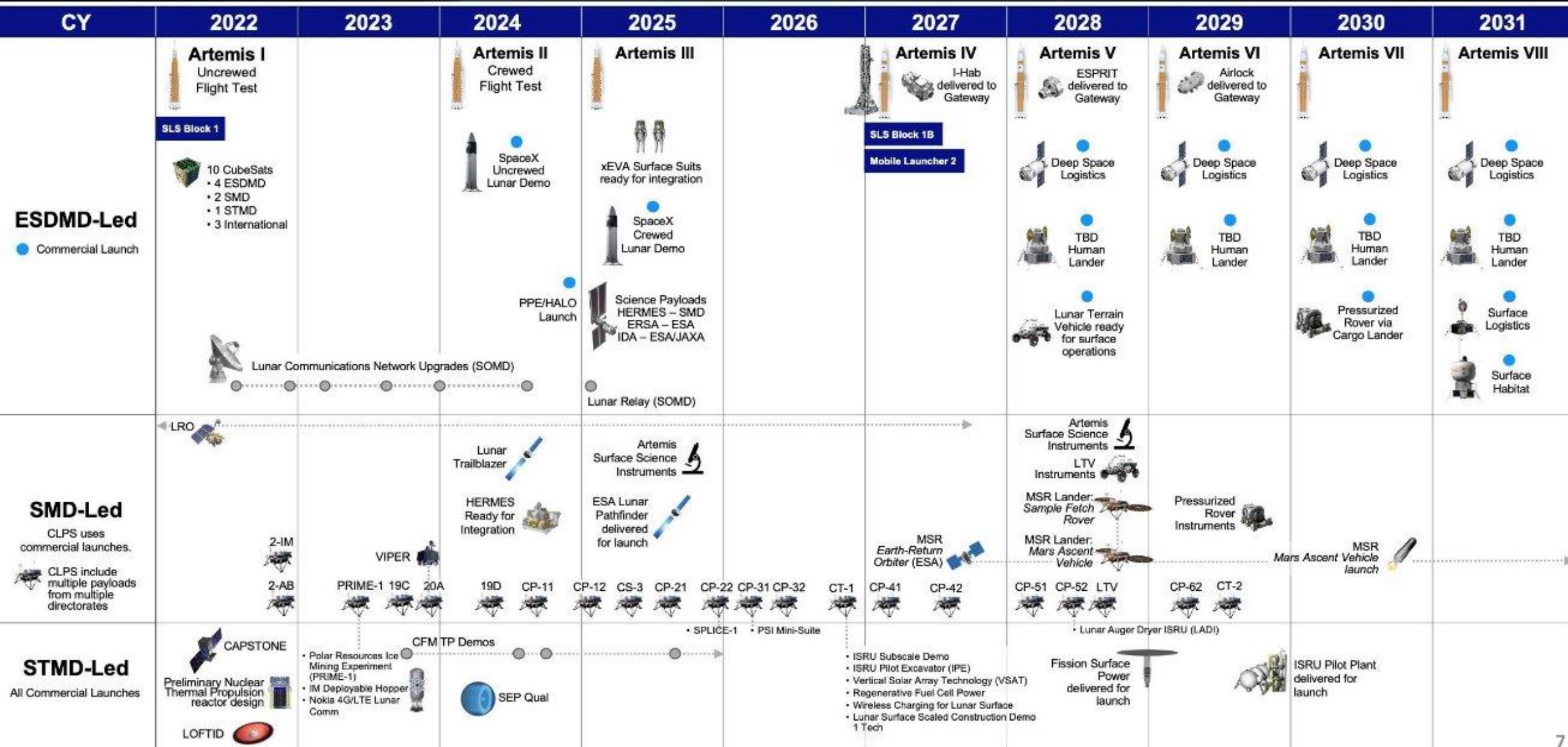


# ARTEMIS I

*The First Uncrewed Integrated Flight Test of NASA's  
Orion Spacecraft and Space Launch System Rocket*



# Moon to Mars Planning Manifest



Imagery is meant to represent the calendar year in which the launch occurs. Does not include impact from FY22 appropriations.