

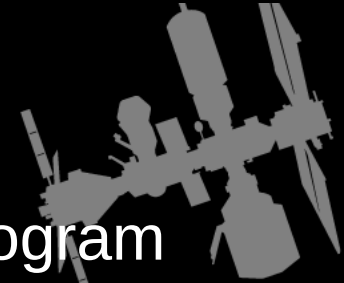


Introduction to Gateway

Dina Contella

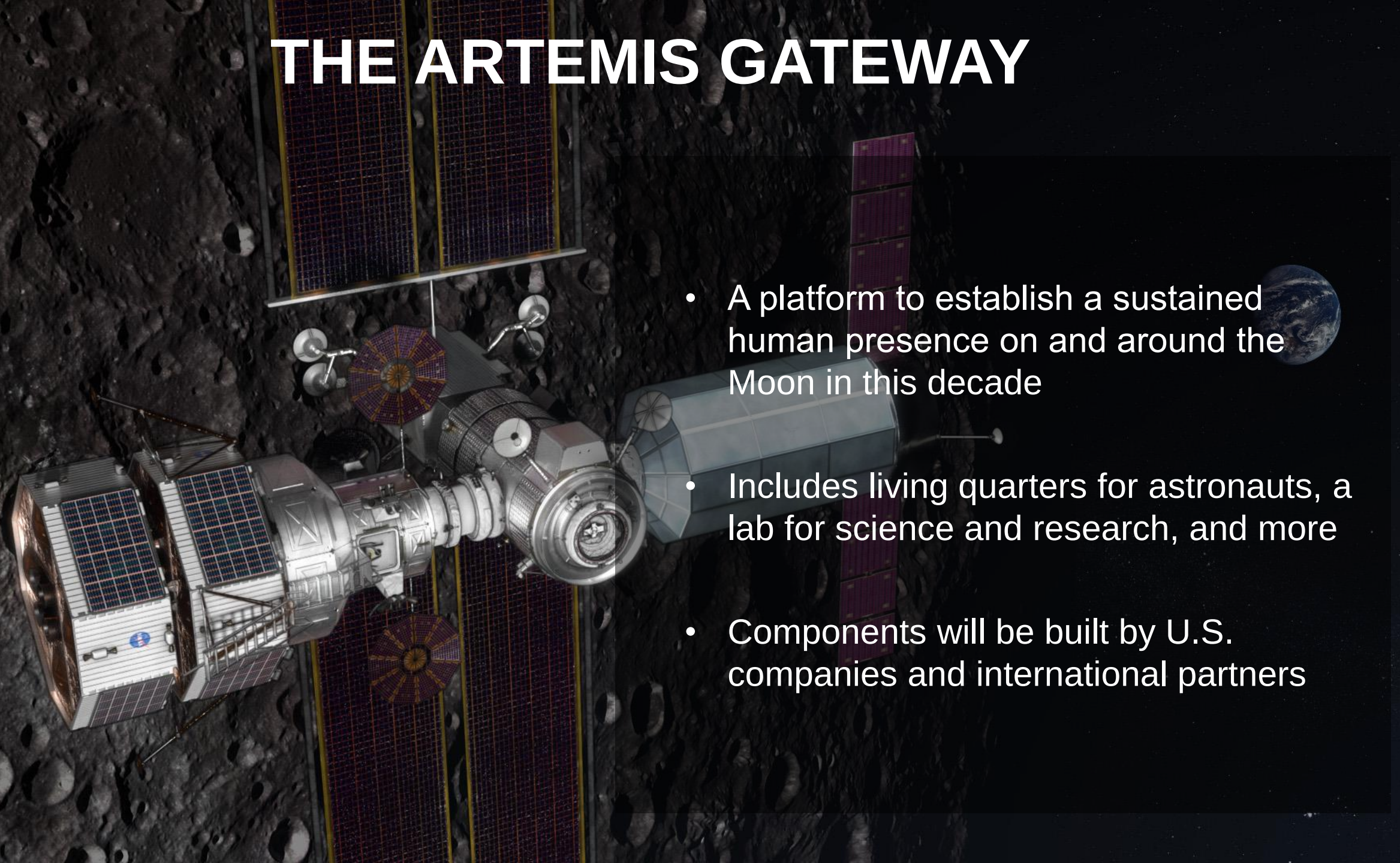
- Manager, Mission Integration and Utilization Office, Gateway Program
- Utilization Integration Lead for Advanced Exploration Systems (AES)

**Decadal Survey on Planetary Science and Astrobiology:
Panel on Mercury and the Moon**



THE ARTEMIS GATEWAY

- A platform to establish a sustained human presence on and around the Moon in this decade
- Includes living quarters for astronauts, a lab for science and research, and more
- Components will be built by U.S. companies and international partners



ARTEMIS: LANDING HUMANS ON THE MOON

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

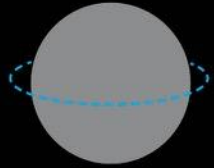
*First crew leverages infrastructure
left behind by previous missions*

LUNAR SOUTH POLE TARGET SITE

GATEWAY ORBIT

Cislunar space offers innumerable orbits for consideration, each with merit for a variety of operations. The Gateway will support missions to the lunar surface and serve as a staging area for exploration farther into the solar system, including Mars.

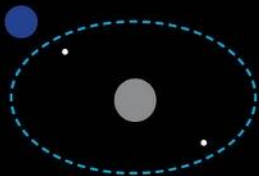
ORBIT TYPES



LOW LUNAR ORBITS

Circular or elliptical orbits close to the surface. Excellent for remote sensing, difficult to maintain in gravity well.

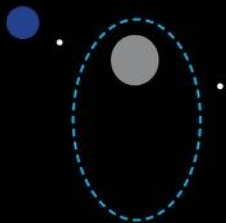
» Orbit period: 2 hours



DISTANT RETRO- GRADE ORBITS

Very large, circular, stable orbits. Easy to reach from Earth, but far from lunar surface.

» Orbit period: 2 weeks



HALO ORBITS

Fuel-efficient orbits revolving around Earth-Moon neutral-gravity points.

» Orbit period: 1-2 weeks

NEAR-RECTILINEAR HALO ORBIT (NRHO)

1,500 km at its closest to the lunar surface, 70,000 km at its farthest.



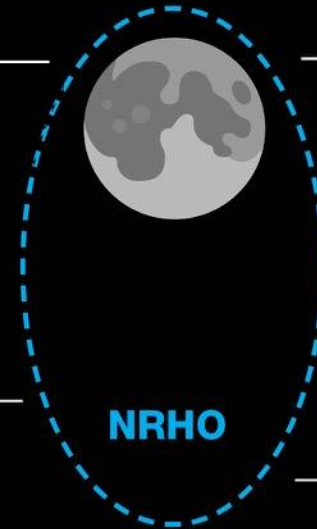
ACCESS

Easy to access from Earth orbit with many current launch vehicles. Staging point for both lunar surface and deep space destinations.



ENVIRONMENT

Deep space environment useful for radiation testing and experiments in preparation for missions to the lunar surface and Mars.



SCIENCE

Favorable vantage point for Earth, sun and deep space observations.



COMMUNICATIONS

Provides continuous view of Earth and communication relay for lunar farside.



SURFACE OPERATIONS

Supports surface telerobotics, including lunar farside. Provides a staging point for planetary sample return missions.

FIRST GATEWAY COMPONENTS INTEGRATED FOR LAUNCH IN 2024

MAXAR

POWER AND PROPULSION ELEMENT (PPE)

- 60 kW-class spacecraft with 50kW dedicated to the solar electric propulsion engine and the other 10kW dedicated to spacecraft power, communications, experiments
- Provides Gateway with electrical power, propulsion, and communication capabilities
- Accommodates science and technology demonstration payloads

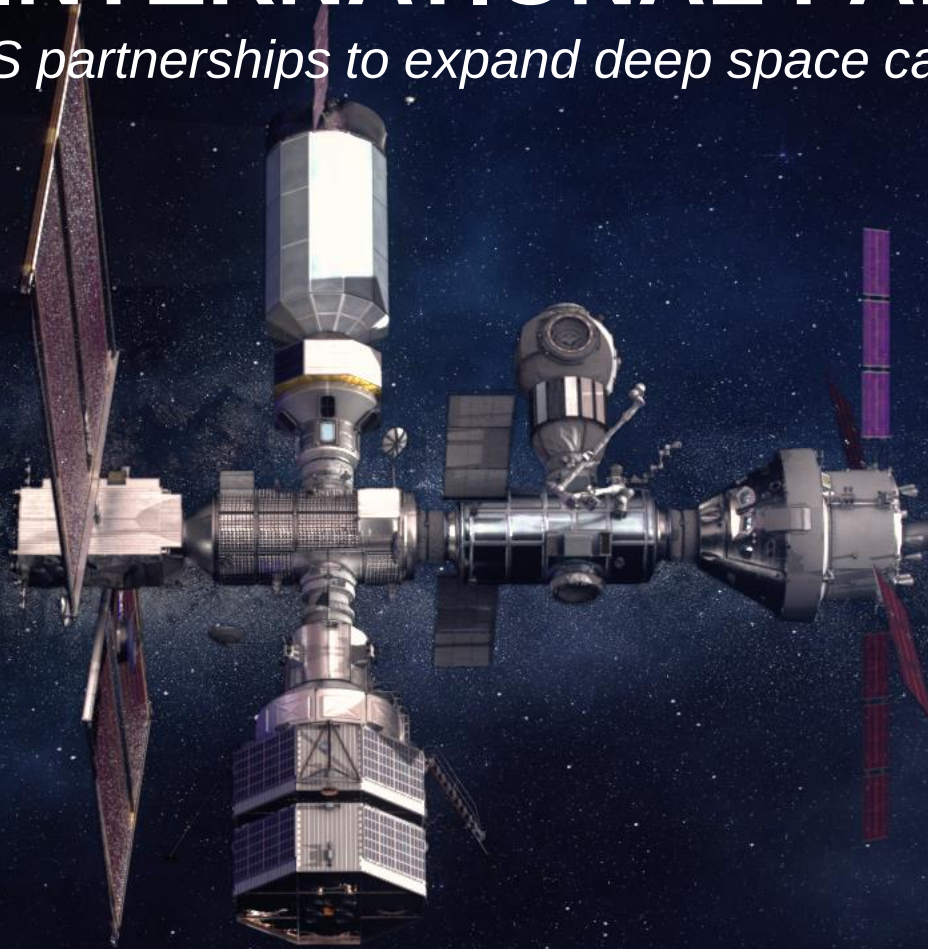
**NORTHROP
GRUMMAN**

HABITATION AND LOGISTICS OUTPOST (HALO)

- Initial crew cabin for astronauts visiting the Gateway
- Multiple docking ports for visiting spacecraft
- Cargo space for science and stowage
- Accommodates science and technology demonstration payloads

GATEWAY INTERNATIONAL PARTNERS

Building on ISS partnerships to expand deep space capabilities



GATEWAY LOGISTICS SERVICES (GLS)



- SpaceX selected as the first U.S. commercial provider under the Gateway Logistics Services contract to deliver cargo, experiments and other supplies to the Gateway in lunar orbit
- Multiple supply missions are planned in which the cargo spacecraft will stay at the Gateway for up to several months at a time
 - 5 MT delivered cargo capability
 - Power to internal and external payloads
 - Disposal of equipment and trash



GATEWAY UTILIZATION – UNIQUE ASPECTS



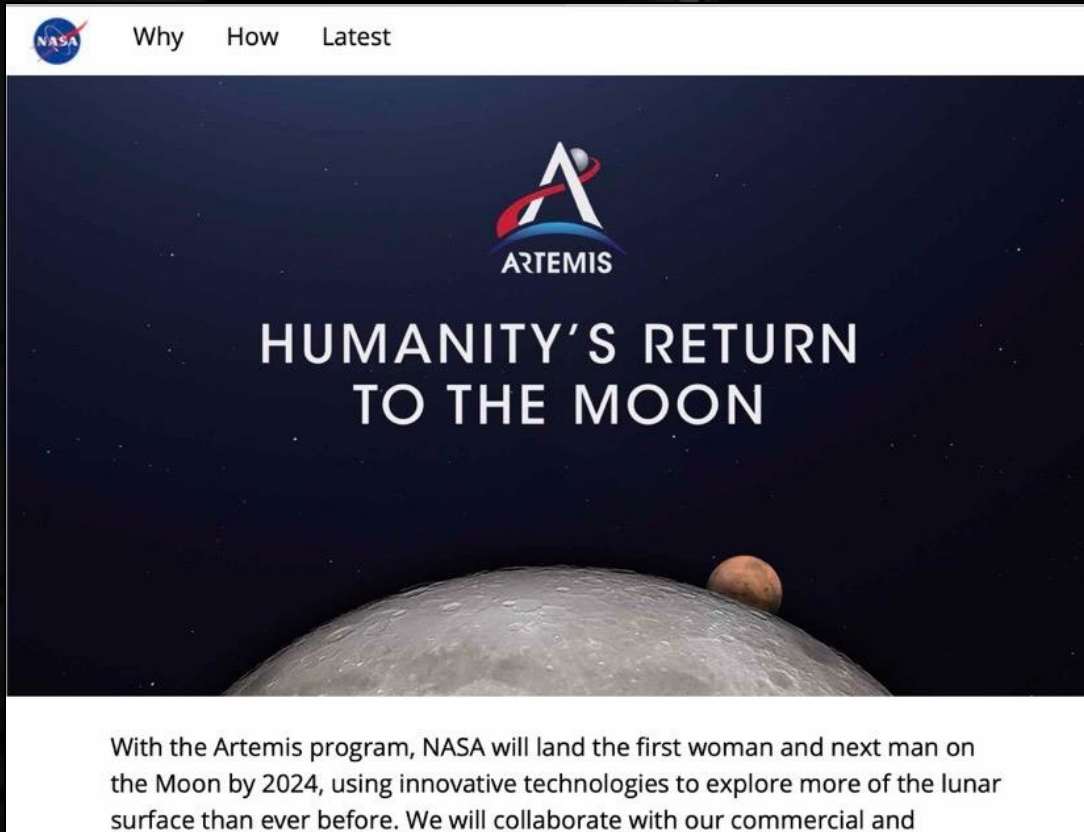
- **NASA's agreements with the Gateway international partners require significant multilateral collaboration**
 - Must minimize or eliminate redundancy in experiments and develop multilateral utilization plans to coordinate and integrate each Gateway partner's high-priority utilization objectives
- **Number of utilization opportunities are much more limited than with the International Space Station (ISS)**
 - Significantly smaller vehicle, limited crew time, fewer cargo flights, less return capability, less stowage
 - Emphasizing collaborative multilateral payloads, data sharing, equipment sharing
- **Payloads may be operated on/in logistics module, even post-Gateway departure**
- **Gateway uncrewed for many months/year, but sending telemetry when no crew present**
- **New modules, vendors and interfaces - intending to make interfaces consistent**
- **The unique location in Cislunar space results in new areas of research focus**
 - Focused on objectives that cannot be met from other locations/platforms (e.g., ISS)

EARLY GATEWAY SCIENCE PAYLOADS – INTERNATIONAL ENDEAVOR

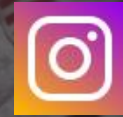
A satellite with large solar panels is shown in orbit above the Moon's surface. The Moon's surface is covered in numerous craters of various sizes. The satellite is positioned diagonally across the frame, with its solar panels extended. The background is the dark, cratered surface of the Moon.

- The first payloads to launch on and in Gateway (PPE/HALO) will be led by NASA's Science Mission Directorate and ESA (European Space Agency), with science participation from all Gateway international partners

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