



Gateway Memorandum for the Record

A statement from NASA regarding partnerships and development of the Lunar Orbital Platform-Gateway, published May 2, 2018.

Introduction

The Administration and Congress have provided NASA with ambitious goals that will strengthen current human spaceflight efforts, ensure continued U.S. leadership in space, foster a robust space economy in low-Earth orbit, and extend the Nation's ability to live and work farther into our solar system in the decades ahead.

As reflected in NASA's Exploration Campaign, the next step in human spaceflight is the establishment of U.S. preeminence in cislunar space through the operations and the deployment of a U.S.-led lunar orbital platform, "gateway." Together with the Space Launch System (SLS) and Orion, the gateway is central to advancing and sustaining human space exploration goals, and is the unifying single stepping off point in our architecture for human cislunar operations, lunar surface access and missions to Mars. The gateway advances US industry development and ensures US global leadership in an emerging, critical domain allowing the US to chart the course by which others may join.

When coupled with government support for small commercial lunar landing systems, the gateway prepares the United States for larger lunar robotic missions leading to a return of humans to the surface of the Moon. As a cislunar spacecraft, it enables a broader human architecture based on the principles of reusability and accessibility by a range of government and commercial vehicles. The first element of the gateway, a PPE (Power and Propulsion Element), will be launched as early as 2022. This element leverages the U.S. commercial satellite expertise and offers American companies an opportunity to advance state of the art in communication system spacecraft busses. This effort will not only benefit NASA, but also the domestic commercial satellite industry to maintain global advantage. For NASA, the gateway provides a platform that enables significant cislunar science and deep space technology development, including lunar sample returns and the operation of lunar, robotic, and in-space systems.

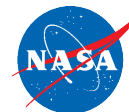
Underscoring broad international support for a gateway, the 14 space agencies participating with NASA in the International Space Exploration Coordination Group (ISECG) have reached consensus regarding the importance of a gateway in expanding human presence to the Moon, Mars and deeper into the solar system.

Strategy — Gateway Based Exploration in Partnership

NASA will balance and serve as the integrator of the spaceflight capabilities and contributions of U.S. commercial partners, our international partners and other U.S. government entities. Through partnerships both domestic and international, NASA will bring innovation and new approaches to the advancement of U.S. human spaceflight goals. NASA will lead human exploration in space to achieve U.S. spaceflight goals and global exploration objectives. International partnerships with Japan, Europe, Canada, and Russia bring over 30 years of Space Shuttle and International Space Station (ISS) experience and have been a vital component of U.S. space exploration. NASA expects additional capabilities could be provided by other international partners. The gateway offers a compelling vision of the future that will attract contributions from U.S. private sector companies and international partners. This activity will uphold the U.S. position as a leader in spaceflight and allow the United States to set "rules of road" for activities in space.

Gateway Functions

NASA's gateway concept distributes necessary functions across high-level capabilities: a power and propulsion (and communication) element (PPE), habitation/utilization, logistics resupply, airlock, and robotics. An effective habitation/utilization capability comprises pressurized volume containing integrated habitation systems and components, docking ports, environmental control and life support systems (ECLSS), avionics and control systems, radiation mitigation and monitoring, fire safety systems, autonomous capabilities, utilization, and crew health capabilities, including exercise equipment.



Gateway Architecture

NASA is studying various implementation approaches for the gateway including potential commercial design concepts initiated under NASA's Next Space Technologies for Exploration Partnerships (NextSTEP) habitation development activity. The purpose of the NextSTEP habitation development activity includes establishing public-private partnerships with U.S. industry to allow NASA to leverage their capabilities and investigate enabling crew habitation needs for a cislunar gateway. In support of this effort, the six U.S. companies are developing full-size cislunar habitat ground prototypes which will allow NASA and the NextSTEP habitation partners to: 1) evaluate configurations and habitability attributes of the concepts; 2) assess how the various systems interact together and with other capabilities like logistics modules and airlocks; and 3) provide platforms to test and ensure that the standards and common interfaces being considered are comprehensive and enable the intended interoperability. Additionally, NASA completed targeted studies in partnership with five U.S. companies on technical requirements drivers and ideas on business approaches for the PPE. In parallel to the domestic efforts, NASA is continuing a conceptual gateway study together with its ISS partners. NASA is incorporating the spaceflight experience, engineering expertise and potential contributions of our ISS partners in the gateway architecture concept analysis. By the summer 2018, the goal is to have the distribution of functions across all partners (domestic and International) sufficient to begin design and acquisition work on gateway for the remaining elements beyond the PPE. The requirements for the future gateway elements can be developed serially once the functional allocations are agreed to this summer.

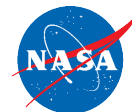
Candidate Partner Contributions

NASA will remain the overall lead as gateway architect, systems integrator, and operator.

NASA and partner contributions may include:

- Transportation Elements:
 - o Orion
 - Including crew module, service module, launch abort system
 - o SLS
 - o Ground processing
 - Including integration of gateway launch packages for SLS and/or commercial launch vehicles
 - o Commercial launch vehicles
- Gateway Capabilities:
 - o PPE to include initial lunar telecommunication capabilities
 - o Utilization/Habitation capabilities & elements comprising pressurized volumes containing integrated habitation systems and components, docking ports, environmental control and life support systems (ECLSS), avionics and control systems, radiation mitigation and monitoring, fire safety systems, autonomous capabilities, utilization, and crew health capabilities, including exercise equipment.
 - o Multiple logistics support flights
 - o Crew airlock, science airlock and science airlock outfitting
 - o Science experiments (both internal and external) to include cubesat deployer used in concert with a science airlock
 - o Docking, additional propellant storage with the potential of additional fuel for the gateway and advanced lunar telecommunication capabilities
 - o Robotic manipulator arm including robotic interfaces
 - o Rendezvous sensor packages
 - o Support to human and robotic lunar surface missions
- Mission Control Center
- Launch facilities
- Payload and experiments operations centers

By the end of this year, the gateway requirements will be baselined, which will enable the acquisition and partnership activities leading to gateway hardware development and deployment. As announced in



February 2018, NASA is preparing to release a Broad Agency Announcement to solicit innovative partnership proposals for the PPE with launch in 2022. The PPE demonstrates the partnership approach with U.S. industry for the whole gateway, capitalizing on developments in high power SEP and investments within the U.S. telecommunications industry to partner with NASA while minimizing costs. This partnership is intended to advance and diffuse advanced electric propulsion technology into the U.S. commercial satellite industry, leading to a U.S. competitive advantage. NASA's SLS will deliver Orion and additional elements as co-manifested components to complete the construction of the gateway. Orion will serve as an in-space tug to deliver and dock gateway elements during initial assembly as well as delivering the astronauts to carry out research and technology development activities from this unique vantage point.

Forward Plans

NASA will continue maturation of the gateway acquisition and partner planning activities utilizing mutually beneficial approaches in public-private and international partnerships to inform NASA's exploration plans for the lunar surface and ultimately, toward Mars. Future acquisition analyses will address element configurations; options for deployment using SLS, Orion and commercial launch vehicles; incorporation of commercial, science, and technology plans outside of NASA needs; and feature the development of a gateway for cislunar space. Lessons learned from almost 20 years of operating the ISS and other large-scale multi-party collaborations will be applied to manage and integrate partner contributions. While acquisition and manufacturing of hardware to support human spaceflight is a multi-year endeavor, NASA will be making decisions on key gateway capabilities in the summer of 2018. With the gateway construction and deployment in the early-mid 2020s in mind, NASA will be working closely with international and domestic partners to enable the activities necessary to preserve this schedule.