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45th Space Congress “The Next Great Steps”: Space Policy Directive-1

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45th Space Congress
“The Next Great Steps”

Bill Hill
Deputy Associate Administrator
Exploration Systems Development
Human Exploration and Operations Mission Directorate
NASA Headquarters, Washington, D.C.
“Lead an innovative and sustainable program of exploration with commercial and international partners to enable human expansion across the solar system and to bring back to Earth new knowledge and opportunities.

Beginning with missions beyond low-Earth orbit, the United States will lead the return of humans to the Moon for long-term exploration and utilization, followed by human missions to Mars and other destinations.”
Strategic Principles for Sustainable Exploration

• **FISCAL REALISM**
  Implementable in the near-term with the buying power of current budgets and in the longer term with budgets commensurate with economic growth;

• **SCIENTIFIC EXPLORATION**
  Exploration enables science and science enables exploration; leveraging scientific expertise for human exploration of the solar system.

• **TECHNOLOGY PULL AND PUSH**
  Application of high Technology Readiness Level (TRL) technologies for near term missions, while focusing sustained investments on technologies and capabilities to address the challenges of future missions;

• **GRADUAL BUILD UP OF CAPABILITY**
  Near-term mission opportunities with a defined cadence of compelling and integrated human and robotic missions, providing for an incremental buildup of capabilities for more complex missions over time;

• **ECONOMIC OPPORTUNITY**
  Opportunities for U.S. commercial business to further enhance their experience and business base;

• **ARCHITECTURE OPENNESS AND RESILIENCE**
  Resilient architecture featuring multi-use, evolvable space infrastructure, minimizing unique developments, with each mission leaving something behind to support subsequent missions;

• **GLOBAL COLLABORATION AND LEADERSHIP**
  Substantial new international and commercial partnerships, leveraging current International Space Station partnerships and building new cooperative ventures for exploration; and

• **CONTINUITY OF HUMAN SPACEFLIGHT**
  Uninterrupted expansion of human presence into the solar system by establishing a regular cadence of crewed missions to cis-lunar space during ISS lifetime.
**In LEO**
Commercial & International partnerships

**In Cislunar Space**
A return to the moon for long-term exploration

**On Mars**
Research to inform future crewed missions
# NASA Lunar Exploration Campaign

### Notional Launches

#### Early Science & Technology Initiative
- **SMD**—Pristine Apollo Sample, Virtual Institute
- **HEO/SMD**—Lunar CubeSats
- **SMD/HEO**—Science & Technology Payloads

#### Small Commercial Lander Initiative
- **HEO**—Lunar Catalyst & Tipping Point
- **SMD/HEO**—Small Commercial Landers/Payloads

#### Mid to Large Commercial Lander Initiative Toward Human-Rated Lander
- **HEO/SMD**—Mid Commercial Landers (~500kg–1000kg)
- **SMD/HEO**—Payloads & Technology/Mobility & Sample Return
- **HEO/SMD**—Human Descent Module Lander (5-6000kg)

#### Lunar Orbital Platform—Gateway
- **HEO/SMD**—Power & Propulsion Element/Communication Relay
- **HEO/SMD**—Crew Support of Lunar Missions
- **HEO/SMD**—Lunar Sample Return Support

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Timelines are tentative and will be developed further in FY 2019.
Assumptions
- Lunar Orbital Platform-Gateway provides ability to support multiple NASA, U.S. commercial, and international partner objectives in cis-lunar space and beyond
- The gateway is designed for deep space environments
  - Supports crew of 4 for a minimum of 30 days
  - Supports staging of other assets including landers

Emphasis on defining early elements
- Power Propulsion Element
- Habitat
- Logistics Strategy
- Airlock

Feasibility trades and future work
- Partner-provided elements
- Deep Space Transport
How Are We Leading Future Exploration?

Maximizing utilization of the International Space Station
Developing LEO commercialization
Resolving the human health and performance challenges
Expanding partnerships with commercial industry
Growing international partnerships
Building the critical Deep Space Infrastructure
Enabling the capabilities to explore multiple destinations
It begins with…

EXPLORATION MISSION-1
EXPLORATION MISSION-1

The first uncrewed, integrated flight test of NASA’s Deep Space Exploration Systems. The Orion spacecraft and Space Launch System rocket will launch from a modernized Kennedy spaceport.

Total distance traveled: 1.3 million miles  
Mission duration: 25.5 days  
Re-entry speed: 24,500 mph (Mach 32)  
13 CubeSats deployed
Assurance

EM-1 will strengthen worldwide confidence that this is the right strategy to send humans to deep space
Achievement

EM-1 will herald the success of America's human spaceflight program in partnership with others
Aspiration

EM-1 can inspire the world to pursue greatness in the exploration of our universe.
Building a new future for humans in deep space