NASA Advisory Council NASA Human Exploration and Operations Overview

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We've been a little busy since the last time we met.

What's The Same

- 1. SPD-1
- 2. EM-1
- 3. Goals of returning humans and science to the Moon
- 4. Goals of using Gateway to access the lunar surface
- 5. Use of commercial and international partners
- 6. Horizon goal of Mars

Space Policy Directive – 1 Reinvigorating America's Human Space Exploration Program



"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."



NASA's Path to Moving Human Presence Into The Solar System

- Build an infrastructure that will make deep space accessible to all
- Develop incremental capabilities during human lunar expeditions that will inform future missions, deeper into the solar system
- Expand our near-Earth economy to establish a sustainable presence in deep space, as we are already doing in low-Earth orbit
- Provide initial backbone crew transportation system augmented with commercial transportation







What's Changed

- 1. Timeframe to the lunar surface
- 2. Notional Gateway buildup
- 3. Name of lunar exploration program: Artemis





Recommendation: The NAC recommends that while working to implement improvements that have been recommended for programs like the James Webb Space Telescope and the Space Launch System, NASA should also take positive action to ensure that the policies which are within the agency's control, provide needed flexibility for program managers to enhance the agency's ability to continue its innovative and inspiring efforts in the exploration of Space. The first step in this process should be to solicit inputs from program managers on factors that would help them better meet all their obligations.

Major Reasons for the Recommendation: The NAC applauds NASA's work, consistent with the National Space Policy Directives in bringing back to earth new knowledge and opportunities through innovative and inspirational space programs and technical advances, which were based on a culture of discovery, risk acceptance and learning. NASA's rich history of managing large projects includes huge mission successes like the Apollo program, Viking, Voyager, and the Hubble Space Telescope. The managers of these successful programs were given enough flexibility and resources to accomplish tasks that had never been done before.

The council observes that the large programs of today are facing a change in the external and internal environment, which is creating a change in program and project management. The culture being created is focused on compliance and failure prevention at the expense of innovation and inspiration. Programs and projects are learning to pass audits and failing to deliver programs. While oversight of programs is important, NASA needs to be able manage. And the more challenging the project, the more it needs the flexibility and resources to manage well.

Consequences of No Action on the Recommendation: Additional constraints will make it more and more difficult for program managers to address program challenges, and could result in attitudes toward risk which discourage innovation.



- NASA has set forth a clear set of principles to guide its ISS transition plan for 2024 and beyond, and submitted a report on ISS transition to congress. The committee looks forward to reviewing the responses from industry to NASA's most recent NASA Research Announcement (NRA) on ISS transition, which are expected in December of 2018.
- The Committee is encouraged to see the level of support from the president and congress for NASA's sustainable approach to human exploration beyond low earth orbit as evidenced by the president's space policy directives, the most recent NASA authorization act, as well as the 2018 and 2019 NASA budgets. It will be exciting for the committee to monitor and review plans for returning humans to cislunar space and to the surface of the moon as they are developed over the next year. At this meeting the committee saw some preliminary plans for lunar landers. More information is expected after the president's budget is submitted to congress.
- The committee members support NASA's plans for a lunar orbiting platform that will enable international and commercial partnerships, reusability of hardware to transport crews to and from the lunar surface, reduce risk for lunar exploration crews by providing a safe haven, improve communications with spacecraft on the lunar surface, and provide valuable opportunities for scientific investigations, while expanding the knowledge base in the area of deep space maneuvering and solar electric propulsion required for travel to Mars.
- The approach and flexibility displayed by NASA in its commercial cargo program is resulting in the provision of essential services at a cost lower than previously possible. Where appropriate, other programs such as SLS and Orion should be allowed to take advantage of aspects of the commercial cargo program that enabled success at a lower cost. A similar procurement approach to that used for ISS cargo is planned for future programs such as PPE, the gateway habitation module, and some components of the lunar lander. It would be helpful to fully document and formalize the procurement and management approach that worked well for ISS cargo.
- Complexity of commercial crew and gateway will result in integration challenges that should be anticipated to minimize problems.
 Approaches proven on ISS and clearly expressed standards will help to make the integration problem manageable.



- As the Commercial Crew Program, SLS and Orion finish their development phases and transition toward operations, NASA's
 approach to program governance may unnecessarily slow the resolution of critical issues as they make their way through the
 programs and independent technical authorities for final resolution.
- NASA has been working with their Russian partners to maximize the on orbit stay time for Soyuz vehicles which will ensure US crew presence at ISS through January of 2020. If operational availability of commercial crew vehicles for station crew rotation is delayed beyond January, 2020, US crew presence aboard ISS could be lost. The ISS and Commercial Crew programs are continuing to look for ways to keep US crew members aboard ISS, if the first commercial crew flights are delayed.
- Low SLS and Orion Launch rate pose future risks for proficiency of the operations team and reduce program resilience in the event of mission failure.
- Shifting priorities may result in the reduction of government funding for the ISS before a viable U.S. commercial follow-on capability is established. This capability is critical to allow NASA continued access to low Earth orbit for research, deep space exploration system testing, and other applications that may arise.
- The current HEOMD organization is working well due to its strong management team and also due to the synergy that comes from having exploration development and operations in the same mission directorate. Efforts to reorganize HEOMD at this time could increase the risk level of NASA's human exploration programs, especially considering the large amount of critical engineering work that must be completed prior to the first launches of the Commercial Crew vehicles, SLS and Orion. If a reorganization is determined to be the best course for NASA, SLS and Orion are at the point where they should remain part of the HEO organization.

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EXPLORE MOON to MARS

" President Donald Trump has asked NASA to accelerate our plans to return to the Moon and to land humans on the surface again by 2024. We will go with innovative new technologies and systems to explore more locations across the surface than was ever thought possible. This time, when we go to the Moon, we will stay. And then we will use what we learn on the Moon to take the next giant leap - sending astronauts to Mars "

-NASA Administrator Jim Bridenstine

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LATEST NEWS



NASA Seeks US Partners to Develop Reusable Systems to Land Astronauts on Moon

As the next major step to return astronauts to the Moon under Space Policy Directive-1, NASA announced plans on Dec. 13 to work with American companies to design and develop new reusable systems for astronauts to land on the lunar surface. [...]



NASA Selects Experiments for Possible Lunar Flights in 2019

NASA has selected 12 science and technology demonstration payloads to fly to the Moon as early as the end of this year, dependent upon the availability of commercial landers. These selections represent an early step toward the agency's long-term scientific study and human exploration of the Moon and, later, Mars. [...]



<u>NASA Announces New</u> <u>Partnerships for Commercial</u> <u>Lunar Payload Delivery Services</u>

Nine U.S. companies now are eligible to bid on NASA delivery services to the lunar surface through Commercial Lunar Payload Services (CLPS) contracts, as one of the first steps toward long-term scientific study and human exploration of the Moon and eventually Mars. [...]

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NASA to Land in Mars, Pennsylvania to Celebrate Red Planet with STEAM

May 23, 2019 - NASA returns to Mars, Pennsylvania Friday, May 31 to celebrate Mars exploration and share the agency's excitement about landing astronauts on the Moon in five years.

NASA Administrator to Make Artemis Moon Program Announcement

May 22, 2019 - NASA Administrator Jim Bridenstine will make a significant announcement about the Artemis program's lunar exploration plans at 1 p.m. EDT Thursday, May 23, at the Florida Institute of Technology. The remarks will be carried live on NASA Television and the agency's website.

NASA Invites Public to Submit Names to Fly Aboard Next Mars Rover

May 21, 2019 - Although it will be years before the first humans set foot on Mars, NASA is giving the public an opportunity to send their names — etched on microchips — to the Red Planet with NASA's Mars 2020 rover, which represents the initial leg of humanity's first round trip to another planet.

Texas Students to Speak with NASA Astronaut on Space Station

May 17, 2019 - Students in Texas will have an opportunity next week to speak with a NASA astronaut aboard the International Space Station.

NASA Taps 11 American Companies to Advance Human Lunar Landers

May 16, 2019 - NASA has selected 11 companies to conduct studies and produce prototypes of human landers for its Artemis lunar exploration program.



@JimBridenstine

ON LIGHTS

@NASA Administrator. Husband. Father. Veteran. nasa.gov/about/highligh...

Washington, DC

III Joined January 2011

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12:30 p.m. ET

with Administrator Jim Bridenstine

employees about the President's budget

amendment that supports our #Moon2024

Jim Bridenstine 🧿

plans

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9:30 AM - 14 May 2019

Jim Bridenstine @JimBridenstine

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Want to supply the lunar Gateway? @NASA will work w/ US industry to deliver cargo (food/water/experiments/etc), critical supplies for orbital outpost to support astronauts on the surface for #Moon2024! Interested businesses can learn more: go.nasa.gov/2JSPBEX



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Jim Bridenstine 🤈 Good news for #Moon2024! We just selected 11 American companies to conduct sixmonth studies and/or develop prototypes for our human landing system. Learn more: go.nasa.gov/2Q6jkeN

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