

**U.S. House of Representatives
Committee on Science, Space, and Technology**

Mars Flyby 2021: The First Deep Space Mission for the Orion and SLS?

CHARTER

Thursday, February 27, 2014
10:00 a.m. – 12:00 p.m.
2318 Rayburn House Office Building

Purpose

The Science, Space, and Technology Committee will hold a hearing titled *Mars Flyby 2021: The First Deep Space Mission for the Orion and SLS?* at 10:00 a.m. on Thursday, February 27th. This hearing will explore the need for a roadmap of missions to guide investments in NASA's human spaceflight programs, how a manned mission to flyby the planets Mars and Venus launching in 2021 might fit into a series of missions and how the Space Launch System (SLS) and Orion Multipurpose Crew Vehicle could contribute to that mission.

Witnesses

- **Dr. Scott Pace**, Director of the Space Policy Institute, George Washington University
- **General Lester Lyles (Ret.)**, Independent Aerospace Consultant and former Chairman of the National Research Council Committee on the Rationale and Goals of the U.S. Civil Space Program¹
- **Mr. Doug Cooke**, Owner, Cooke Concepts and Solutions and former NASA Associate Administrator for Exploration Systems Mission Directorate
- **Dr. Sandy Magnus**, Executive Director, American Institute of Aeronautics and Astronautics

Background

President Obama offered a budget for fiscal year 2011 that proposed to cancel NASA's Constellation program. The primary goal for the Constellation program was a manned return mission to the Moon with a long-term goal of a manned mission to Mars. By contrast, the primary human spaceflight goal under the Obama Administration is a manned mission to an asteroid instead of the Moon. President Obama outlined the difference in his approach during a speech at Kennedy Space Center in April 2010, saying²:

I understand that some believe that we should attempt a return to the surface of the Moon first, as previously planned. But I just have to say pretty bluntly here: We've been there before. Buzz has been there. There's a lot more of space to explore, and a lot more to learn when we do. So I believe it's more important to ramp up our capabilities to reach -- and

¹ http://www.nap.edu/catalog.php?record_id=12701

² <http://www.whitehouse.gov/the-press-office/remarks-president-space-exploration-21st-century>

operate at -- a series of increasingly demanding targets, while advancing our technological capabilities with each step forward.”

Administration's Proposed Schedule

Later this year, NASA will launch the Orion crew capsule on a United Launch Alliance (ULA) Delta IV Heavy Rocket from Cape Canaveral Air Force Station. This test, Exploration Flight Test 1 (EFT-1), is meant to validate various systems including Orion's heat shield, avionics, and parachutes used for landing.

NASA plans to launch a 70-metric ton variant of the SLS with for the first time with an uncrewed Orion capsule to a circumlunar orbit in 2017. This flight, Exploration Mission-1 (EM-1), will demonstrate the integrated capability of both systems. The first manned mission for the Orion and SLS is planned for 2021 to orbit the Moon, and the first destination for this or subsequent missions may be an asteroid.³

In briefings before the Committee, NASA officials have explained the primary driver for NASA's proposed Orion-SLS schedule is the out-year budget profile proposed by the Administration, not technology or engineering development.

Mars Flyby

A trip to Mars for humans is a complicated endeavor. The orbital alignment that makes travel time reasonable occurs approximately every 15 years. The next such alignments are in 2018 and 2021. Last year, the Space Subcommittee received testimony from Mr. Dennis Tito, Chairman of the Inspiration Mars Foundation, that indicated that with existing technologies and additional development work, the SLS and Orion could potentially be ready for a Mars flyby by 2021 instead of the 2030s as proposed by the Administration.⁴ NASA reviewed the 2018 proposal, but has not reviewed a potential 2021 mission.

Key Questions

1. What are the various exploration architecture options for the Orion and SLS that are needed for a 2021 Mars flyby, and what is the best strategies for their development?
2. What steps have been taken to develop a strategic framework for the future of space exploration and how does a Mars flyby fit into this framework?
3. How can the development of new technologies and challenging missions inspire the next generation of scientists, engineers, and explorers?
4. How does a specific plan with measurable goals and milestones impact the industrial base?

³ <http://www.nasa.gov/exploration/systems/index.html>

⁴ <http://science.house.gov/sites/republicans.science.house.gov/files/documents/HHRG-113-SY16-WState-DTito-20131120.pdf>

Appendix One- Reports on Space Exploration

2009 – Review of U.S. Human Space Flight Plans Committee (Augustine Commission Report)
http://www.nasa.gov/pdf/396093main_HSF_Cmte_FinalReport.pdf

2004 – President’s Commission on Implementation of United States Space Exploration Policy (Aldridge Commission Report)
http://history.nasa.gov/aldridge_commission_report_june2004.pdf

1993 – The National Space Council Report on the U.S. Space Program
<http://history.nasa.gov/33082.pt1.pdf>

1991 - Office of Technology Assessment: Exploring the Moon and Mars
<http://history.nasa.gov/32992.pdf>

1991 – The Synthesis Group (The Stafford Report)
http://history.nasa.gov/staffordrep/main_toc.PDF

1990 – Advisory Committee on the Future of the U.S. Space Program (Augustine Commission Report)
<http://www.hq.nasa.gov/office/pao/History/augustine/racup1.htm>

1987 - NASA Leadership and America's Future in Space: A Report to the Administrator (Ride Report)
<http://history.nasa.gov/riderep/main.PDF>



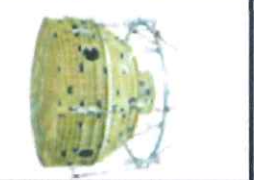
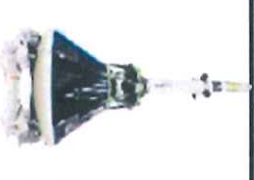





1986 - The National Commission on Space (Paine Commission Report)
http://www.nasa.gov/pdf/383341main_60%20-%2020090814.5.The%20Report%20of%20the%20National%20Commission%20on%20Space.pdf

NASA Orion Test Plan



Goal: To safely fly the first crew on Exploration Mission 2 (EM-2) on SLS in 2021.

How: With a ground and flight test campaign to ensure all Orion EM-2 systems are tested the way they will be used.

TEST								
 Parachute ONGOING Performance of critical landing systems in off-nominal cases	 Water impact & recovery ONGOING Performance over a range of sea-states	 Structural ONGOING Quality structure for the forces it will experience, including pressurization	 Space environment ONGOING Quality structure and system for thermal, vibration, etc. environment	 PA-1 Pad Abort 1 2010 Fires abort motors from the launch pad Test solid rocket attitude control system	 EFT-1 Exploration Flight Test 1 2014 Provides heatshield and environment data to use in the Critical Design Review	 EM-1 Exploration Mission 1 2017 Deep space operation Experience heating of a deep-space re-entry	 AA-2 Ascent Abort 2 2018 Fires abort motors at most difficult part of climb to orbit	 EM-2 Exploration Mission 2 2021 First crewed flight of Orion: 2 crew members on a 21-day deep space mission
Integrated Objectives								
Crew survivability under multiple failure cases	Navy assets demonstration of crew and vehicle recovery	Mass reduction for secondary payload capability	Exploration crew survivability Radiation hardening for avionics	Supported crew safety and recovery	HS Avionics Launch Abort System jettison motors Demo software and avionics in radiation environment	Initial exploration design and operational capability	Data for analysis	Data analysis for further design and mission optimization

