



NASA begins its lunar testbed program with robotic missions that perform orbital reconnaissance and demonstrate capabilities for sustainable solar system exploration.

Lunar Exploration

MAJOR EVENTS IN FY 2005

Lunar Exploration will be established as a new Theme for FY 2005, in response to the President's Vision for U.S. Space Exploration. Major activities for FY 2005 will be developed prior to the start of FY 2005.

Theme: Lunar Exploration

OVERVIEW

The Lunar Exploration (LE) Theme will undertake lunar exploration activities that enable sustained human and robotic exploration of Mars and other bodies across the solar system. These activities will be used to further science, and to develop and test new approaches, technologies, and systems, including use of lunar and other space resources, to support sustained human space exploration to Mars and other destinations.

As the Theme responsible for preliminary demonstration and operation of systems to be employed in future human-robotic exploration, the LE Theme will develop precursor lunar missions in response to mission and technology requirements defined by the Exploration Systems Enterprise. These requirements will be derived from the planetary surface exploration architecture defined by Exploration Systems. LE Theme missions will infuse the technologies and test the operations modes that NASA will employ in human and robotic solar system exploration. To the extent that NASA's exploration architectures will assign functions to both humans and robots based on their respective capabilities and characteristics, robotic lunar missions will test systems that support human and robotic architectural elements.

The specific number, frequency, duration, sizes and types of lunar missions and systems NASA ultimately deploys will be determined based on: the capabilities requiring demonstration on or near the Moon; the operational concepts being considered for future human and robotic exploration of Mars and other solar system destinations; and the research results from ongoing robotic missions to Mars and other solar system destinations. The Lunar Exploration Theme will develop and conduct a robotic lunar orbital mission, launching by 2008, and a robotic lunar surface mission, launching by 2009, to test system capabilities, gather engineering data for future systems development, identify in situ resources, characterize the operating environment at the lunar surface, and address lunar science priorities, such as uncovering geological records of our early solar system. These precursor missions will lay a foundation for a human mission to the Moon, launching between 2015 and 2020, that will test humans and robots as integrated elements of the architecture that will be used to explore Mars and the solar system in the years to come.

Missions	Goals supported by this Theme	Objectives supporting those Goals
To Understand and Protect our Home Planet	5. Explore the solar system and the universe beyond, understand the origin and evolution of life, and search for evidence of life elsewhere..	5.13 Through robotic and human lunar missions, demonstrate capabilities for safe, affordable, effective and sustainable human-robotic solar system exploration.

RELEVANCE

In direct support of the President's new vision of future space exploration, the LE Theme will manage the operation and demonstration of new capabilities for safe, affordable, effective, and sustainable future human-robotic solar system exploration. The Lunar Exploration Theme will formulate and develop missions that meet requirements determined by the Exploration Systems Enterprise. These mission requirements will be derived from a planetary surface exploration architecture that assigns functions to humans and robots based on their respective capabilities and characteristics, and will ensure that elements of this architecture are tested on the lunar surface. Science objectives associated with Mars and solar system exploration will drive the requirements for the architecture and systems to be tested in lunar human-robotic missions, and these testbed missions will also address lunar science priorities.

Education and Public Benefits

Human and robotic missions to the Moon will provide an operational environment to demonstrate exploration capabilities as precursors for human missions to Mars or other destinations, testing human-scale exploration systems, such as surface power, habitation and life support, and planetary mobility. In addition to laying a foundation for inspiring future exploration missions, the Lunar Exploration Theme missions will provide opportunities for academic and student engagement in scientific research and operations.

IMPLEMENTATION

The managerial structure for the Lunar Exploration theme is not yet determined. The exact scope and phasing of missions are also not yet determined, but will include a robotic lunar orbital mission launching by 2008 and a robotic lunar surface mission launching by 2009. Lunar Exploration Theme investments and project plans will ensure cost-effective and timely development of technologies and demonstration of capabilities, in preparation for launch of a human lunar surface mission between 2015 and 2020.

The NASA Enterprise official is Dr. Edward Weiler, Associate Administrator for Space Science. Acting Theme director and point of contact is Mr. Orlando Figueroa, Director of the Solar System Exploration Division and the Mars Exploration program at Headquarters. The acting Program Executive Officer is Mr. David Lavery, Program Executive Officer for Solar System Exploration.

The programs within the Lunar Exploration Theme will be managed to be compliant with NPG 7120.5B.

Theme: Lunar Exploration

STATUS

The Lunar Exploration Theme is a full new start in 2005, but will be organizing management structures, executing preliminary reviews and design studies, and conducting other initializing activities in 2004.

PERFORMANCE MEASURES

Outcomes/Annual Performance Goals (APGs)	
<i>Outcome 5.13.1</i>	<i>Develop capability to conduct robotic lunar test bed missions by 2008 and human lunar missions as early as 2015 that demonstrate preferred exploration systems and architectural approaches to enable human-robotic exploration across the solar system.</i>
5LE1	Identify and define preferred human-robotic exploration systems concepts and architectural approaches for validation through lunar missions.
5LE2	Identify candidate architectures and systems approaches that can be developed and demonstrated through lunar missions to enable a safe, affordable and effective campaign of human-robotic Mars exploration.
<i>Outcome 5.13.2</i>	<i>Conduct robotic missions, in lunar orbit and on the lunar surface, to acquire engineering and environmental data by 2015 required to prepare for human-robotic lunar missions.</i>
5LE3	Establish a baseline plan and Level 1 requirements to utilize the robotic lunar orbiter(s) and robotic lunar surface mission(s) to collect key engineering data and validate environmental characteristics and effects that might affect later robotics, astronauts and supporting systems.
5LE4	Identify candidate scientific research and discovery opportunities that could be pursued effectively during robotic lunar missions.
<i>Outcome 5.13.3</i>	<i>By 2020, establish through lunar surface missions the building block capabilities to support safe, affordable and effective long-duration human presence beyond low Earth orbit (LEO) as a stepping-stone to sustained human-robotic exploration and discovery beyond the Moon.</i>
5LE5	Establish a viable investment portfolio for development of human support systems, including human/machine extravehicular activity (EVA) systems, locally autonomous medical systems and needed improvements in human performance and productivity beyond low Earth orbit (LEO).
<i>Outcome 5.13.4</i>	<i>By 2015, demonstrate new human-robotic space operations capabilities employing advanced in-space infrastructures, including space assembly, maintenance and servicing, and logistics concepts.</i>
5LE6	Identify preferred approaches for development and demonstration during lunar missions to enable transformational space operations capabilities.
5LE7	Conduct reviews with international and U.S. government partners, to determine common capability requirements and opportunities for collaboration.
Uniform Measures	
5LE8	The Theme will distribute at least 80% of its allocated procurement funding to competitively awarded contracts.

INDEPENDENT REVIEWS

Review Types	Performer	Last Review Date	Next Review Date	Purpose
Presidential Commission	Aldridge Commission		Feb-Jun 2004	Assess implementation approaches to President's Vision for U.S. Space Exploration

BUDGET

Budget Authority (\$ millions)	FY 2003	FY 2004	Change	FY 2005	Comments
Lunar Exploration			+70.0	70.0	
Technology and Advanced Concepts			+70.0	70.0	
Lunar Exploration			+70.0	70.0	

 Indicates changes since the previous year's President's Budget Submit

 Indicates budget numbers in full cost.