A New Space Enterprise of Exploration

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NASA’s Exploration Systems Mission Directorate

Exploration of Near Earth Objects Objectives Workshop

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ESMD: Blazing a Trail Into the Solar System

- NASA’s human spaceflight program seeks to extend human presence throughout the solar system.

- The President's FY2011 budget request takes a new approach to this goal, focusing on capabilities that will allow us to reach multiple destinations, including the moon, asteroids, and Mars and its moons.

- The investments seek to create the new knowledge and capabilities required for humans to venture beyond low-Earth orbit (LEO) to stay.

- Approach expands alternatives available for human exploration, currently limited by lack of strategic investment in technology development over past decades.
Human Space Exploration Themes Remain the Same

A Sustained Presence - Extending Human Frontiers

New Knowledge in Science and Technology

Economic Expansion

Global Partnerships

Inspiration and Education
What is the Destination?

• The future human spaceflight program will build through a steady sequence of achievements, from a set of crewed flights to test and prove systems required for exploration beyond LEO orbit early in the next decade, to a near-Earth object mission in 2025, to missions to Mars’ environs by mid-2030s, followed by landing on Mars.

• This approach builds experience and capability through time, results in successive “firsts” (much like the Mercury and Gemini approach) and allows the human spaceflight systems to be developed serially rather than concurrently, making the endeavor affordable to the tax payer.

• Although we cannot provide a date with certainty for the first human landing on Mars, we can identify essential capabilities needed for such a mission. These are reflected in the programs within this budget request.
  – They are capabilities that have been recommended consistently for more than two decades in national level reports of committees and commissions addressing future human space exploration.
  – They are the near-term steps NASA must take to create the new knowledge and capabilities required for humans to venture beyond LEO to stay.
The New Path for Human Space Exploration

• The FY2011 budget request challenges NASA to embark on a new human space exploration program that is sustainable and affordable.

• The budget balances investments in future human spaceflight systems with obtaining key knowledge about future destinations and demonstrating critical enabling technologies for human spaceflight and exploration, including:
  – Research and development of heavy-lift and propulsion engines and other key technologies.
  – Technology development and demonstrations to reduce cost and prove required capabilities for future human exploration.
  – Exploration precursor robotic missions to multiple destinations to cost-effectively scout human exploration targets and identify hazards and resources for future human exploration.
  – Increased investment in human research to prepare for long journeys beyond Earth.
  – Expanded efforts to develop U.S. commercial human spaceflight capabilities, making space travel more accessible and affordable.
Phased Development Strategy

Phase I
Build the Foundation
Commercial Sector, Robotic Precursors, and Game-Changing Technology Development

Phase II
Systems Development
Design and Development of Heavy-Lift and In-space capabilities

Phase III
Sustainable Exploration of the Solar System
Human Exploration Missions to Solar System Destinations
### ESMD Planned Programs and Projects

#### 30 June 2010

**by Fiscal Year**

<table>
<thead>
<tr>
<th>Year</th>
<th>Human Research</th>
<th>Enabling Technology Development</th>
<th>Heavy Lift/Propulsion Technology</th>
<th>Flagship Technology Demonstrations</th>
<th>Exploration Precursor Robotic Program</th>
<th>Exploration Scout Missions</th>
<th>Commercial Cargo</th>
<th>Commercial Crew</th>
<th>LEO Access</th>
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</thead>
<tbody>
<tr>
<td>2012</td>
<td>Radiation Risk Model</td>
<td>Autonomous Lunar High Power Electric Propulsion System</td>
<td>In-Space Cryo Thruster Demo</td>
<td>Inflatable / AR&amp;D</td>
<td>xScout 2</td>
<td>1 Demo and 8 Operational Flights</td>
<td>Orbital</td>
<td>1 Demo Flights</td>
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<td>2013</td>
<td>Performance Health Tech Demo</td>
<td>Advanced EVA Suit</td>
<td>Advanced ECLSS On ISS</td>
<td>Advanced EVA Suit</td>
<td>xScout 3</td>
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<td>2014</td>
<td>Biomed Tech Demo</td>
<td>Scorecard</td>
<td>Inflatable / AR&amp;D</td>
<td>Advanced EVA Suit</td>
<td>xScout 4</td>
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<td>2016</td>
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<td>Mars Medical Suite Demo</td>
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<td>Advanced EVA Suit</td>
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**Supports Initiation of Systems in 2015 Timeframe**

For Human Exploration Beyond Low Earth Orbit
Where We are Today

<table>
<thead>
<tr>
<th>Instrument</th>
<th>Release</th>
<th>Response</th>
<th>Award</th>
<th># Responses</th>
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</thead>
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<tr>
<td>Heavy Lift and Propulsion Technology (HLPT)</td>
<td>RFI</td>
<td>4 May</td>
<td>21 May</td>
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<td>Enabling Technology Development and Demonstration (ETDD)</td>
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<td>Flagship Technology Demonstrations (FTD)</td>
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<td>Exploration Precursor Robotic Missions (xPRM)</td>
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<td>11 Jun</td>
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<td>Commercial Crew (CC)</td>
<td>RFI</td>
<td>21 May</td>
<td>18 Jun</td>
<td>N/A</td>
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- As part of the Exploration Enterprise Workshop in Galveston, Texas May 25-26, 2010, received much feedback from partners in industry and academia
- The Exploration Systems Mission Directorate (ESMD) has been incorporating input into development plans
- This conference is next major engagement with public to continue the dialog
Where We Go Next

- ESMD ready to proceed with new exploration enterprise
- While leadership works towards consensus on exploration strategy, will continue to refine plans and keep options open
- Now is the best opportunity to develop requirements and CONOPS for future missions
ESMD: Blazing a Trail Into the Solar System

- Extending human presence throughout the solar system
- Focusing on capabilities that will allow us to reach multiple destinations
- The investments seek to create the new *knowledge* and *capabilities*
- Approach expands alternatives available for human exploration

[www.nasa.gov/exploration](http://www.nasa.gov/exploration)