Validating Advanced Technologies for Future Space Missions

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Topics

- Program Objective
- Program Focus
- NMP Flight Team Partners and IPDT Members
- Microelectronics IPDT
- NMP Missions
  - Mission objectives
  - Technologies validated
- Summary
NMP Program Objective

- Conduct space flight validation of breakthrough technologies which will significantly benefit future Space Science and Earth Science missions

  - Breakthrough technologies focused on:
    * Enabling new capabilities to fulfill the Science Enterprises’ needs
    * Reducing costs of future missions

  - Flight validation to mitigate risks to first users and enable rapid infusion into future missions
Program Focus

NMP

Revolutionary Nature Of Breakthrough
## IPDT's Represent Broad Spectrum of Government Agencies, Universities and Industry

<table>
<thead>
<tr>
<th>Member Organizations</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Microelectronics</strong></td>
</tr>
<tr>
<td>USAF Research Lab, Boeing, Georgia Tech, GSFC(^1), Hughes, Honeywell, Irvine Sensors, JPL(^2), APL(^3), LeRC(^4), Lockheed-Martin, MIT/LL(^5), Optivision, Sandia National Lab, Space Computer Corp., Space Electronics Inc., TRW, UC/San Diego, Univ. of New Mexico, USC</td>
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<tr>
<td><strong>Telecommunications</strong></td>
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<tr>
<td>Boeing, GSFC, JPL, APL, Lockheed-Martin, Raytheon</td>
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<tr>
<td><strong>Multifunctional Structures and Modular Systems</strong></td>
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<tr>
<td>GSFC, Honeybee Robotics, JPL, LaRC(^6), L'Garde, MIT, ARC(^7), NOAA(^8), Primex, SGG, Univ. of Arizona, Univ. of Colorado, USAF Research Labs, Yardney, NRL(^9)</td>
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<tr>
<td><strong>In-Situ Instrument and Micro Electro-mechanical Systems</strong></td>
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<tr>
<td>DARPA, USAF Research Labs, Ball Aerospace, JPL, APL, LANL(^10), NSF, U.S. Navy Postgraduate School, Sandia National Lab, Southwest Research Institute, Stanford Univ., Univ. of So. Calif./ISI</td>
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<tr>
<td><strong>Autonomy</strong></td>
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<td><strong>Instrument Technologies and Architecture</strong></td>
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<tr>
<td>Ball Aerospace, GSFC, ITT Aerospace, JPL, APL, Lockheed-Martin, MSFC(^11), MIT/LL, LaRC, NRL, NOAA, Orbital Sciences Corp., Raytheon, SGG Corp., TRW, Univ. of Wisconsin</td>
</tr>
</tbody>
</table>

\(^1\)NASA Goddard Space Flight Center  \(^2\)Jet Propulsion Laboratory  \(^3\)Johns Hopkins Applied Physics Lab  \(^4\)NASA Lewis Research Center  
\(^5\)MIT/Lincoln Laboratory  \(^6\)NASA Langley Research Center  \(^7\)NASA Ames Research Center  \(^8\)National Oceanic and Atmospheric Administration  
\(^9\)Naval Research Laboratory  \(^10\)Los Alamos National Laboratory  \(^11\)NASA Marshall Space Flight Center
# NMP Mission Launch Schedule

<table>
<thead>
<tr>
<th>Mission</th>
<th>FY98</th>
<th>FY99</th>
<th>FY00</th>
<th>FY01</th>
<th>FY02</th>
<th>FY03</th>
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<tbody>
<tr>
<td>Approved Missions</td>
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<tr>
<td>DS-1 (Asteroid/Comet Flyby)</td>
<td></td>
<td></td>
<td>10/98</td>
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<tr>
<td>DS-2 (Mars Impact Lander)</td>
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<td>01/99</td>
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<tr>
<td>EO-1 (Formation Flying/</td>
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<tr>
<td>Hyperspectral Imager)</td>
<td></td>
<td></td>
<td>12/99</td>
<td></td>
<td>03/01</td>
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<tr>
<td>EO-2 (Coherent Lidar Expt)</td>
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<tr>
<td>Proposed Missions</td>
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<tr>
<td>DS-3 (Multi S/C Interferometer)</td>
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<td>09/03</td>
<td>(target)</td>
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<tr>
<td>DS-4 (Comet Lander)</td>
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<td>04/03</td>
<td>(target)</td>
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<tr>
<td>ST-5 target launch window</td>
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<tr>
<td>EO-3 target launch window</td>
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</tbody>
</table>
Representative Technologies Validated on DS-1 (Cont'd)

- NSTAR ion propulsion system
- Plasma experiment for planetary exploration
- Autonomous onboard optical navigation
- Advanced solar concentrator array
- Miniature integrated camera spectrometer
- Small deep space transponder
Technologies to be Validated on DS-2

Advanced Microcontroller

Power Microelectronics Unit

Evolved Water Experiment / Soil Thermal Conductivity Experiment
Technologies to be Validated on DS-2 (Cont’d)

- Lithium-Thionyl Chloride Primary Battery
- Aeroshell/Entry System
- Flexible Cable Interconnect
- Compact Telecom System
Technologies to be Validated on EO-1

- Carbon-Carbon Radiator
- Pulsed Plasma Thruster
- X-Band Phased Array Antenna
- Wideband Advanced Recorder Processor
Technologies to be Validated on EO-1 (Cont’d)

Atmospheric Corrector

Lightweight Flexible Solar Array

Advanced Land Imager

Hyperion Instrument
Other NMP Microelectronics Technologies

Fiber-Optic Data Bus

3D Flight Computer
Summary

- DS-1 launched 24 October 1998
  - Low Power Electronics Experiment operational/data analysis underway
  - Power Activation and Switching Module operational/data analysis underway
  - Multi-Functional Structures operational/performance parameters verified
  - All other technologies operational/performance analysis in progress

- DS-2 launched 3 January 1999
  - Expected to impact near Mars southern polar region on 3 December 1999

- EO-1 on schedule for launch in December 1999

More details on microelectronics technologies in this Session and in Session 8A