Planetary Science Division Update
&
Small Bodies Research in PSD

Presentation at the
Small Bodies Assessment Group

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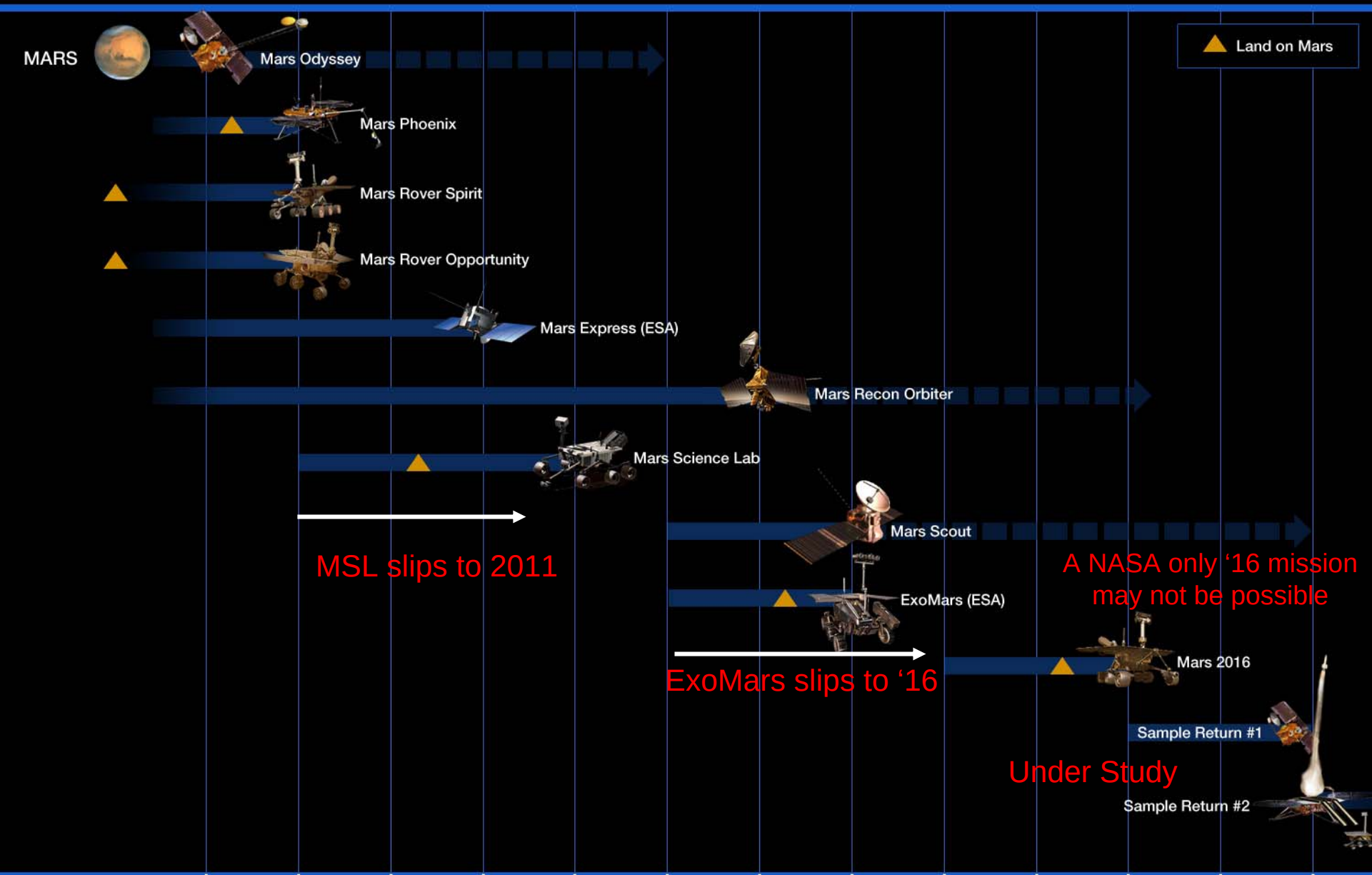
Outline

- Status of MSL
- Small Body activity in PSD
- Recent Selections and Upcoming Events

Mars Mission timeline



PSS Recommendations- Oct. 2

- Reaffirm support for MSL. However, the PSS retracts its earlier recommendation that NASA make every effort to remain on schedule for a 2009 launch for MSL.
- NASA should make a prompt decision on a launch timeline for MSL that minimizes both the risk to the full success of that mission and the impact on other programs. Consistent with concurrent SMD policy, cost increases should be:
  - Borne by JPL, the implementing organization for the mission
  - Additional funds sought next from Mars Exploration Program
  - Impacts to non-Mars programs, as needed after those two sources of funds are utilized, should be sought through delays rather than cancellation of approved missions now under development
- NASA should conduct an external review to assess the causes of the MSL cost overruns and to recommend changes to prevent similar situations for future missions.
- These recommendations were taken into account to develop a new fiscal solution to accommodate the launch slip of MSL to 2011

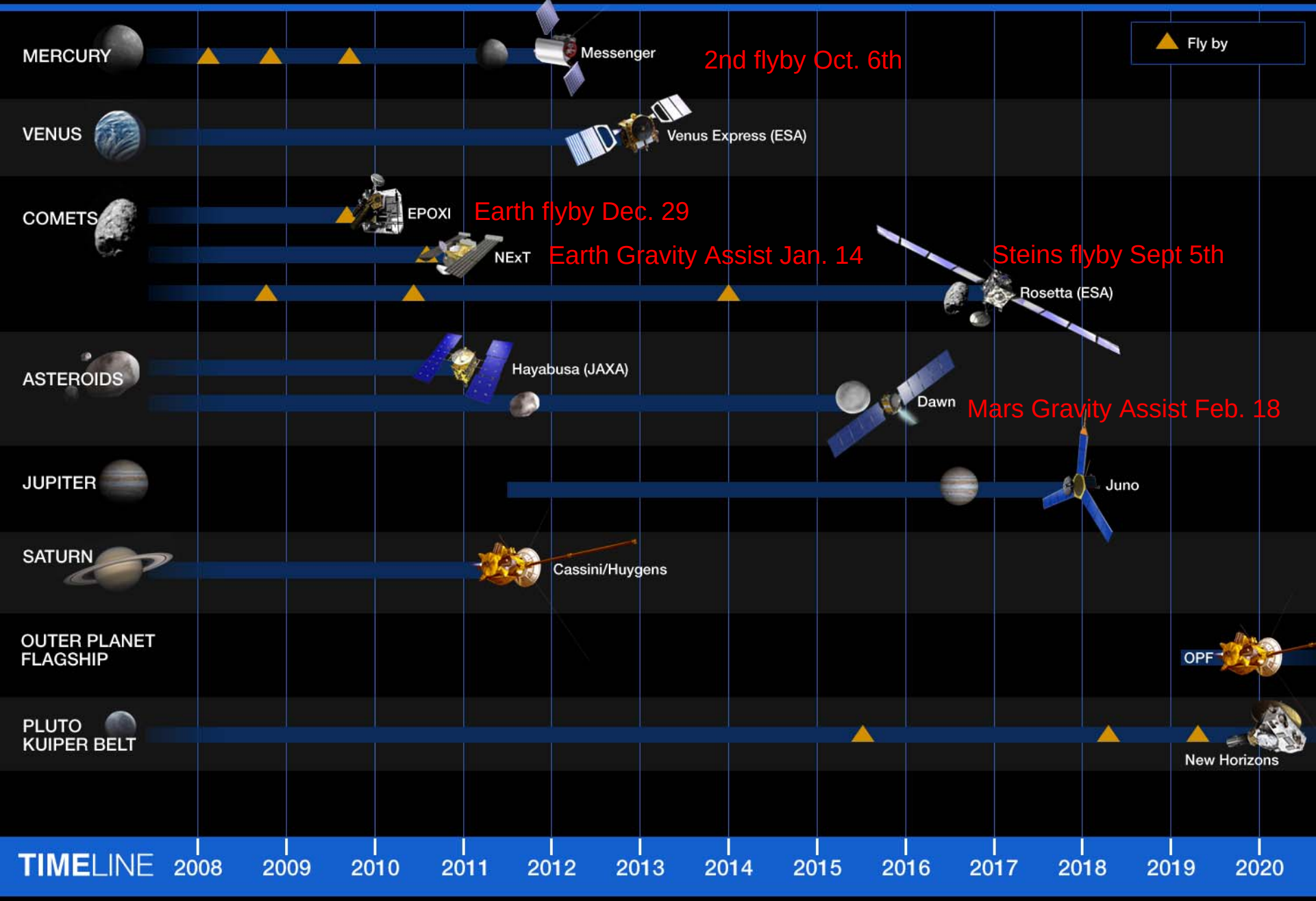
Timeline of Events

- Several options to handle cost implications of the MSL launch slip within the Planetary Science Division have been created
  - Use the “Guiding Principles” determined by the Planetary Science Subcommittee (PSS)
  - Mars programs effected the most; then the rest of planetary; delaying missions preferable to cancellation
- Discussion with OMB of all the options (completed)
- Initial analysis of projected cost and MSL-Juno launch conflict (completed)
- PSS meeting to review options and obtain community recommendations
- Complete the analysis of cost & launch conflicts (could take months!)
- Update will be presented to the NASA Advisory Committee (NAC-SC), in February 2009
- Implemented in NASA’s budget development process (FY10-15)
- Began the process to assessing the causes of the MSL cost overruns to prevent similar situations for future missions (ie: Next Flagship)

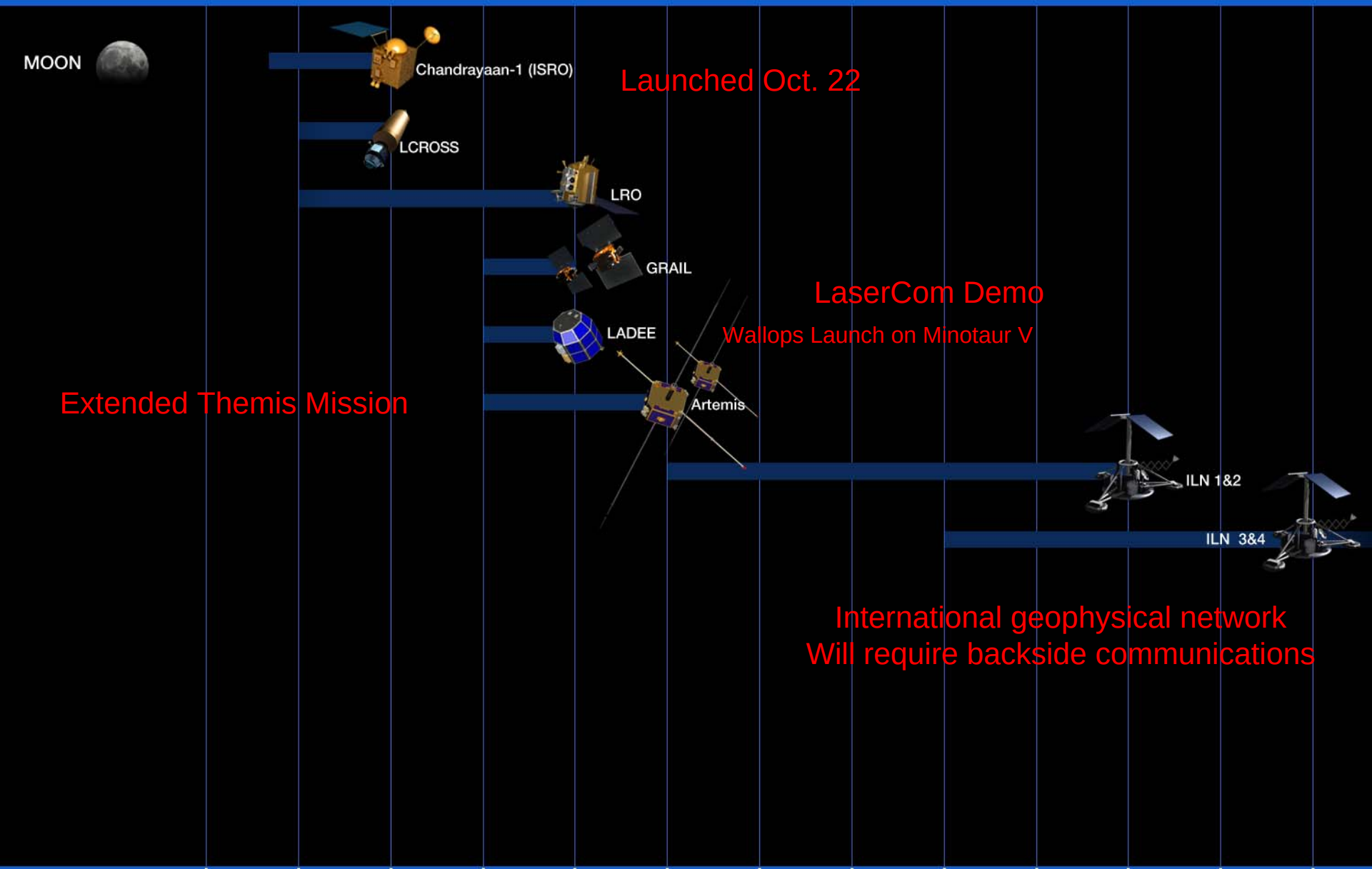
Summary Of MSL Status

- Options have been developed using PSS “guiding principles”
- MSL launch slip to 2011 will be funded by MEP but a rephasing of funding using other planetary programs must be part of the solution
  - Additional funding in FY10 & 11 is needed with the appropriate payback in FY12 & 13
- An outstanding issue remains with MSL-Juno launch manifest conflicts but potential solutions look promising to keep Juno & MSL 2011 launch dates
- More analysis continues on total cost estimates and launch conflicts
- Will get back to the PSS if analysis leads outside the bounds of our current option space

Planetary Missions (Non-Mars, Non-Lunar) timeline



Lunar Mission timeline



New Frontiers Program

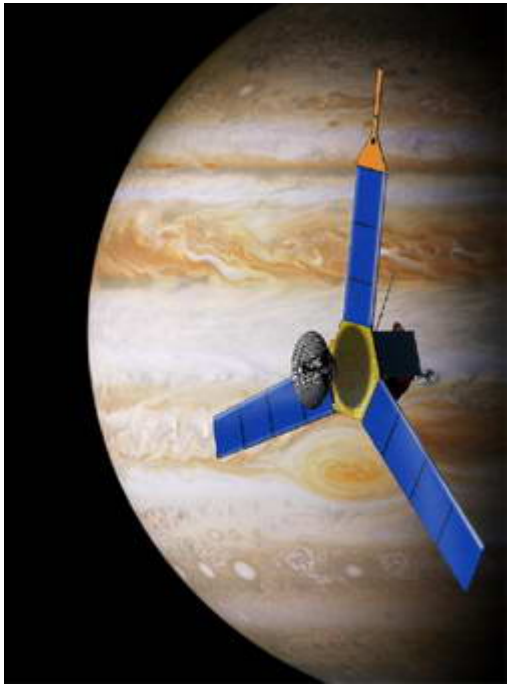
1st NF mission
New Horizons:

Pluto-Kuiper Belt Mission

Launched January 2006
Arrives July 2015

2nd NF mission
JUNO:

Jupiter Polar Orbiter Mission



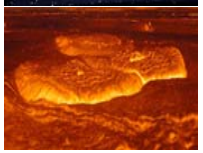
August 2011 launch

3rd NF mission AO

South Pole - Aitken Basin Sample Return

Comet Surface Sample Return

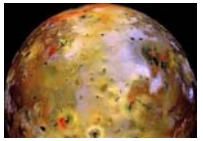
Venus In Situ Explorer



Network Science

Trojan/Centaur

Asteroid Sample Return



Io Observer

Ganymede Observer

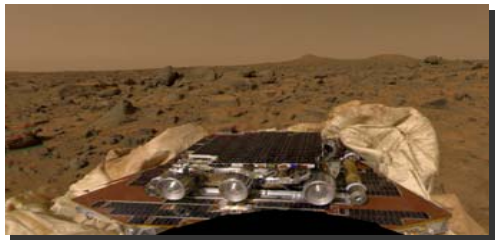
New Frontier Program Status

- Open competition for PI class missions of strategic importance to Planetary Science in the < $1B class
- Draft AO released November 17th
  - First use of the new standard AO for PI-led missions
- Workshop on Draft AO held December
  - Received over 70 comments/questions at the workshop
  - Comment period closed January 5, 2009
    - Received additional comments
- Revision of the AO is in progress based on the comments/questions received
- Final AO release has been delayed until budget for MSL launch slip has been finalized

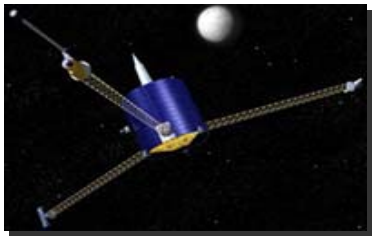
Discovery Program

Completed

Mars evolution:
Mars Pathfinder (1996-1997)



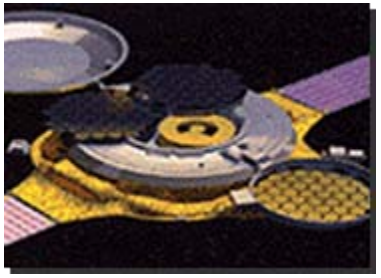
Lunar formation:
Lunar Prospector (1998-1999)



NEO characteristics:
NEAR (1996-1999)

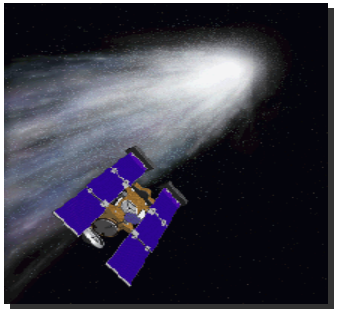
Completed / In Flight

Solar wind sampling:
Genesis (2001-2004)



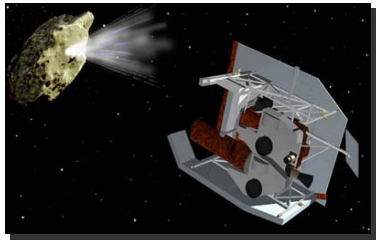
Comet diversity:
CONTOUR

Nature of dust/coma:
Stardust(1999-2006)

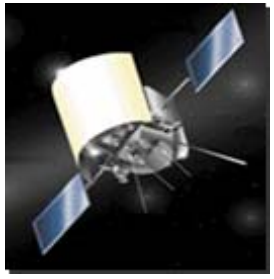


In Flight / In Development

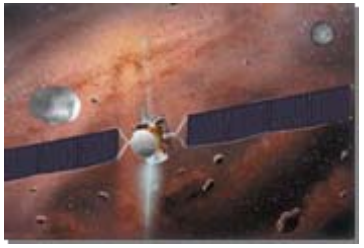
Comet internal structure:
Deep Impact (2005-2006)



Mercury environment:
MESSENGER (2004-*2012*)



Main-belt asteroids:
Dawn (*2007-2015*)



Lunar Internal Structure
GRAIL (*2011-2012*)

No RPS were used on any of these

DSMCE Selections

Baines, Kevin	JPL	Venus	Aerial Vehicle	Polar VALOR: The Feasibility of A Nuclear-Powered Long-Duration Balloon Mission to Explore the Poles of Venus
Elphic, Richard	Los Alamos National Laboratory	Moon	Lander	Locating and Characterizing Lunar Polar Volatiles: Feasibility of a Discovery-Class Mission
Jolliff, Bradley	Washington University	Moon	Rover	Journey to the land of Eternal Darkness and Ice (JEDI): A Lunar Polar Volatile Explorer
Rivkin, Andrew	Applied Physics Lab	Asteroid	Lander	Ilion: An ASRG-Enabled Trojan Asteroid Mission Concept
Hecht, Michael	JPL	Mars	Lander	A tour through Martian history: An ASRG-powered polar ice borehole.
Stofan, Ellen	Proxemy Research	Outer Planets	Lander	Titan Mare Explorer (TiME)
McEwen, Alfred	University of Arizona	Outer Planets	Orbiter	Mission Concept: Io Volcano Observer (IVO)
Sandford, Scott	NASA/AMES	Comet	Sample Return	Concept Study for a Comet Coma Rendezvous Sample Return Mission
Sunshine, Jessica	Univeristy of Maryland	Comet	Lander	Comet Hopper

- Next Discovery AO will follow the New Frontiers release - Time of release is TBD
- GFE Stirling as part of the AO is TBD

PSD NEO Activities

- NASA has received several unfunded mandates with respect to conducting NEO activities
  - Surveys: >1 km followed by >140m and mitigation
- NASA's approach has been limited by available funding and facilities but great progress has been accomplished
  - First steps have been surveying and characterizing the population which must be done before mitigation
  - No funding has been available for mitigation activities
  - Continue to work with NSF to leverage their gb facilities
- Planned Future missions will extend survey results:
  - WISE (NASA), NEOSSat (CSA)

PSD NEO Activities (2)

- NASA's NEO science efforts will continue per the Planetary Decadal Report
  - Supported through missions, data analysis, and R&A activities
- Participation by other countries, space agencies, and other US government agencies has been very limited
  - NASA needs help to begin to meet Congressional & public expectations
  - With no dedicated funding available it is nearly impossible for other US Agencies to participate

International NEO Activities

- JAXA supported the 1st International Primitive Bodies Exploration Working Group (IPEWG) in January 2008
  - IPEWG meetings to be held every two years
  - NASA will sponsor IPEWG ‘10
  - JAXA maintains an IPEWG website
- Charter promotes international cooperation and coordination in :
  - Free and open access of scientific information and data
  - Exploration of primitive bodies through observation and characterization, using ground-based and space-based facilities, as well as sample analysis and curation
- SBAG should review status and plans of IPEWG

Recent Selections and Upcoming Events

SB Related Academy Studies

- NASA funding the National Academy studies:
  - R&A - Role and Scope of Mission-Enabling Activities
    - 1st meeting Jan. 22-23, 2009 in Irvine, CA
  - Radioisotope Power System Requirements & availability of Plutonium
    - ”Letter report" on the Pu-238 issue in advance of the full report
    - Draft report for internal review in late March
  - NEO - address issues in the detection and mitigation
    - Jointly requested by NASA and NSF
    - 2nd meeting January 28-30th
- Planetary Science Decadal:
  - Jointly requested by NASA & NSF
  - Academy held town hall meeting at DPS (Oct.) and AGU (Dec.)
  - Will begin pulling together their panel chairs & members
- SBAG is *the* key small bodies group that can provide extremely valuable input into the next Decadal
  - Begin the process of developing community consensus on a roadmap of small body research for the future

NLSI Mission

- Carrying out and supporting **collaborative research** in lunar science, investigating the Moon itself and using the Moon as a unique platform for other investigations;

- Providing **scientific and technical perspectives** to NASA on its lunar research programs, including developing investigations for current and future space missions;

- Supporting and catalyzing the lunar science community and **training the next generation** of lunar science researchers; and

- Supporting **education and public outreach** by providing scientific content for K-14 education programs, and communicating directly with the public.

Proposal Data

- Received 33 proposals with ~575 team members from nearly 200 institutions

- Selected proposals represent studies:

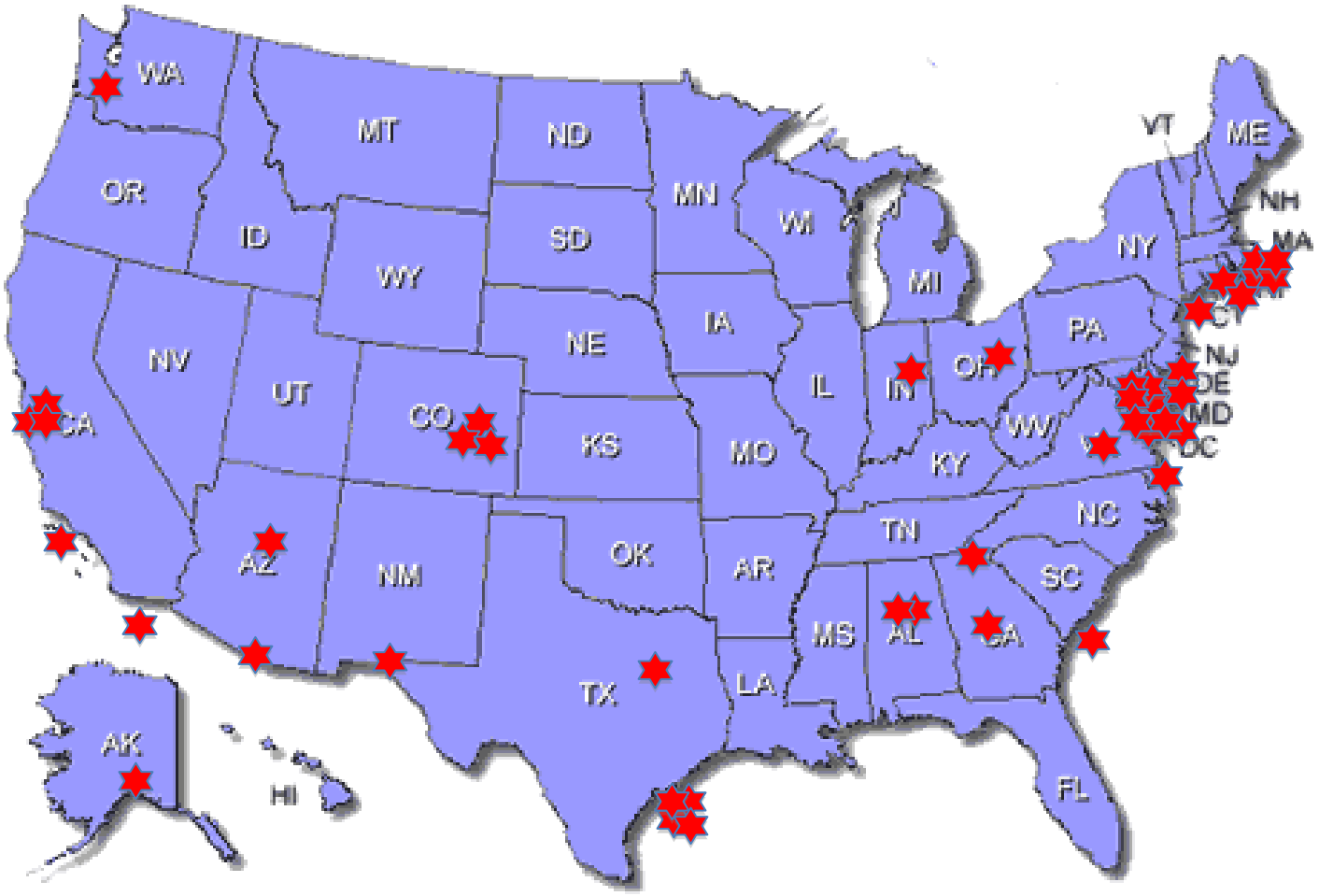
  "**Of the Moon**","**On the Moon**", and "**From the Moon**"

- NLSI funding contributed by both ESMD and SMD

NLSI Selections

PI	Institution	Title
William Bottke	Southwest Research Institute (SwRI)	Understanding the Formation and Bombardment History of the Moon
Jack Burns	University of Colorado	Lunar University Node for Astrophysics Research (LUNAR): Exploring the Cosmos From the Moon
Ben Bussey	John Hopkins University Applied Physics Lab	Scientific and Exploration Potential of the Lunar Poles
William Farrell	Goddard Space Flight Center	Dynamic Response of the Environment At the Moon (DREAM)
Mihaly Horanyi	University of Colorado	NASA Lunar Science Institute: Colorado Center for Lunar Dust and Atmospheric Studies
David Kring	Lunar and Planetary Institute	Impact Processes in the Origin and Evolution of the Moon: New Sample-driven Perspectives
Carle Pieters	Brown University	The Moon as Cornerstone to the Terrestrial Planets: The Formative Years

NASA Lunar Science Institute



<u>International "Affiliate" Nodes</u>

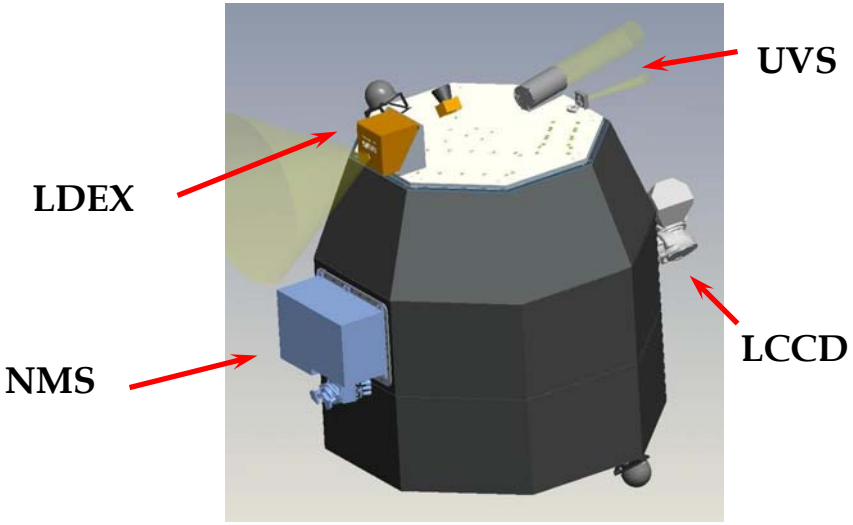
- UK: Open University
- Canada: University of Western Ontario
- Korea: Korea Advanced Institue of Science and Technology

NASA Selected Lunar Dust Experiment (LDEX)

LDEX EM

- The Instrument is an in impact ionization dust detector
- The investigation will map the size and spatial distribution of dust grains in the lunar environment.
- Directly addresses LADEE Objective 2: "Characterize the lunar exospheric dust environment and measure any spatial and temporal variability and impacts on the lunar atmosphere."

LADEE S/C



PI: Mihaly Horanyi
Institution: Univ. of Col. (LASP)
Mass: 2 Kg
Power 4 W
High TRL High Heritage

Upcoming Events

- Other selections from the Stand-Alone Mission of Opportunity Notification (SALMON)
  - U.S. Participating investigator program
  - Instrument Mission of Opportunity

- These selections will not be effected by the MSL delay

NASA's

Planetary Science

Advance scientific knowledge of the origin and history of the solar system, the potential for life elsewhere, and the hazards and resources present as humans explore space

"Flyby, Orbit, Land, Rove, and Return Samples"

Outer Planets Flagship Status

Outer Planets Flagship Studies

- NASA has completed a nine month long outer planet flagship mission study conducted jointly with ESA. Two missions were studied:
  - Europa Jupiter System Mission (EJSM) consisting of a Europa Orbiter and a Ganymede Orbiter
  - Titan Saturn System Mission (TSSM) consisting of a Titan Orbiter, Lake Lander, and Balloon
- Final reports were submitted Nov. 3, 2008
- Independent reviews by TMC and Science panels are complete
- Series of selection meetings between ESA and NASA is scheduled for late January
- NASA and ESA will jointly select a single Outer Planet Flagship mission in February 2009
  - NASA will continue technology risk reduction, mission implementation plan, and budget plan as part of ongoing pre-phase A activities
  - ESA will conduct industry studies as part of the ongoing Cosmic Vision competition among LISA, Xeus, and OPF