



Planetary Science Division Update

*Presentation to the
Planetary Science Subcommittee of the
NASA Advisory Council*

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Outline

- Current status of the Division
- PSS Recommendations
- NAC Recommendations
- Other Items to be Addressed

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Division Status

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Administrative Changes

- Key Civil Servant positions have been filled:
 - James L. Green, Director
 - James Adams, Deputy Director
- Civil servant positions to be filled (were on hold but are now active again!)
 - Discovery Program Executive
 - A Discovery Program Scientist
- Other staff changes and positions filled:
 - Alan Harmon, Detailed from DOE new Program Executive for Radio-isotope Power Systems
 - Kelly Snook, Lunar Science Liaison with ESMD
 - Tom Morgan detailed to GSFC as Senior Scientist for Lunar Exploration

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FY07 Budget Implications

What Stayed the Same:

- Discovery 2006 and Mars Scout AO's on track
 - Selected 3 Discovery full-class and 3 Mission of Opportunity (MoO) missions concept studies
 - Selected 2 Mars Scout full-class and 1MoO and 2 MoOs for technology development
- One Mars mission per opportunity
 - Phoenix scheduled for launch in August 2007 and MSL in 2009
- New Frontiers AO #3 no later than 2008
- Moon Mineralogy Mapper (M3), selected as a Discovery MoO, on schedule to launch on the ISRO Chandrayaan-1 spacecraft
- Continues operations of Mars Rovers (Spirit, Opportunity), Odyssey, Mars Express, Mars Reconnaissance Orbiter (MRO), MESSENGER, ASPERA-3, New Horizons, Cassini, and Rosetta

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FY07 Budget Implications (cont.)

What's Changed:

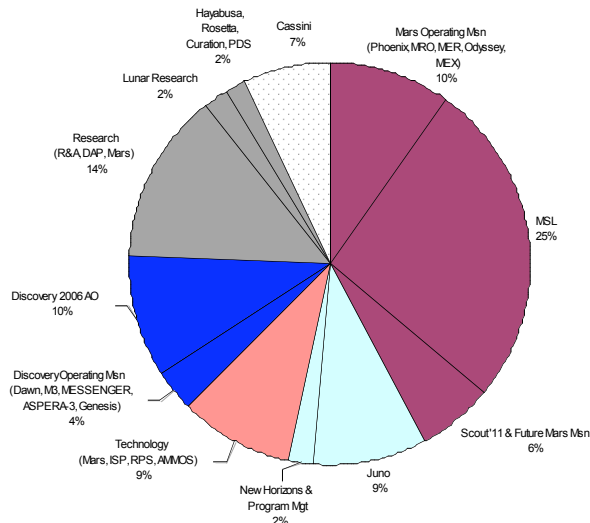
- Funds Dawn for a launch in June 2007
- Funds Juno for a launch in August 2011
- Confirms and provides additional funding for Mars Science Laboratory (MSL) to reduce schedule risk for 2009 launch
- New Mars Next Decade architecture vetted through NRC Space Studies Board
- Adds a new Lunar Science Research project to enhance opportunity for lunar scientific discovery
- Funds Outer Planets mission concept studies
- Planetary Research and Analysis (R&A) changes:
 - Provides partial restoration (~\$5.8M) of the 15% cut
 - Include the new LASER program over a multi-year
- Funds Mars rovers through FY07
- Transfers Deep Space Mission Systems but kept the advanced multi-mission operations system
- Transfers Near Earth Objects (NEO) to ESMD

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Planetary Science Division

FY08 Budget, Total \$1320M (included "Simplified" Full Cost)



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Division Activities

- Current Academy reviews:
 - PSD- based on the NASA Authorization 2005
 - Planetary Performance Assessment Committee formed (meetings: Feb. 22, 2007....)
 - How well is PSD addressing the strategies, goals, and priorities outlined in Academy reports
 - COMPLEX - providing guidelines for the selection of candidate missions for the next NF
 - Evaluate NAI's success leading to reshaping the future of astrobiology activity

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Current Mission Status

- Mars: MRO, MER-1, MER-2, Mars Odyssey
 - *Upcoming Launches*: MSL and Phoenix
- Discovery: MESSENGER, Deep Impact, Stardust
 - *Upcoming Launch*: Dawn
- Lunar Science Research Project
 - *Upcoming Launch & Extended Mission*: LRO
- New Frontiers: New Horizons
 - *Upcoming Launch*: Juno
- Flagships: Cassini/Huygens at Saturn
 - *Upcoming Launch*: Mars Science Laboratory (MSL)
- International: Mars Express, Venus Express, Rosetta, Hayabusa, and ExoMars
 - *Upcoming Launch*: Moon Mineralogy Mapper - Chandrayan

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Planetary Mission Future Events

2007	2008	2009	2010	2011	2012	2013	2014	2015
Feb 28, NH @ Jupiter	Jan. 14 Messenger @ Mercury		LRO Extended Mission	March 3 Messenger @ Mercury				
	Chandrayan	MSL		Juno	Discovery			Discovery
June 5, Messenger @ Venus				Discovery				
Dawn	Oct. 6 Messenger @ Mercury	Sept. 29 Messenger @ Mercury		Mars Scout 2			New Frontiers 3	July, NH @ Pluto/Charon
Phoenix	LRO-LCROSS			Fall Dawn @ Vesta		MSO		Summer Dawn @ Ceres
	Phoenix Lands							

- Planetary Division launches (green)
- Planetary mission events (red)
- Exploration Systems Mission Directorate (blue)

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Discovery Selections

- Selected 3 full missions and 3 Missions of Opportunity on October 31st
- Missions received \$1.2M to conduct concept studies (Phase-A) over a 7 month period
- NASA may choose one or more missions to continue
 - If selected to continue: cost cap is \$425M.
- MOO will receive \$250K to refine concept
 - If selected to continue: cost cap at \$35M.

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Selected Phase-A Full Missions

- **GRAIL: Gravity Recovery and Interior Laboratory - Maria Zuber (PI), MIT** — Produce a uniform, global, high-quality gravity field mapping of the Moon that will allow for unprecedented modeling of its internal structure and thermal history.
- **OSIRIS: Origins Spectral Interpretation, Resource Identification, and Security - Michael Drake (PI), University of Arizona** — Survey asteroid 1999 RQ36 and provide return of uncontaminated surface sample to Earth.
- **Vesper: Venus Chemistry and Dynamics Orbiter - Gordon Chin (PI), NASA GFSC** — Advance our understanding of the atmospheric composition and dynamics of Venus, especially its photochemistry.

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Mission of Opportunity

- **DIXI: Deep Impact eXtended Investigation of Comets - Michael A'Hearn (PI), University of Maryland** — Uses the existing *Deep Impact* spacecraft for an extended flyby mission to a second comet, Boethin, that will return data advancing our understanding of the nature of comet nuclei.
- **EPOCh: Extrasolar Planet Observations and Characterization - L. Drake Deming (PI), NASA GSFC** — Observations using *Deep Impact's* High Resolution Imager will either lead to the discovery of additional low mass (down to one Earth-mass) planets or will set limits on the existence of such planets that will be useful for constraining theories of planet formation.
- **Stardust NEXt: A Mission of Opportunity to complete the exploration of Tempel 1 - Joseph Veverka (PI), Cornell University** — Uses the *Stardust* spacecraft to perform an extended flyby mission to comet Tempel 1 which will provide the first look at the changes to a comet nucleus after a perihelion passage.

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Mars Scout Selections

- Selections announced January 8, 2007
 - Phase-A studies for 9 months with \$2 M
- **MAVEN: Mars Atmosphere and Volatile EvolutionN** - Bruce Jakosky (Univ. of Colorado) - Mars climate and habitability and improve understanding of dynamic processes in the upper atmosphere and ionosphere.
- **TGE - The Great Escape** - Alan Stern (SWRI) - Determine basic processes in Martian atmospheric evolution by measuring the structure and dynamics of the upper atmosphere.
- Mission of Opportunities include:
 - Mars Organic and Oxidant Detector - J. Bada (UC at San Diego)
 - Mars Organic Molecule Analyzer - L. Becker (UC Santa Barbara)
 - Co-I for Raman-LIBS instrument on ExoMars

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Ices, Oceans, and Fire: Satellites of the Outer Solar System

- Purpose is to bring together researchers to share their work in the broader context of common processes and unique properties shaping the satellites of the outer solar system
- The goal of the conference is to promote cross fertilization of research among small communities focused on specific satellites
- Papers in special issue of JGR-Planets
- August 13-15 in Boulder, CO

<http://www.lpi.usra.edu/meetings/icysat2007/home.shtml>

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Discovery at 15: Looking Backward Looking Forward

- Open to the scientific community
- All former Discovery Principal Investigators, Project Managers, and Education/Public Outreach Leads
- Session include:
 - Invited talks
 - Contributed posters on mission concepts and new technologies
- September 19-20, 2007 in Huntsville, AL

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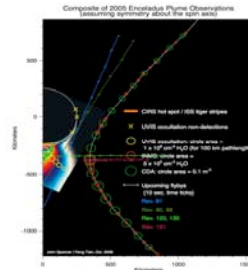


Cassini Senior Review



- Senior Review held February 15, 2007
- Prime mission July 2004 – July 2008
 - Cassini spacecraft virtually 100% operational
- Proposed extended mission goes to July 2010
- Extended mission science goals include:
 - Titan (26 encounters)
 - Enceladus (7 encounters + Rhea, Dione)
 - Observe Saturn System thru Aug. '09 equinox
- Estimate ~46% of hydrazine will remain at end of the extended mission
 - Important for end of life to retain adequate fuel
- Panel recommendations and findings are due to NASA Headquarters on March 9, 2007

The extended mission plan includes 2 ~ 25 km passes thru Enceladus' plume. Prime observations on curved line.



PSS Recommendations

From the Sept. 25-26, 2006 Meeting



Topics of PSS Recommendations

- Restore R&A cuts - PSD Retreat Results
- Lunar activities
- More frequency “Mission of Opportunities”
- Programmatic decision on ASI proposal for Juno
- Transfer of NEOO to ESMD
- PSS recommendations through the NAC:
 - Mission concept studies for outer solar system missions
 - Defining next New Frontier mission candidates



PSD R&A Program

ROSES 2007 Released on February 16, 2007



Outcome of R&A Retreat

- Internal PSD Retreat (Dec. 20-21, 2007)
- Purpose included:
 - Discuss how to evaluate the health & balance of our R&A program
 - Identify what portion(s) of the program needs additional funding in priority order
 - Develop strategies for improvements in process, procedures, and reporting
- Retreat input included:
 - R&A statistics for all elements from FY03 to present
 - DPS Membership Survey - 2005
 - A Survey of the Planetary Community to Prioritize NASA Solar System Exploration Programs - April 30, 2006
- Results included:
 - New PSD Policy issued
 - Program elements identified for additional funds

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Metrics

YR	Number of Proposals in Each Category					Number of Awards in Each Category					Total Awards	Ratio (Awd/Tot)	Average Grant (\$K)	#Days to Award
	E	E/VG	VG	Rest	Total #	E	E/VG	VG	Rest					
2003														
2004														
2005														
2006														

- Address if any “high risk – high payoff” proposal were funded
- What is your approach for taking 15% reduction
- (reduce all, reduce new, select less, etc.)

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New PSD R&A Policy

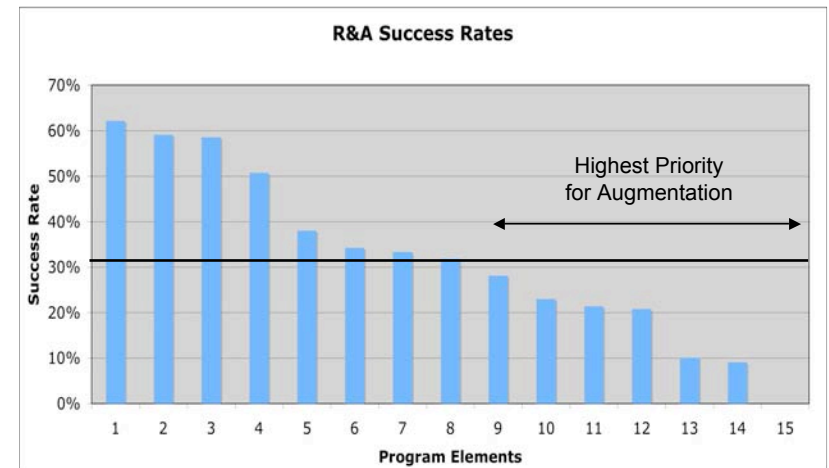


- Issued February 20, 2007 - effective immediately
 - Applies to all PSD R&A elements in ROSES
- Rapid notification and funding procedure
 - Within four weeks of the review panel I expect to sign an “initial Selection Decision Document” or SDD - within 2 weeks goal!
 - Proposals are in “Selected, Selectable, Not Selected” categories
 - Selectable proposals are those in competitive range that may have a chance to be selected pending identification of funds
 - Letters issued to all with Selected proposals funded
 - As funding becomes available/identified a new addendum is added to the SDD and signed then those proposals in the Selectable range are funded
 - With final budget authority, letters sent to the selectable but deferred category are notified of their non-selection

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Overview of R&A Awards



- Success rate = Awarded / Total number of proposals
- FY07 Provides partial restoration of the 15% cut (~\$5.8M)

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Top Priority R&A Programs for Additional Funding

- Astrobiology: Exobiology & Evol. Biology
- Astrobiology Science & Technical Inst. Dev.
- Mars Data Analysis
- Mars Fundamental Research
- Outer Planets Research
- Planetary Instrument Definition & Development
- Planetary Protection Research
- Augmentation rules:
 - Astrobiology will have special consideration
 - Intent will be to fund all "Excellent Proposals"

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PSD R&A Program for ROSES 2007

- Astrobiology: Exobiology And Evolutionary Biology (pending)
- Astrobiology Science & Technology Instrument Development & Mission Concept (pending)
- Astrobiology Science And Technology For Exploring Planets
- Cassini Data Analysis
- Cosmochemistry
- Discovery Data Analysis
- Early Career Fellowships
- In-Space Propulsion (pending)
- • **Lunar Advanced Science and Exploration Research ***
- • [Near Earth Object Observations --- Funded by ESMD -- to be release in ROSES 2007]
- **New Horizons at Jupiter Data Analysis ***
- Origins of the Solar System
- Outer Planets Research
- Planetary Astronomy
- Planetary Atmospheres
- Planetary Geology And Geophysics
- Planetary Instrument Definition And Development
- Planetary Major Equipment
- Planetary Protection Research
- Mars Data Analysis
- Mars Fundamental Research
- Mars Instrument Development
- Mars Technology Project (pending)
- Sample Return Laboratory Instruments & Data Analysis

* New PSD R&A elements 26



Lunar Activities



PSS Recommendations (Lunar)

- Seek an augmentation to support LRO data archiving
- Determine the costs for supporting the generation of derived data sets from LRO
- PDS explore how cross-disciplinary data sets can be identified
- A new chair be named for LEAG as quickly as feasible (Clive Neal, University of Norte Dame)
- An expanded Scientific Organizing Committee for the Lunar Workshop be charged immediately with the detailed planning of workshop objectives (Completed, workshop this week)

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New Lunar Science Project

- Science funding wedge from FY08 - FY13
- Supports science activities for the Exploration Initiative (SMD & ESMD working together)
 - ESMD manages the Lunar Precursor Robotics Program (LPRP) and acquires and processes all LPRP data required for exploration purposes
 - ESMD's Lunar Reconnaissance Orbiter (LRO) mission objectives to be achieved in 1 year
- Key elements of SMD's Lunar Science Project:
 - PSD will support scientific utilization of LPRP data obtained through the ROSES R&A program
 - LASER and LRO Participating Scientist program
 - SMD will assume responsibility for operation of LRO in an extended mission phase
 - Continued scientific analysis and archiving of the data
 - Upgrade to PDS to handle LRO data volumes
 - Potential Mission of Opportunities

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Lunar Advanced Science and Exploration Research (LASER)

- LASER R&A will appear in ROSES 2007 and supports:
 - a) Basic Lunar Science
 - b) Exploration Lunar Science (Applied)
 - c) Data Analysis
 - d) Lunar Data Restoration
 - ✓ *No selection quotas for (a)-(d)*
 - ✓ *Proposals that span the Basic(a)-Exploration(b) science continuum encouraged*
- Funding ~ \$2-3M/year (Co-Funded: SMD-ESMD)
- Seeking 1, 2, or 3 year proposals
- LRO Participating Scientist will be a separate call

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More Frequent Mission of Opportunities



Mission of Opportunity (MOO)

- White paper presented to SMD Science Management Council (Division Chiefs and office personnel)
 - Regular (yearly) AO call for MOO only
 - Organized like ROSES with boiler plate material and discipline specific appendices
 - Not limited to international missions
 - Peer reviews will be more focused, rigorous, and appropriate
 - Expect several proposals per opportunity to consider providing enhanced competition.
 - The normal NASA categorization would still apply.
 - Category III proposals would provide the opportunity for technology funds buying down future mission risk
- All Division Chiefs expressed interest
- Current AA has deferred decision until Alan Stern arrives in April

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Programmatic Decision for the ASI Proposal on Juno

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Status Juno/ASI proposal

- Using guidance from the Planetary Science Subcommittee a process for review and approval was developed
 - Assessments included: PI, Project, Program Office, Procurement, Legal, International Affairs, Export Control, and an Independent Science Panel
- Based on these assessments PSD position recommended approval for ASI to deliver KaT & JIRAM instrument on Juno
- Presented results to: AA, Dep.AA, Dep.AA for Programs
- AA approval obtained February 12, 2007

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Transfer of Near Earth Object Observations (NEOO) to Exploration Systems Mission Directorate (ESMD)

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NEOO Program Transition

- Objective: Discover 90% of NEOs > 1 km in size within 10 years (1998 – 2008)
 - Expected to achieve goal
 - See: <http://neo.jpl.nasa.gov/stats> (over 700 found)
- Program transitioned to ESMD Oct 1, 2007
 - Budget of \$4.1M R&A funds moved to ESMD account
 - Lindley Johnson works part-time (25%) for ESMD
- Transition done smoothly with minor hiccups
 - Different WBS and funding channels to initiate
 - Should be transparent to survey teams, with minor delays
 - New agreement on solicitation for NEOO in 2007
 - Will be done as forthcoming amendment to ROSES-07

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PSS/NAC Recommendations

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NASA Response to NAC Recommendation S-06-09

- *NASA should conduct planetary mission concept and technology costing studies to determine whether future Europa Orbiter, Enceladus Explorer, and Titan Explorer missions can fit into the New Frontier class or if they instead require flagship-class missions.*

Response:

- On October 1, 2006 the Science Mission Directorate's Planetary Science Division initiated mission studies for Enceladus and Titan. These studies were designed to determine the technical feasibility of conducting separate missions to these moons and to characterize the potential science return within a New Frontiers cost cap. The results from these studies will be completed by March 15, 2007 and released to the community. An Europa mission has been studied many times and will clearly require a flagship-class mission.

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Flagship Studies Status

- PSD detailed studies for flagship-class missions and assignments:
 - Europa - Jet Propulsion Laboratory
 - Titan - Applied Physics Laboratory
 - Enceladus - Goddard Space Flight Center
 - Ganymede (with additional focus on Jovian system science) - Jet Propulsion Laboratory
- Science community participation via Science Definition Teams (SDT)
 - Call for participation ended December 22, 2006
 - Teams selected in January 2007 and announced
- Kickoff meeting at NASA Headquarters on February 9, 2007
- Studies will be completed fall 2007
 - Results will undergo independent external review
 - Presented to OPAG and at a variety of science meetings
- Study results will be used as input to near term NASA strategic planning for a Flagship mission

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NASA Response to NAC Recommendation S-06-10

- *NASA should develop a process to expand and reassess the field of solicited mission candidates for the New Frontiers mission line prior to each New Frontiers solicitation. NASA should engage the science community in this reassessment of targets/missions prior to the creation of each AO for New Frontiers.*

Response:

- The PSD agrees that a revised candidate list is necessary for the next New Frontiers AO. Our current plan is to release that list before the end of FY07 to enable the community to formulate and develop competitive mission proposals.
- The list of candidate missions will follow the recommendations from the National Academies planetary decadal report
 - The SMD will formally request a study from the National Academies Committee on Planetary and Lunar Exploration (COMPLEX) that provides criteria and guiding principles that would enable the PSD to narrow the list of candidate missions to 5.
 - COMPLEX will be asked to consider recent scientific results from current missions as it considers the relevant range of science objectives and concepts in the *New Frontiers* report.

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NASA AUTHORIZATION ACT OF 2005 Direction for Extended Search

“The Congress declares that the general welfare and security of the United States require that **the unique competence of the National Aeronautics and Space Administration be directed to detecting, tracking, cataloguing, and characterizing near-Earth asteroids and comets** in order to provide warning and mitigation of the potential hazard of such near-Earth objects to the Earth”

“The Administrator shall **plan, develop, and implement a Near-Earth Object Survey program to detect, track, catalogue, and characterize the physical characteristics of near-Earth objects equal to or greater than 140 meters in diameter** in order to assess the threat of such near-Earth objects to the Earth. It shall be the **goal of the Survey program to achieve 90 percent completion of its near-Earth object catalogue (based on statistically predicted populations of near-Earth objects) within 15 years** after the date of enactment of this Act.”

“The Administrator shall **transmit to Congress not later than 1 year after** the date of enactment of this Act **an initial report** that provides the following:

- (A) An **analysis of possible alternatives that NASA may employ to carry out the Survey program**, including ground- based and space-based alternatives with technical descriptions.
- (B) **A recommended option and proposed budget** to carry out the Survey program pursuant to the recommended option.
- (C) **Analysis of possible alternatives that NASA could employ to divert an object on a likely collision course with Earth.”**

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NEO Analysis of Alternatives Study

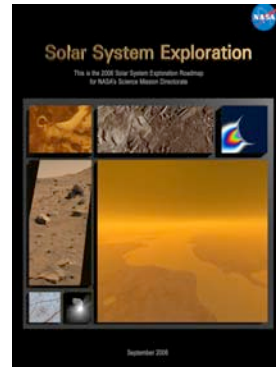
- **Currently embargoed since it has not been sent to Congress yet**

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Planetary Science Division Roadmap

- Completed in August and sent to the printers!
- 1400 hardcopies available with distribution underway
- Planned distribution includes:
 - Internal to NASA
 - Various teams and advisory groups
 - Foreign Space Agencies
 - Professional Societies
 - Congressional Oversight Bodies
 - Various Government Libraries
- Currently being reviewed by the National Academy for consistency with the Decadal report



<http://solarsystem.nasa.gov/multimedia/downloads.cfm>

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Summary

Division Perspective:

- PSD has a solid foundation of very talented dedicated personnel with important new additions
- PSD has made significant progress on ALL PSS recommendations
- A full year of CR will present unique challenges
- PSD is looking forward to working with the new AA Alan Stern when he arrives in April

Technical Highlights:

- Discovery and Mars Scout Phase-A missions & MoO selections
- We will have some limited ability to help R&A
- Beginning in FY08, Lunar Science initiative provides a significant benefit to the community with important research opportunities and operational activities

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