



Planetary Science Division Update

Presentation at the
Planetary Science Subcommittee

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Director, Planetary Science Division

July 9, 2009

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Outline



- Administrative & Announcements
- Planetary Science FY10 Budget
- Planetary missions status and plans
- New Frontiers/Discovery status
- Outer Planets Flagship status
- R&A status
- PSS Recommendations
- *MSL status – to be discuss by Doug/Jim*

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Administrative & Announcements



- Personnel Changes:
 - Planetary Protection Officer (position closed – selection TBA)
 - Astrobiology lead – position to be advertized widely
 - Jon Rall returned to GSFC – PIDDP now under Lisa May
 - Natasha Johnson (NASA postdoc) obtained position at GSFC
- National Academy Studies
 - Radioisotope Power System & availability of Plutonium – Completed
 - Planetary Protection for Mars Sample Return - Completed
 - NEO - address issues in the detection and mitigation
 - Expect a "mid-term" letter report by September
 - R&A - Role and Scope of Mission-Enabling Activities
 - Planetary Science Decadal – just started!
- Stand-Alone Mission of Opportunity Notification (SALMON)
 - Instrument Mission of Opportunity: Strofio on BepiColombo

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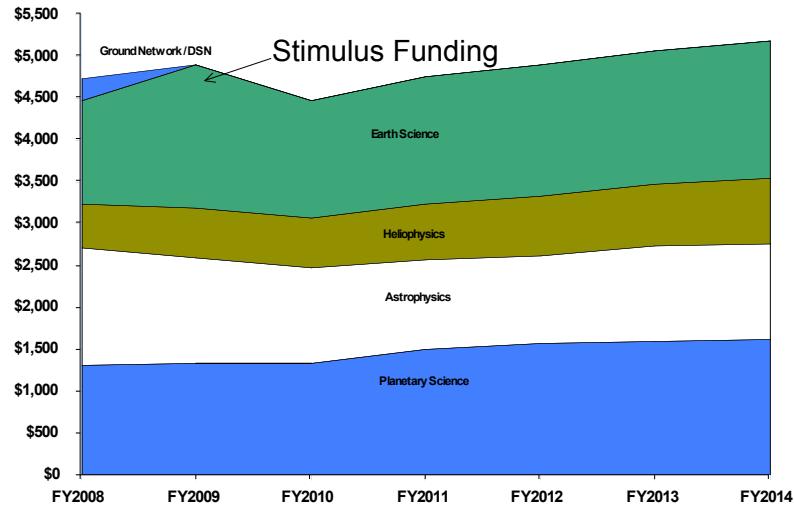
NASA FY10 Budget Overview



	FY2008	FY2009	FY2010	FY2011	FY2012	FY2013	FY2014
Total NASA	\$17,401.9	\$18,784.4	\$18,686.0	\$18,631.0	\$18,613.0	\$18,607.0	\$18,858.0
Science	\$4,733.2	\$4,903.0	\$4,477.2	\$4,747.4	\$4,890.9	\$5,069.0	\$5,185.4
Earth Science	\$1,237.4	\$1,704.6	\$1,405.0	\$1,500.0	\$1,550.0	\$1,600.0	\$1,650.0
Planetary Science	\$1,312.6	\$1,325.6	\$1,346.2	\$1,500.6	\$1,577.7	\$1,600.0	\$1,633.2
Astrophysics	\$1,395.6	\$1,281.2	\$1,120.9	\$1,074.1	\$1,042.7	\$1,126.3	\$1,139.6
Heliophysics	\$536.4	\$591.6	\$605.0	\$672.6	\$720.5	\$742.7	\$762.6
Ground Network / DSN	\$251.2						
Aeronautics Research	\$511.4	\$650.0	\$507.0	\$514.0	\$521.0	\$529.0	\$536.0
Exploration Systems	\$3,299.4	\$3,905.5	\$3,963.1	\$6,076.6	\$6,028.5	\$5,966.5	\$6,195.3
Constellation Systems	\$2,675.9	\$3,433.2	\$3,505.4	\$5,543.3	\$5,472.0	\$5,407.6	\$5,602.6
Advanced Capabilities	\$623.5	\$472.3	\$457.7	\$533.3	\$556.5	\$558.9	\$592.7
Space Operations	\$5,427.2	\$5,764.7	\$6,175.6	\$3,663.8	\$3,485.3	\$3,318.6	\$3,154.8
Space Shuttle	\$3,295.4	\$2,981.7	\$3,157.1	\$382.8	\$87.8		
International Space Station	\$1,685.5	\$2,060.2	\$2,267.0	\$2,548.2	\$2,651.6	\$2,568.9	\$2,405.9
Space and Flight Support (SFS)	\$446.2	\$722.8	\$751.5	\$732.7	\$745.9	\$749.7	\$748.9
Education	\$146.8	\$169.2	\$126.1	\$123.8	\$123.8	\$123.8	\$125.5
Cross-Agency Support Programs	\$3,251.4	\$3,356.4	\$3,400.6	\$3,468.4	\$3,525.7	\$3,561.4	\$3,621.4
Center Management & Operations	\$2,011.7	\$2,024.0	\$2,084.0	\$2,119.2	\$2,142.5	\$2,166.1	\$2,189.9
Agency Management & Operations	\$834.1	\$921.2	\$961.2	\$956.9	\$964.5	\$972.3	\$981.5
Institutional Investments	\$325.5	\$343.7	\$355.4	\$392.3	\$418.7	\$423.0	\$450.0
Congressionally Directed Items	\$80.0	\$67.5					
Inspector General	\$32.6	\$35.6	\$36.4	\$37.0	\$37.8	\$38.7	\$39.6



SMD Budget by Theme (RY \$M)



FY10 Planetary Science Budget



	FY09	FY10	FY11	FY12	FY13	FY14
FY10 President Submit	1,325.6	1,346.2	1,500.6	1,577.7	1,600.0	1,633.2
Discovery	247.0	213.2	234.6	256.8	256.5	264.3
GRAIL	122.4	124.1	104.8	41.4	4.7	
Operating Missions	47.4	50.4	52.8	30.1	12.9	10.1
Research / Management / Future	77.2	38.7	77.1	185.4	238.8	254.2
New Frontiers	263.9	264.1	239.9	294.2	239.8	249.6
Juno	245.0	237.2	174.2	71.4	17.8	18.1
New Horizons / Management / Future	19.0	26.9	65.7	222.8	222.0	231.5
Outer Planets	101.1	98.6	97.1	140.3	117.7	118.5
Outer Planets Flagship	5.1	13.7	20.7	69.3	70.0	70.0
Cassini, Research	96.0	84.9	76.4	71.0	47.7	48.5
Technology	64.9	89.0	98.4	102.1	93.5	91.4
Planetary Science Research	162.1	161.7	193.5	240.2	232.6	254.2
Research & Analysis, PDS, Curation, NEOO	152.8	153.6	163.4	172.5	176.6	180.9
Rosetta, MUSES-C	5.4	6.7	7.0	7.0	7.0	13.2
SMD Administrative	3.9	1.4	23.1	60.7	49.0	60.1
Lunar Quest	105.0	103.6	142.6	138.6	145.5	118.7
LRO extended mission		0.8	21.6	22.2	27.2	
LADEE	30.2	66.5	73.9	31.1		
ILN	10.0	3.7	16.3	48.9	81.2	79.3
Entry, Descent and Landing	0.5					
Lunar Science, Management and Future Mns	64.3	32.5	30.8	36.3	37.0	39.4
Mars Exploration	381.6	416.1	494.5	405.5	514.3	536.7
Phoenix	4.6					
MSL 2009	223.3	204.0	194.6	67.3	65.0	30.0
MAVEN 2013	6.7	53.4	168.7	182.6	138.4	30.6
ExoMars	10.5	9.0	14.0	24.0	20.0	15.0
Management / Future Missions	48.3	45.6	46.1	71.0	227.9	379.4
Operating Missions / R&A	88.1	104.1	71.1	60.6	63.1	81.6
JPL Building Support						



PSD What's Changed



- Outer Planet Flagship funded as Europa Mission study
 - Continue to determine feasibility (science, technical, schedule, cost) and to align with the international partners science, technical, and schedule requirements
- Mars Exploration Program
 - MSL delays to 2011, the next launch opportunity for Mars, due to hardware development delays
 - Launch every opportunity, ~26 month (except 2009) through 2020 with European Space Agency partnership
- Transferred Lunar Robotics activities from Exploration Systems Mission Directorate (ESMD)
- Transferred NEO from Earth Science to Planetary



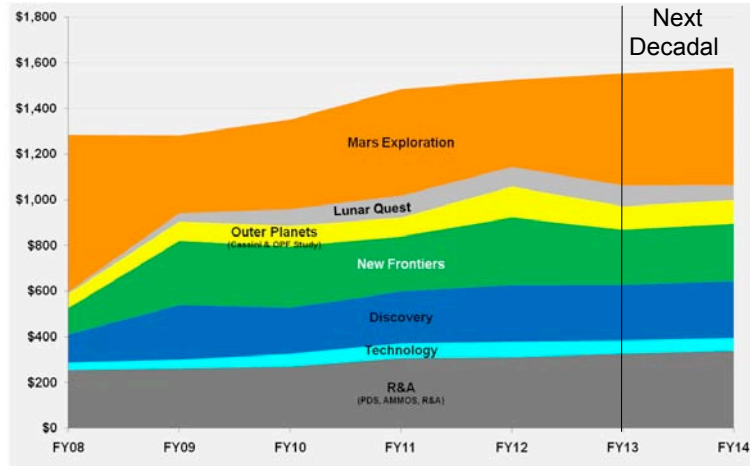
PSD What's Stayed The Same



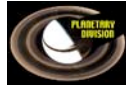
- Continue with missions in development and formulation phase (Juno, GRAIL, MAVEN, LADEE, and ILN)
- Funded operating missions (Cassini, MRO, MER, Odyssey, EPOXI, NExT, Dawn, MESSENGER, New Horizons)
- New Frontiers-3 AO released
- Next Discovery-12 AO in preparation
- Technology (ISP- ion propulsion; RPS-ASRG with PU-238 purchase, LaserCom w/SOMD)
- Research & Analysis opportunities in ROSE09



Planetary FY10 Budget



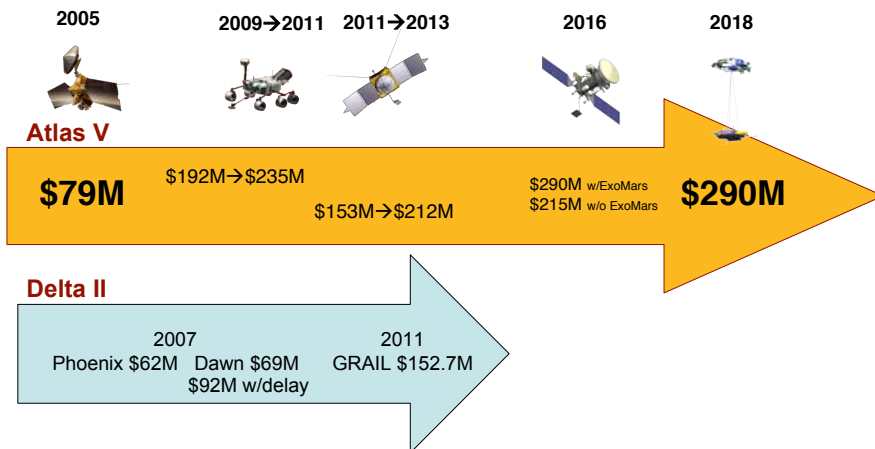
Planetary Science Division Budget History (\$M)



	FY08	FY09	FY10	FY11	FY12	FY13	FY14
FY05 PFP (w/ DSN, O/H, & Lunar Robotics)	\$2,955	\$3,126					
FY06 PFP (w/DSN, O/H, & Lunar Robotics)	\$2,832	\$2,899	\$3,066				
FY07 PFP (w/ DSN & O/H)	\$1,599	\$1,840	\$1,900	\$1,847			
FY08 PFP (include O/H)	\$1,396	\$1,677	\$1,720	\$1,738	\$1,748		
FY09 PFP	\$1,247	\$1,334	\$1,410	\$1,537	\$1,570	\$1,609	
FY10 PFP	\$1,313	\$1,288	\$1,346	\$1,501	\$1,578	\$1,600	\$1,633



Increasing Launch Vehicle Costs

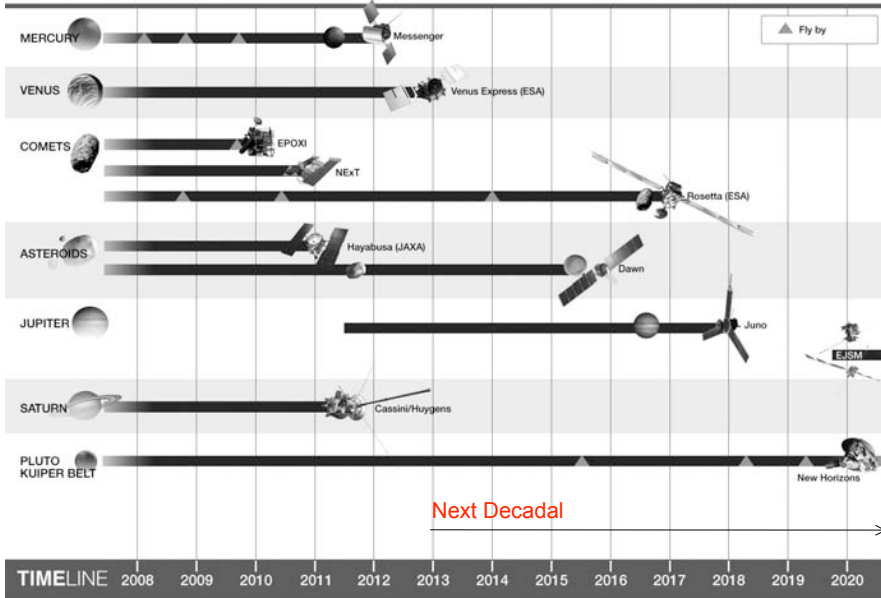


Planetary Missions Overview



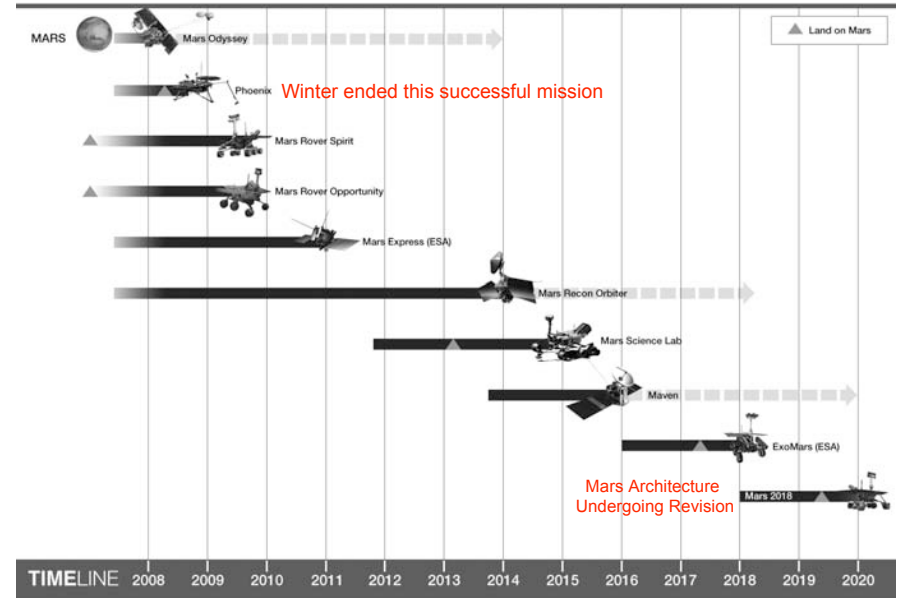
Increasing Launch Vehicle Costs Erode Buying Power for Missions

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



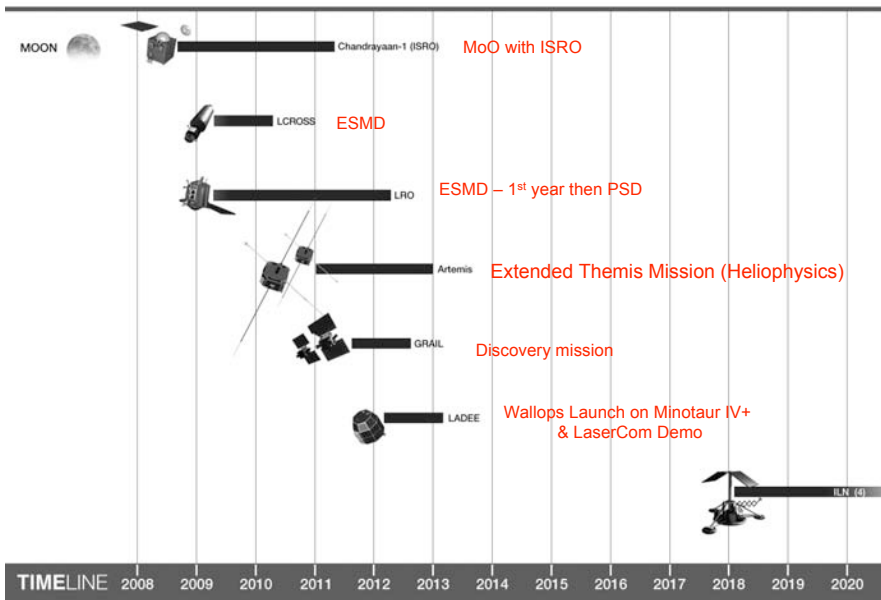
Mars Mission timeline

Next Decadal



Lunar Mission timeline

Next Decadal



New Frontiers & Discovery

PI Mission Opportunities



New Frontiers Program



1st NF mission
New Horizons:

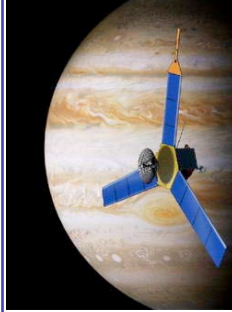
Pluto-Kuiper Belt
Mission



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



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New Frontier-3 Announcement



- Open competition for PI class missions of strategic importance to Planetary Science in the < \$1B class
 - Select up to 3 for a 10 mo. Phase-A then a downselect to 1
 - Launch window beginning late CY 2016 ending NLT the end of CY 2018, according to target
 - Technology infusion:
 - NEXT ion propulsion system & Advanced Materials Bi-propellant rocket
- Schedule:
 - AO released April 20, 2009
 - Proposals Due July 31, 2009

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Discovery Program

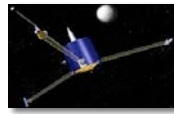


Completed

Mars evolution:
Mars Pathfinder (1996-1997)



Lunar formation:
Lunar Prospector (1998-1999)

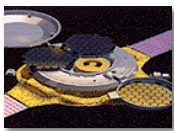


NEO characteristics:
NEAR (1996-1999)



Completed / In Flight

Solar wind sampling:
Genesis (2001-2004)



Comet diversity:
CONTOUR

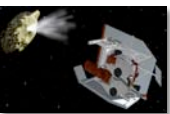


Nature of dust/coma:
Stardust(1999-2006)

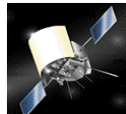


In Flight / In Development

Comet internal structure:
Deep Impact (2005-2006)



Mercury environment:
MESSENGER (2004-2012)



Main-belt asteroids:
Dawn (2007-2015)



Lunar Internal Structure
GRAIL (2011-2012)



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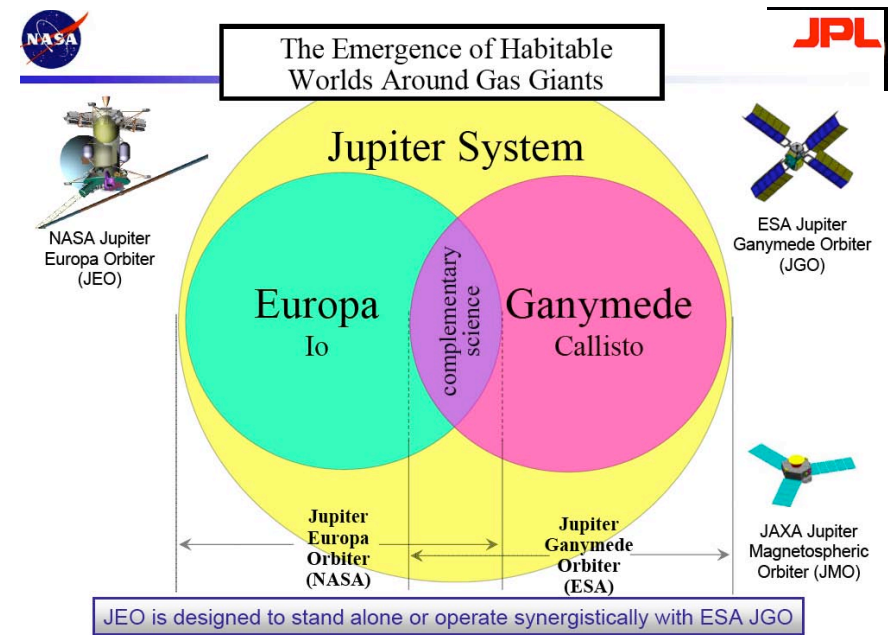
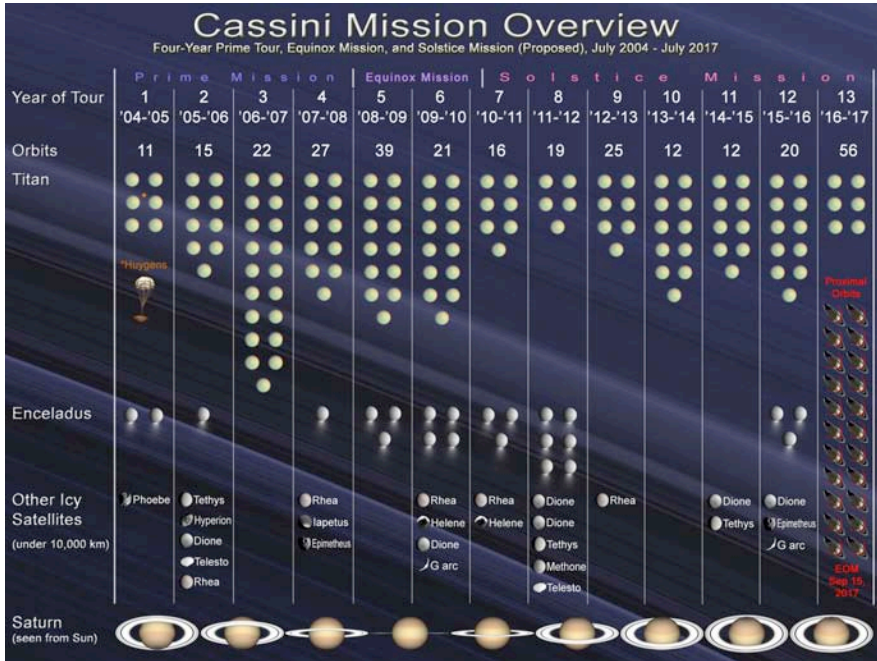


Discovery-12 Announcement

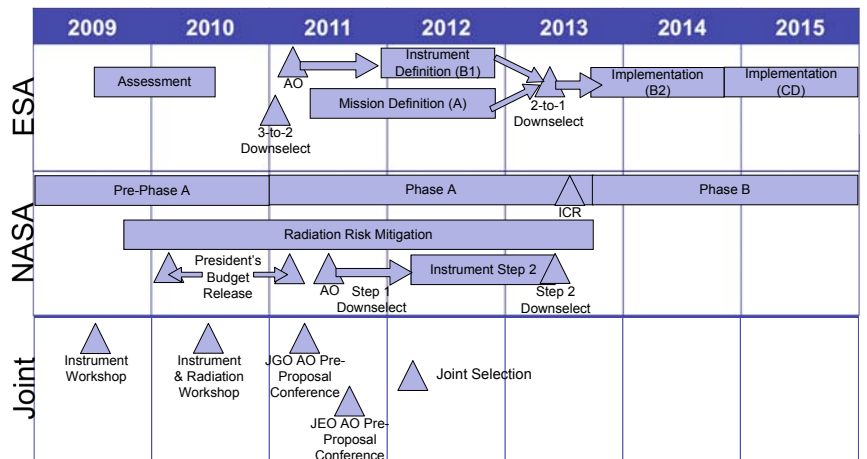


- Planetary Decadal science for PI missions
 - Across entire solar system (including Mars)
 - Cost Cap: \$425M FY10 (without LV)
 - Selection: 2 to 3 missions for a 9 mo. Phase-A then downselect to 1
 - Launch date NLT December 31, 2016
- ASRG is provided GFE as an option
 - Funded 9 feasibility studies
- Schedule:
 - Draft AO ~late July or early Aug 2009
 - Final AO ~ November-December 2009
 - Proposals due 90 days after AO release

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NASA and ESA Schedules



• Continued discussions on schedule & AO coordination

Research & Analysis



Planetary R&A Overview



ROSES	Spent	Spent	Planned	Presidents
	FY07	FY08	FY09	FY10
Mars R&A	\$14,280	\$19,926	\$19,174	\$22,169
Mars Fundamental Research				
Mars DAP				
Discovery Research	\$11,881	\$13,456	\$18,816	\$15,498
Sample Return Lab Inst & DAP				
Discovery DAP & Stardust DAP				
MESSENGER Participating Scientists Prog				
Planetary R&A	\$79,256	\$94,571	\$101,055	\$95,104
PG&G				
Cosmochemistry				
Planetary Astronomy				
Planetary Atmospheres				
Planetary Instruments & Major Equipment				
Origins of Solar Systems				
Planetary Protection				
Outer Planets Research				
Cassini Data Analysis Program (OPF)				
Venus Climate Orbiter PSP				
LPS-USPI				
Astrobiology	\$32,414	\$38,756	\$49,724	\$57,000
ASTEP				
ASTID				
NASA Astrobiology Institute				
Astrobiology: Exo and Evo				
Lunar Research	\$3,800	\$18,700	\$26,355	\$29,207
Lunar Sortie Science Opportunity				
LRO- Participating Scientist Program				
Lunar Science & Exploration Research				
NASA Lunar Science Institute & Nodes				
Total Planetary Research	\$141,631	\$185,409	\$215,124	\$218,978

Does Not Include: PDS or Curation

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NEO Program

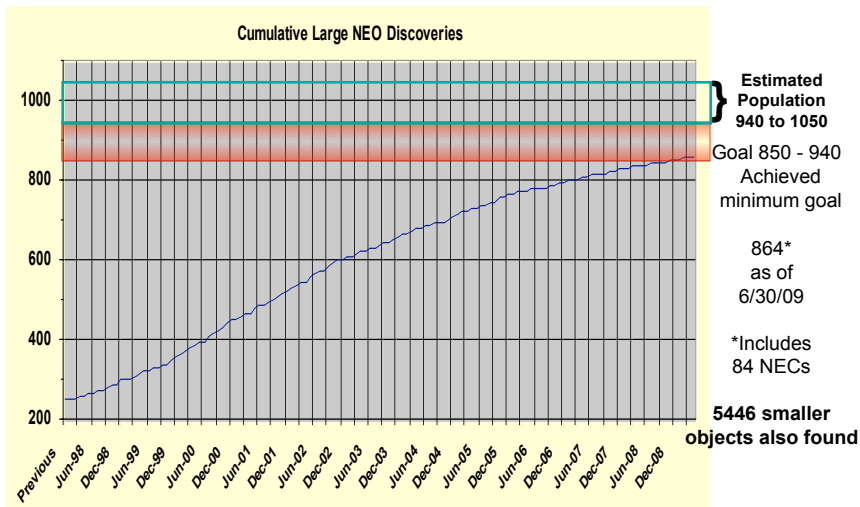


- Current program: Discover 90% NEOs >1 km in size within 10 years (1998 – 2008)
 - Using existing ground-based facilities
 - Arecibo used for characterization
- NASA Authorization Act of 2005 provided additional direction (but no additional funding)
 - "...plan, develop, and implement a Near-Earth Object 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."
- NEO program has limited assets (~\$4M/yr) and will continue to look for opportunities to partner and achieve Congressional goals

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NEO Discovery Metric



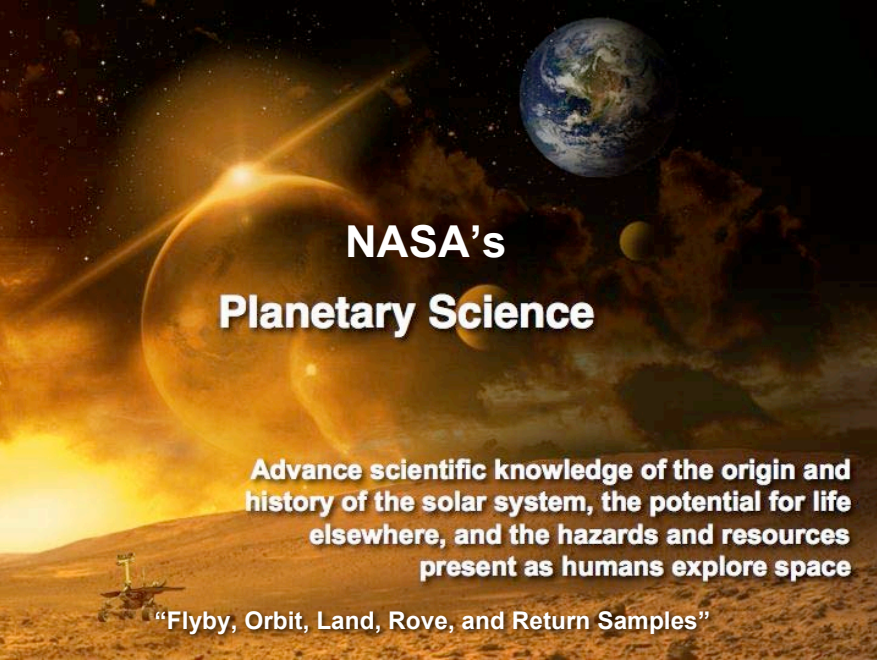
PSS Recommendations

January 9, 2009



- Continue on with MSL
- Endorsement of PSD's approach for accommodating MSL cost growth – seek additional input from PSS if above \$400M
- Re-evaluate the current Mars architecture
- Robust cost estimates should begin at mission concept phase and be used as part of the NRC studies
 - Steve Squyres will address tomorrow
- Internationalization of major missions

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A composite image for NASA's Planetary Science mission. The background is a dark space scene with a bright sun on the left, a large orange planet in the center, and Earth in the upper right. A rover is on a sandy surface in the foreground. The text is overlaid in white.

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"