Planetary Science Division Update

Presentation at the
Planetary Science Subcommittee

James L. Green
Director, Planetary Science Division

July 9, 2009

Administrative & Announcements

- Personnel Changes:
  - Planetary Protection Officer (position closed – selection TBA)
  - Astrobiology lead – position to be advertised widely
  - Jon Rall returned to GSFC – PIDD 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

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

NASA FY10 Budget Overview

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**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

Next Decadal

Planetary Science Division Budget History ($M)

Increasing Launch Vehicle Costs

Planetary Missions Overview

Increasing Launch Vehicle Costs Erode Buying Power for Missions
Planetary Missions (Non-Mars, Non-Lunar) timeline

Next Decadal

Mars Architecture Undergoing Revision

Winter ended this successful mission

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

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

Discovery Program

Mars evolution:
Mars Pathfinder (1996-1997)

Lunar formation:

NEO characteristics:
NEAR (1996-1999)

Completed

Solar wind sampling:
Genesis (2001-2004)

Comet diversity:
CONTOUR

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

Completed In Flight

Comet internal structure:

Mercury environment:
MESSENGER (2004-2012)

Main-belt asteroids:

Lunar Internal Structure
GRAIL (2011-2012)

Completed In Development

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
Advanced Stirling Radioisotope Generator Status

- Operation in space and surface of atmosphere-bearing planets & moons
- Characteristics:
  - ≥14 year lifetime
  - Nominal power: > 140 We
  - Mass: ~ 22 kg
  - Specific Power: > 6 W/kg
  - System efficiency: > 30 %
  - 2 GPHS (Pu238 Bricks”) modules
  - Uses only 0.88 kg Pu238
- ASRC Engineering Unit (EU) delivered by DOE/LM to NASA Glenn for extended (24/7) operation to provide long-life test
- ASRC EU has operated over 4000 hrs of operation to date (June 09) with no performance degradation identified.
- 2 Flight units to be delivered in 2014

President’s FY10 DOE Budget

The DOE Budget includes funding $30M to start preliminary design and engineering for a domestic capability to produce plutonium-238 for use in radioisotope power systems required for NASA’s space missions and other federal government agencies needs.

Outer Planets Flagships

Cassini
Europa & Ganymede missions
NASA and ESA Schedules

- **2009**: Assessment, President's Budget Release
- **2010**: AO Downselect, Mission Definition (A)
- **2011**: AO Downselect, AO Step 2
- **2012**: AO Step 2, Instrument Step 2 Downselect
- **2013**: AO Step 2, AO Downselect
- **2014**: AO Step 2, AO Downselect
- **2015**: AO Step 2, AO Downselect

- **Joint**
  - Instrument Workshop
  - Instrument & Radiation Workshop

- NASA and ESA Schedules:
  - **Pre-Phase A**: Radiant Risk Mitigation
  - **Phase A**: AO Downselect, AO Step 2, AO Downselect
  - **Phase B**: AO Step 2, AO Step 2

- **Research & Analysis**

- **Continued discussions on schedule & AO coordination**

**The Emergence of Habitable Worlds Around Gas Giants**

- **Jupiter System**
  - Europa
  - Io
  - Ganymede
  - Callisto

- **Complementary science**

- **NASA Jupiter Europa Orbiter (JEO)**
- **ESA Jupiter Ganymede Orbiter (JGO)**
- **JAXA Jupiter Magnetospheric Orbiter (JMO)**

JEO is designed to stand alone or operate synergistically with ESA JGO.
Planetary R&A Overview

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

NEO Discovery Metric

Cumulative Large NEO Discoveries

Estimates Population 940 to 1050
Goal 850 - 940
Achieved minimum goal

864* as of 6/30/09
*Includes 84 NECs

5446 smaller objects also found

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
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”