



NASA OVERVIEW

1st IPDA Steering Committee Meeting

Reta Beebe

New Mexico State University

NASA-PDS Program Scientist

rbeebe@nmsu.edu

Nov. 8-10, 2006



NASA ORGANIZATION

- NASA is a part of the Executive Branch of the government
 - As such, visions, goals, long term plans and budgets are developed in NASA but are presented to congress through the President's Office of Management and Budget.
 - Annually the Legislative Branch (Senate & House) allocates a budget and issues directives - many at very specific missions and efforts.
 - NASA negotiates with congress to resolve issues and implements the budget.
- The science side of NASA is vulnerable to cost over-runs on the exploration (shuttle & lunar) programs
 - Lunar exploration (LRO) and later Lunar missions are assigned to the exploration division.
 - The Orion vehicle (shuttle replacement) is under development
 - Development toward manned missions to Moon is ongoing
 - Mars is in the science section and despite the fact that the vision calls for "The Moon, Mars and Beyond" the current Mars Roadmap places the Sample Return Mission beyond and includes no plan toward manned mission.



NASA ORGANIZATION

- NASA has 2 main divisions that are involved in development of spacecraft and missions
 - The Science Mission Directorate
 - The Exploration Directorate
- Within the Science Mission Directorate are 4 division that have developed their own cultures.
 - Planetary science
 - Astronomy and Astrophysics
 - Sun-Earth connections
 - Earth science
- We will be concerned with missions within the Planetary Section and the Exploration Directorate(currently Lunar Missions)

<http://solarsystem.nasa.gov/index.cfm>



CURRENT MISSIONS

- **Cassini** - NASA/ESA Mission - a detailed study of Saturn, its rings, its magnetosphere, its icy satellites, and its moon Titan. Cassini also delivered a probe (called Huygens, provided by the European Space Agency) to Titan. Given permission to plan for an extended mission.
- **Deep Impact** - “Bombed” Comet Tempel 1 releasing a cloud of fine powdery material. The data is being analyzed and the spacecraft successfully executed a trajectory correction maneuver that put it on a path to fly past Earth on Dec. 31, 2007. The burn preserves options for future use. Two sequential missions were selected as MoOs in recent Discovery selection
- **Mars Exploration Rovers** - the identical rovers - Spirit arrived at Mars on 2004 January 4 and Opportunity arrived 2004 January 25. They were planned for 90 days and are still operating.
- **Mars Express** - ESA MISSION - NASA’s contribution is an energetic neutral atoms analyzer instrument is called Analyzer of Space Plasmas and Energetic Atoms (ASPERA-3) that studies the interaction between the solar wind and the atmosphere of Mars.



CURRENT MISSIONS (Cont.)

- **Mars Global Surveyor** - a multi- instrumented orbiter was involved in global mapping (Launched 1996 November 7).
- **Mars Odyssey** - is mapping the mineralogy and morphology of the Martian surface, elemental composition of the surface and the abundance of hydrogen in the shallow subsurface. (Launched 2001 April 7; Mars arrival: 2001 October 24)
- **Mars Reconnaissance Orbiter (MRO)**- will focus on analyzing the surface at new scales as a follow-up of the Mars Global Survey, and to bridge the gap between surface observations and measurements from orbit. MRO will reach resolutions of 20- to 30-centimeters (Launched 2005 August 12; Mars arrival: 2006 March)
- **Mercury Surface, Space Environment, Geochemistry and Ranging (MESSENGER)** is a DISCOVERY mission carrying seven instruments to study Mercury. (Launched 2004 August 3; Mercury arrival: 2011)



CURRENT MISSIONS (Cont.)

- **New Horizons** - A Pluto-Kuiper Belt Mission to carry out the first reconnaissance of Pluto and Charon. The mission will then visit one or more Kuiper Belt Objects (Launch: 2006 January 19; Pluto arrival: 2015 July)
- **Rosetta** - is a European Space Agency mission to rendezvous with comet 67P/Churyumov-Gerasimenko in May 2014. NASA provided science instruments for the orbiter. (Launched 2004 March 2)
- **Stardust** - collected interstellar dust, flew by an asteroid, and captured both dust and images of Comet P/Wild 2. The spacecraft flew by Earth and dropped off a sample return capsule filled with thousands of particles of primordial dust.. (Launched 1999 February 7; Sample return 2006 January 15)
- **Voyager 1 and Voyager 2** - were launched in the summer of 1977. Between them, the Voyagers explored all the giant outer planets of our solar system, 48 of their moons, rings and magnetic fields those planets. Voyager 1 is now the furthest human-made object from the Sun, having surpassed Pioneer 10 on February 17, 1998.



FUTURE MISSIONS

- Dawn mission I- will orbit Vesta and Ceres, two of the largest asteroids in the solar system, Vesta and Ceres, believed to form in regions where water was a gas and an ice. By observing both asteroids with the same set of instruments, Dawn would probe in detail the properties of each asteroid. (Launch: TBD)
- Phoenix - a stationary lander, in situ investigation of volatiles (especially water), organic molecules and modern climate at high-latitude sites where Mars Odyssey has discovered evidence of large ice concentrations in the Martian soil.
- A new set of DISCOVERY missions are in PHASE A
 - VESPER - Venus atmospheres
 - GRAIL- Two-craft lunar gravity probe
 - ORISIS - Asteroid Sample Return



FUTURE MISSIONS

- Mars Science Laboratory - 2009 is a roving long-range, long-duration science laboratory that will continue surface measurements and pave the way for a future sample return mission. The mission will also demonstrate the technology for "smart landers" with accurate landing and hazard avoidance.
- A second SCOUT is in competition. MoO's to support ESA ExoMars are included.
- Future Mars Missions - NASA plans additional science orbiters, rovers and landers are not well-defined at this time- Mars Sample Return has been postponed.



PAST MISSIONS

- Clementine -Lunar Mission was launched on 25 January 1994.
- Galileo - Jupiter arrival 1995 Dec. 7; end of mission 2003 Sept. 21)
- Genesis - Solar Wind - capsule damaged-. 2001 Aug. 8- 2004 Sept. 8)
- Lunar Prospector - Discovery missions. (1998 Jan. 6 - 1999 July 31.)
- Magellan-Venus radar mapper - (4 May 1989 - 11 October 1994).
- Mariner - Between 1962 and 1973, NASA designed and built 10 spacecraft named Mariner to explore the inner solar system – to Mercury, Venus, and Mars.
- Mars Pathfinder - 2 December 1996 -10 March 1998.



PAST MISSIONS

- Near Earth Asteroid Rendezvous(NEAR) - (1996 Feb. 17- 2001 Feb. 12)
- Pioneer 10 (Jupiter) and 11 (Saturn) - Launched in 1972 and 1973).
- Pioneer Venus Orbiter - Launched on 20 May 1978,
- Viking - Mars in the mid 1970's.
- Ranger - In the early 1960's
- Surveyor- Surveyor succeeded the Ranger program.



Template for NASA

Mission	FY06				FY07				FY08				FY09				FY10				FY11				FY12			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Cassini-Huygens	E																											
Dawn (Discovery 9)					E																							
Deep Impact (Discovery 8)																												
Deep Space 1	E																											
Discovery AO-2006 (Discovery 12)					A/B								C/D				E											
GALEX (SMEX 7)	E																											
Genesis (Discovery 5)	E																											
Juno (New Frontiers 1)									C/D								E											
Kepler (Discovery 10)	C/D								E																			
Lunar Lander Project	A/B								C/D								E											
Lunar Reconnaissance Orbiter	C/D												E															
Mars Exploration Rovers	E																											
Mars Global Surveyor	E				proposed				proposed																			
Mars Science Laboratory									C/D				E															
Mars Odyssey	E																											
Mars Reconnaissance Orbiter	E																											
Mars Scout 2 (launch 2011)					A/B								C/D				E											
Mars Sample Return (2013)									A/B								C/D											
MESSENGER	C/D				E																							
Moon Mineralogy Mapper	C/D								E																			
Muses C	C/D																											
NEAR	E																											
New Horizons									C/D																			
Phoenix (Mars Scout 1)	C/D								E																			
Stardust (Discovery 4)	E																											
Ulysses	E																											
Voyager	E																											