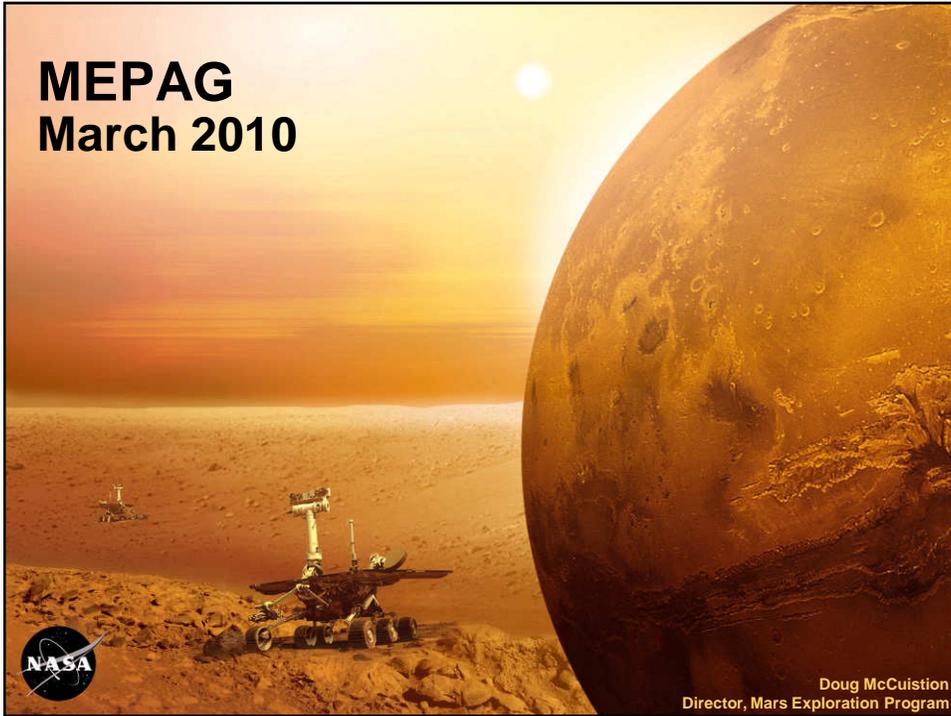


MEPAG March 2010



Agenda

- News
- FY11 President's Budget
- Major NASA Changes proposed in the President's Budget—a more in-depth look
- NASA-ESA Partnership for Mars Exploration—where are we now?



Miscellaneous News

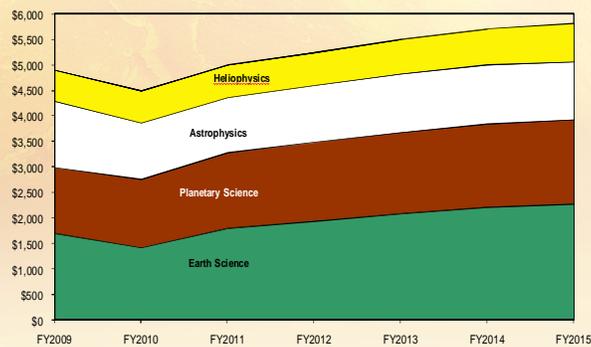
- Significant personnel changes!
 - Loses: Karen McBride, Tom Morgan, Dave Lindstrom and Marilyn Lindstrom
 - New Civil Servant: Kristen Erickson
 - New Detailees: Jeff Grossman, Amy Kaminski, Tiffany Nail, Andrea Razzaghi
 - Additional Civil Servant, IPA and detailee opportunities at HQ this FY are anticipated—and needed!
- New SMD E/PO Policy
 - The floor is now 1% of total mission cost (excluding LV)
 - Covers all missions (AO selected, strategic, decadal survey, etc)
 - Provides milestones for development and review of E/PO plans
 - Sets out reporting and evaluation requirements
 - Provides budget phasing guidance (Phase A-E)
- SALMON released for instruments on ESA-NASA 2016 Trace Gas Orbiter
 - Released Jan 2010 will select instrument this fiscal year
- Discovery-12 selections due by end of FY11

3



SMD FY11 Budget By Theme

	FY2009	FY2010	FY2011	FY2012	FY2013	FY2014	FY2015	Change FY10-15	
Science	\$4,903.1	\$4,493.3	\$5,005.7	\$5,246.7	\$5,509.7	\$5,709.9	\$5,814.1	\$1,320.8	29%
Earth Science	\$1,702.3	\$1,420.7	\$1,801.7	\$1,944.5	\$2,089.5	\$2,216.6	\$2,282.2	\$861.5	61%
Planetary Science	\$1,286.1	\$1,341.3	\$1,425.8	\$1,547.3	\$1,591.3	\$1,650.2	\$1,649.5	\$368.2	23%
Astrophysics	\$1,304.9	\$1,103.9	\$1,076.3	\$1,109.3	\$1,149.1	\$1,158.7	\$1,131.6	\$27.7	3%
Heliophysics	\$607.8	\$627.4	\$641.9	\$647.6	\$679.8	\$704.4	\$750.8	\$123.4	20%





Planetary Science Program Details

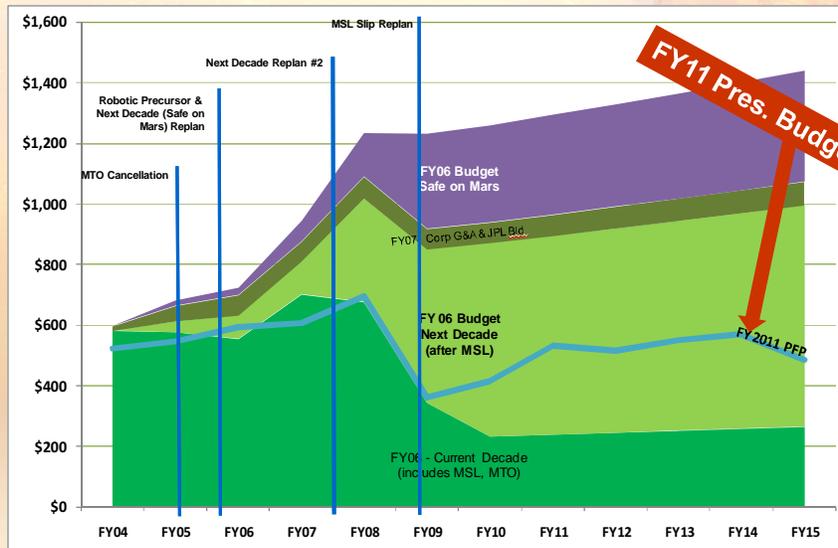
New NRC
Decadal Coverage →

	FY09	FY10	FY11	FY12	FY13	FY14	FY15
FY11 President's Budget	1,288.1	1,341.3	1,485.8	1,547.3	1,591.3	1,630.2	1,649.5
Planetary Science Research	166.2	160.7	180.4	190.8	195.2	214.2	240.9
Lunar Quest	69.1	103.6	136.6	136.4	131.7	109.7	110.5
Discovery	234.8	209.2	202.0	216.8	235.9	263.0	312.9
New Frontiers	279.0	264.1	223.8	229.5	237.9	247.7	258.5
Mars Exploration	361.7	416.1	532.8	514.8	549.9	569.6	485.8
Outer Planets	104.8	98.6	103.5	157.9	152.0	144.0	155.8
Technology	72.4	89.0	106.6	101.2	88.8	82.1	85.2

- New PSD funding FY10 to FY11 = ~\$15M for NEOs
- Mars Exploration increase is MAVEN entering Phase C, and MSL



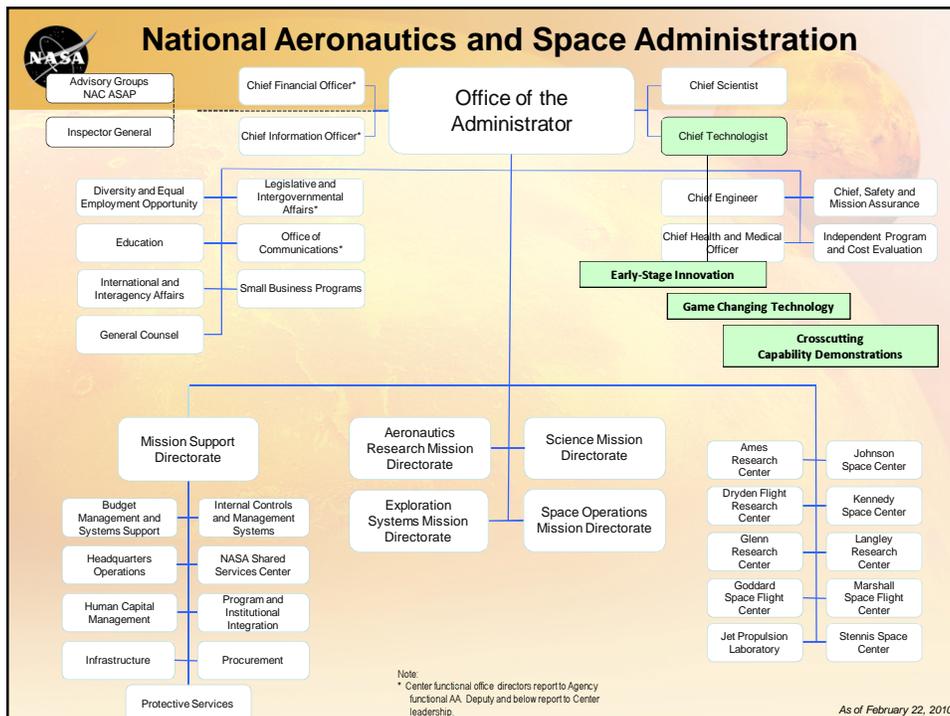
MEP Budget History Relative to the FY11 Budget





Agency Changes with the FY11 President's Budget

Office of the Chief Technologist (OCT)





Office of Chief Technologist Roles/Responsibilities

- Six main goals and responsibilities:
 - 1) **Principal NASA advisor** and advocate on Agency-wide technology policy and programs.
 - 2) **Up and out advocacy** for NASA research and technology programs. Communication and integration with other Agency technology efforts.
 - 3) Direct management of **Space Technology program**.
 - 4) **Coordination of technology investments** across the Agency, including the mission-focused investments made by the NASA mission directorates. Perform strategic technology integration.
 - 5) **Change culture** towards creativity and innovation at NASA Centers, particularly in regard to workforce development.
 - 6) **Document/demonstrate/communicate societal impacts** of NASA technology investments. Lead technology transfer and commercialization opportunities across Agency.

- Mission Directorates continue to manage mission-focused technology for directorate missions and future needs



NASA Space Technology Program Elements

TRL	1	2	3	4	5	6	7
	Early-Stage Innovation <ul style="list-style-type: none"> • Creative Ideas for Future Systems • Foundational Disciplinary Advances • Technology Enablers • Benefits/Feasibility Assessments 						
			Game-Changing Technology <ul style="list-style-type: none"> • Prove early stage novel ideas • New Capabilities (Systems & Subsystems, Not Components) • Large Scale • Quantitative Performance • Hardware Validation • Risk Results in Moderate Failure Rate 				
					Crosscutting Capability Demo. <ul style="list-style-type: none"> • Maturation to Flight Readiness • Relevant Environment Testing • 7120 Flight Processes • Not Mission Specific Technology • 25% Cost Share Req. for Flight Tests 		



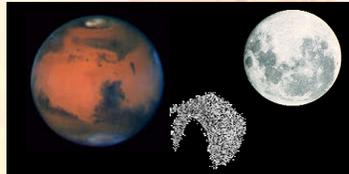
Agency Changes with the FY11 President's Budget

Exploration System Mission Directorate (ESMD)



FY 2011 President's Budget *Exploration Overview*

- Challenges NASA to embark on a new human space exploration program that focus' on
 - Obtaining key knowledge about future destinations
 - Demonstrating critical enabling technologies for human spaceflight
- Six Internal Study Teams Established
 - Exploration Robotic Precursors
 - Flagship Technology Demonstration
 - Enabling Technology Development and Demonstration
 - Heavy Lift and Propulsion Technology
 - Commercial Crew
 - Human Research
- *Mars as the ultimate destination* is typically their driving case
 - MEP has been engaged with the Exploration Robotic Precursor teams, helping them with understanding the scope and depth of 2004-05 Safe on Mars roadmapping efforts.
 - Goal IV becomes is extremely relevant—again





Most MEP-Relevant New *Exploration* Technology & Mission Activities

Exploration Technology

- ~\$8 billion over five years
- Develop and demonstrate the highest leverage technologies
- Initiate four technology demonstrations in FY2011
- Technology priorities include:
 - In-orbit propellant transfer and storage
 - Lightweight/inflatable modules
 - Automated/autonomous rendezvous and docking
 - Aerocapture/entry, descent and landing
 - Advanced life support
 - Advanced in-space propulsion (ion/plasma, etc)



Most MEP-Relevant New *Exploration* Technology & Mission Activities

Exploration Precursor Robotic Missions

- \$3.0 billion over five years
- Scout exploration targets, identify hazards and resources for human visitation and habitation
- Initiate at least two missions in FY 2011
- Candidate missions include:
 - Lunar missions, following up on LRO/LCROSS results
 - Reconnaissance of and/or landing on near-earth asteroids or on the moons of Mars (Phobos and Deimos)
 - Landing in situ resource utilization capability to process lunar or asteroid materials into fuel and/or other exploration enabling materials
 - Mars precursor measurements and demonstrations
- In all cases, emphasize partnerships





NASA-ESA Partnership Progress



NASA-ESA Joint Initiative Management Structure Program Initiation and Mission Formulation

- Management structure established
 - Joint Mars Executive Board—meets regularly
 - Joint Engineering Working Group for future mission concepts
 - Joint Mars Architecture Review Team (jMART) will be established this year
- 2016 mission project office established in Mars Program Office at JPL
 - ESA orbiter mission under ExoMars program office
- Bi-Lateral next week (Dr. Southwood and Dr. Weiler)—meets regularly
- Overall governance, documentation, review and approval processes, etc., maturing
 - Presentation to NASA Agency Program Management Council expected in May '10
- MSR working group agreed to be established



2016 NASA/ESA Orbiter Overview

Mission Overview— ESA Mission Lead

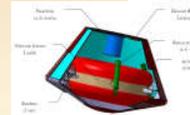
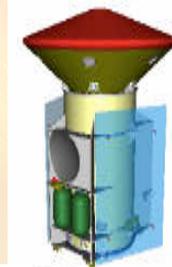
- ▶ Orbital science and refresh telecommunications infrastructure
 - Critical ESA secondary mission—Entry, Descent and Landing (EDL) demonstrator
- ▶ Primary Science—Trace gas detection and characterization, incl. methane
 - Potential Secondary Science—moderate resolution imaging (2-3m)
 - Tertiary science—<5kg battery-only landed science, e.g. seismology, meteorology, etc.
 - All instruments jointly selected through AOs for orbiter & lander
 - Orbiter AO released January 15, 2010

Key NASA roles/deliverables

- Orbiter science payload
- Launch vehicle – Atlas V 421-class
- Proximity link/Ka-Band deep space-to-earth link
- Science operation lead; aerobraking design/operation lead; relay lead

Key Near-term Milestones

- Mar '10: Mission/System Definition Review ($\phi A \rightarrow \phi B$)
- Nov '10: Mission PDR
- Jun '11: Mission/System Confirmation Review ($\phi B \rightarrow \phi C$)



2018 NASA/ESA Rovers Overview

Mission Overview— NASA Mission Lead

- ▶ Deliver NASA's and ESA's rovers to the surface of Mars
- ▶ Primary Science—astrobiology and caching samples
 - NASA: astrobiology and contact science, sample caching
 - ESA: critical technologies—roving and drilling
 - Exobiology science payload
- ▶ ISAG formed to help define complimentary science (out-brief at MEPAG)

Key NASA roles/deliverables

- Rover—science payload selected through AO
- Launch vehicle – Atlas V 531-class
- SkyCrane-based entry, descent and landing system
- Launch, cruise and EDL operations, operations for U.S. rover

Key Near-term Milestones

- Mar '10: Concept Feasibility Review
- Sept '11: ICD Version 1
- Dec '11: Mission Concept Review (leads to KDP-A)

